SEVENTH FRAMEWORK PROGRAMME

THEME [SPA.2010.1.1-04]
[Stimulating the development of GMES services in specific areas]

Grant agreement for: Collaborative project*

Annex I - "Description of Work"

Project acronym: MyWater

Project full title: " Merging Hydrologic models and EO data for reliable information on Water "

Grant agreement no: 263188

Date of preparation of Annex I (latest version): 2010-10-11

Date of last change: 2010-10-11

Date of approval of Annex I by Commission:

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Part A

Workplan Tables

A1:
Project summary

Project Number [1]	263188	Project Acronym [2]	MyWater

One form per project

General information			
Project title [3]	Merging Hydrologic models and EO data for reliable information on Water		
Starting date [4]	The first day of the month after the signature by the Commission		
Duration in months [5]	36		
Call (part) identifier [6]	FP7-SPACE-2010-1		
Activity code(s) most relevant to your topic [7]	SPA.2010.1.1-04: Stimulating the development of GMES services in specific areas		
Free keywords [8]		GMES Services, Water Management, Catchment Models, LCLU, LAI, Soil Moisture, Evapotranspiration	

Abstract [9]

In the entire world we are experiencing changing water resources needs mainly as a result of changes in land use. In developing countries the occupation of natural areas by agriculture is a major cause; economical reasons pushed by world globalization play also a major role. In both cases further global changes are expected as a result of climate change.
Water availability is essential for socio-economic activities and citizens expect catchment managers to take the necessary measures for assuring quantity and quality for direct and indirect human consumption. The knowledge of the processes determining water fate, actual reserves and the capacity to forecast water consumption are essential for catchment manager’s decision making.
Land use change drives the modification of three interdependent global variables of the watershed: evapotranspirated water, biomass production and soil organic matter content. The assessment of the consequences of land use changes requires the capacity for studying those global variables on an integrated way. Catchment models can simulate those interactions together with all the processes that determine plant dynamics and are major tools for integrated studies, essential to decision makers.
The MyWater project aims at developing a water management system integrating satellite data, models and in situ data in order to improve knowledge and create the forecasting capabilities necessary to catchment managers, and at the same time optimizing the ratio cost/benefit of water resources monitoring.
The specific products of the project are: 1) A webGIS data tool; 2) Tools for improving operational model exploitation; 3) Training and technological transfer.
The MyWater consortium includes representatives of the type of users expected. For that reason the consortium includes European, African and Latin-American teams to work in selected case studies (Portugal, Greece, Netherland’s, Mozambique and Brazil).

A2:
List of Beneficiaries

Project Number [1]	263188	Project Acronym [2]	MyWater

List of Beneficiaries

No	Name	Short name	Country	Project entry month[10]	Project exit month
1	GMVIS SKYSOFT SA	GMV	Portugal	1	36
2	INSTITUTO SUPERIOR TECNICO	IST	Portugal	1	36
3	HIDROMOD MODELACAO EM ENGENHARIA LDA	HID	Portugal	1	36
4	UNESCO-IHE INSTITUTE FOR WATER EDUCATION	IHE	Netherlands	1	36
5	HYDROLOGIC RESEARCH BV	HR	Netherlands	1	36
6	JRC -JOINT RESEARCH CENTRE- EUROPEAN COMMISSION	JRC	Belgium	1	36
7	INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS	CPTEC	Brazil	1	36
8	Pannon Egyetem	UP	Hungary	1	36
9	ARISTOTELIO PANEPISTIMIO THESSALONIKIS	AUTh	Greece	1	36
10	UNIVERSIDADE EDUARDO MONDLANE	UEM	Mozambique	1	36

A3:
Budget Breakdown

Project Number [1]	263188	Project Acronym [2]	MyWater

One Form per Project

Participant number in this project [11]	Participant short name	Fund. % [12]	Ind. costs [13]	Estimated eligible costs (whole duration of the project)					Total receipts	Requested EU contribution
				RTD / Innovation (A)	Demonstration (B)	Management (C)	Other (D)	Total A+B+C+D		
1	GMV	50.0	A	182,817.56	0.00	177,250.20	58,112.55	418,180.31	0.00	326,771.53
2	IST	75.0	A	296,188.92	0.00	3,406.18	16,624.74	316,219.84	0.00	242,172.61
3	HID	75.0	T	287,200.00	0.00	3,920.00	21,400.00	312,520.00	0.00	240,720.00
4	IHE	75.0	A	147,121.43	0.00	9,064.00	154,176.38	310,361.81	0.00	273,581.45
5	HR	75.0	T	374,120.00	0.00	5,800.00	59,200.00	439,120.00	0.00	345,590.00
6	JRC	75.0	T	326,284.80	0.00	0.00	0.00	326,284.80	0.00	244,713.60
7	CPTEC	75.0	T	175,360.00	0.00	2,160.00	4,320.00	181,840.00	0.00	138,000.00
8	UP	75.0	T	102,200.74	0.00	3,360.00	0.00	105,560.74	0.00	80,010.55
9	AUTh	75.0	T	421,046.90	0.00	2,400.00	4,800.00	428,246.90	0.00	322,985.17
10	UEM	75.0	T	72,883.63	0.00	4,624.37	0.00	77,508.00	0.00	59,287.09
Total				2,385,223.98	0.00	211,984.75	318,633.67	2,915,842.40	0.00	2,273,832.00

Note that the budget mentioned in this table is the total budget requested by the Beneficiary and associated Third Parties.

*** The following funding schemes are distinguished**

Collaborative Project (if a distinction is made in the call please state which type of Collaborative project is referred to: (i) Small of medium-scale focused research project, (ii) Large-scale integrating project, (iii) Project targeted to special groups such as SMEs and other smaller actors), Network of Excellence, Coordination Action, Support Action.

1. Project number

The project number has been assigned by the Commission as the unique identifier for your project, and it cannot be changed. The project number **should appear on each page of the grant agreement preparation documents** to prevent errors during its handling.

2. Project acronym

Use the project acronym as indicated in the submitted proposal. It cannot be changed, unless agreed during the negotiations. The same acronym **should appear on each page of the grant agreement preparation documents** to prevent errors during its handling.

3. Project title

Use the title (preferably no longer than 200 characters) as indicated in the submitted proposal. Minor corrections are possible if agreed during the preparation of the grant agreement.

4. Starting date

Unless a specific (fixed) starting date is duly justified and agreed upon during the preparation of the Grant Agreement, the project will start on the first day of the month following the entry info force of the Grant Agreement (NB : entry into force = signature by the Commission). Please note that if a fixed starting date is used, you will be required to provide a detailed justification on a separate note.

5. Duration

Insert the duration of the project in full months.

6. Call (part) identifier

The Call (part) identifier is the reference number given in the call or part of the call you were addressing, as indicated in the publication of the call in the Official Journal of the European Union. You have to use the identifier given by the Commission in the letter inviting to prepare the grant agreement.

7. Activity code

Select the activity code from the drop-down menu.

8. Free keywords

Use the free keywords from your original proposal; changes and additions are possible.

9. Abstract

10. The month at which the participant joined the consortium, month 1 marking the start date of the project, and all other start dates being relative to this start date.

11. The number allocated by the Consortium to the participant for this project.

12. Include the funding % for RTD/Innovation – either 50% or 75%

13. Indirect cost model
A: Actual Costs
S: Actual Costs Simplified Method
T: Transitional Flat rate
F :Flat Rate

Workplan Tables

Project number

263188

Project title

MyWater—Merging Hydrologic models and EO data for reliable information on Water

Call (part) identifier

FP7-SPACE-2010-1

Funding scheme

Collaborative project

WT1
List of work packages

Project Number [1]	263188	Project Acronym [2]	MyWater

LIST OF WORK PACKAGES (WP)

WP Number [53]	WP Title	Type of activity [54]	Lead beneficiary number [55]	Person-months [56]	Start month [57]	End month [58]
WP 1	Project Management	MGT	1	24.00	1	36
WP 2	Land Core Data	RTD	9	69.00	4	33
WP 3	Meteorological data	RTD	7	28.00	4	33
WP 4	Soil Data	RTD	6	73.50	4	21
WP 5	Models and Data Integration	RTD	2	41.00	4	15
WP 6	Service Chain	RTD	3	15.50	4	12
WP 7	MyWater Platform Development	RTD	3	48.50	7	27
WP 8	Test Site Implementation	RTD	2	52.50	16	36
WP 9	User and Market Analysis	OTHER	1	9.50	1	36
WP 10	Dissemination, Training and Support	OTHER	4	22.50	1	36
			Total	384.00		

WT2:
List of Deliverables

Project Number [1]	263188	Project Acronym [2]	MyWater

List of Deliverables - to be submitted for review to EC

Deliverable Number [61]	Deliverable Title	WP number [53]	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D1.1	Project management plan	1	1	3.00	R	RE	1
D1.2	Progress/Activity report	1	1	7.00	R	RE	12
D1.3	Progress/Activity report	1	1	7.00	R	RE	24
D1.4	Project final report	1	1	7.00	R	RE	36
D2.1	Detailed data inventory	2	9	2.00	R	PU	9
D2.2	Best practices	2	9	2.00	R	PU	21
D2.3	Spatially distributed LCLU	2	9	18.00	O	RE	21
D2.4	Spatially distributed LAI	2	9	19.00	O	RE	21
D2.5	Spatially distributed ETa and ETs	2	9	14.00	O	RE	21
D2.6	Spatially distributed Soil Moisture	2	9	14.00	O	RE	21
D3.1	High-resolution numerical weather forecast	3	7	14.00	O	RE	21
D3.2	Six-month long-range forecasts	3	7	14.00	O	RE	21
D4.1	Integration of new soil information	4	6	18.00	R	RE	9
D4.2	Collection of watershed-scale data	4	6	18.00	R	RE	9
D4.3	Generation of new pedotransfer rules	4	6	19.00	R	RE	21

Deliverable Number [61]	Deliverable Title	WP number [53]	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D4.4	Multiscale thematic soil water database	4	6	18.50	O	RE	21
D5.1	Integration of catchment models with EO based input data	5	2	41.00	R	RE	15
D6.1	Definition of the Service Cases and associated Services Chains	6	3	7.50	R	PU	12
D6.2	Record specifications for the MyWater platform	6	3	4.00	R	RE	12
D6.3	Validation manual	6	3	4.00	R	PU	12
D7.1	MyWater desing and technologies	7	3	5.50	R	RE	9
D7.2	MyWater platform V0	7	3	11.00	O	RE	21
D7.3	MyWater platform V1.0	7	3	11.00	O	RE	24
D7.4	First version of the MyWater user manual	7	3	5.00	R	PU	24
D7.5	MyWater platform V1.1	7	3	11.00	O	RE	27
D7.6	Second version of the MyWater user manual	7	3	5.00	R	PU	27
D8.1	Model implementation and validation	8	2	12.00	R	RE	21
D8.2	MyWater platform study site implementation	8	2	30.00	R	PU	36
D8.3	Utility report from the user	8	2	10.50	R	PU	36
D9.1	End-users requirements documentand WFD	9	1	5.00	R	PU	6

Delive-rable Number [61]	Deliverable Title	WP number [53]	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
	requirements in European cases						
D9.2	Competing solutions analysis document	9	1	1.00	R	PU	6
D9.3	Business model and initial commercial feasibility study	9	1	1.50	R	RE	9
D9.4	Business and Exploitation Plan	9	1	2.00	R	RE	36
D10.1	Project website	10	1	1.50	O	PU	3
D10.2	Dissemination plan	10	4	5.00	R	PU	9
D10.3	Flyers	10	4	1.50	O	PU	24
D10.4	1st Policy brief	10	4	0.50	O	PU	6
D10.5	2nd Policy brief	10	4	0.50	O	PU	36
D10.6	Contribution to the Blueprint on Water Scarcity	10	2	2.00	R	PU	36
D10.7	Special MyWater session at a prestigious international conference	10	4	5.00	O	PU	24
D10.8	Course material	10	4	6.50	R	PU	36
			Total	384.00			

WT3:
Work package description

Project Number [1]	263188	Project Acronym [2]	MyWater

One form per Work Package

Work package number [53]	WP1	Type of activity [54]	MGT
Work package title	Project Management		
Start month	1		
End month	36		
Lead beneficiary number [55]	1		

Objectives

To coordinate and manage all the project activities including programmatic issues, as well as contractual aspects.

Description of work and role of partners

The main objective of the "Project Management" work package is to ensure that the project is administered, and Consortium activities are carried out, in an effective and efficient manner.
The Project Manager will be responsible for the administrative, legal and financial management. The Project Manager will ensure that the various members of the Consortium team communicate with each other in the appropriate ways. The project manager will also be the official point of contact for REA.
The following items are envisaged to be performed as part of the project management tasks:
• Co-ordination of the administrative, financial and legal aspects of the project;
• To act as interface between the REA and the project consortium;
• Contractual management;
• Timely and correct handling of financial and administrative matters in the project;
• Preparation (all but technical aspects) and submission of all the contractual reports associated to the project (including periodic progress / activity reports). Scientific reporting activities are not included;
• Organization and co-ordination of internal communication flow; definition of lines of communication at each working level of the project;
• Tracking of project status from contractual point of view;
• To plan and co-ordinate the consortium's activities (from administrative, legal and financial point of view);
• To ensure that the project makes efficient use of the resources to be committed;
• To ensure timely release of its results;
• Establishment and maintenance of the travel plan;
• Organization of meetings (notification, agenda, chairing and minutes);
• Cost planning and control;
• To ensure the quality procedures are correctly applied during the execution of the project activities;
Contributions to D1.1, D1.2, D1.3 and D1.4.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	GMV	20.00
2	IST	0.50
3	HID	0.50
4	IHE	0.50
5	HR	0.50

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
7	CPTEC	0.50
8	UP	0.50
9	AUTh	0.50
10	UEM	0.50
	Total	24.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D1.1	Project management plan	1	3.00	R	RE	1
D1.2	Progress/Activity report	1	7.00	R	RE	12
D1.3	Progress/Activity report	1	7.00	R	RE	24
D1.4	Project final report	1	7.00	R	RE	36
		Total	24.00			

Description of deliverables

D1.1) Project management plan: Project management plan [month 1]

D1.2) Progress/Activity report: 1st Progress/Activity report [month 12]

D1.3) Progress/Activity report: 2nd Progress/Activity report [month 24]

D1.4) Project final report: Project final report [month 36]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS1	Project Kick-off	1	1	
MS12	End of project	1	36	

WT3:
Work package description

Project Number [1]	263188	Project Acronym [2]	MyWater

One form per Work Package

Work package number [53]	WP2	Type of activity [54]	RTD
Work package title	Land Core Data		
Start month	4		
End month	33		
Lead beneficiary number [55]	9		

Objectives

MyWater Land core data (i.e. LCLU, LAI, ETa, and Soil Moisture) is an essential constituent of the catchment models, component of the MyWater concept. In this WP we will deal with guaranteeing the provision of such data for the test site areas. The main objectives are:
• To produce a detailed inventory regarding the availability, and other characteristics, of land core data, satellite imagery, EO-based products and ancillary data (for the development of the land core data) over the test site areas;
• To develop the methodologies to provide LCLU, LAI, ETa and Soil Moisture datasets;
• To produce the LCLU, LAI, ETa and Soil Moisture datasets for the test site areas.

Description of work and role of partners

Task 2.1 – Test Sites Data Procurement Plan: Land core products, EO and ancillary data (lead: AUTh; partner: GMV)
The first step is to compile all the EO data available (and characteristics) for the test sites that may be used for providing the input land core data to the catchment models. There are two types of data:
• Existent land core data (i.e. LCLU, LAI, ETa and Soil Moisture) that can be directly used in the catchment models (e.g. available GMES data developed for example in Geoland2) if proven to be feasible and adequate;
• EO and ancillary data that can be used for the production of the land core data.
Both EO and ancillary data can be used:
• As direct input data for classifiers and models used to derive the land core data;
• As auxiliary data to help in the production process of the land core data (e.g. regarding LCLU data production, Kompsat-2 images may help in the selection of training data for classifying SPOT or Landsat data).
Preference will be given to the use of high spatial resolution satellite images for local land core features mapping, except for those features that are dynamic (such as ETa) for which high temporal resolution satellite images will be preferred (e.g. MODIS Terra/Aqua).
Regarding EO and ancillary data, the common data among the test sites will be identified, usually originating from global coverage datasets, such as Landsat TM/ETM+ coverage, SPOT and others. This would preferably be the data to be used throughout the project. Another possibility (most likely) is to work with the different data existent in each of the test sites, with a view of producing the best possible land core data. However, this second possibility may not allow the development of a common methodology that can be used worldwide.
Besides the above, the possibility of using data from future satellite missions shall also be evaluated and taken into account to assure the sustainability of the service in the future – it will be analysed the adequacy of the future satellites and sensors, i.e. their technical characteristics, regarding to the development of MyWater Land core data. Examples of such missions are the Sentinels and the Earth Explorers.
Contributions to D2.1.

Task 2.2 – Development of LCLU data (lead: AUTh; partner: GMV)
D2.1 will be an input to this task.
Considering that the MyWater services will address local and regional scales, the LCLU maps will be developed at different scales: regional and local (reference scales 1:1.000.000 and 1:50.000 respectively).
Land Cover Land Use maps will be generated, based on medium and high spatial resolution satellite images from ESA or ESA third party missions. A preliminary evaluation points to the possibility of using:

• Regional scale: moderate spatial resolution imagery, specifically, MERIS (Medium Resolution Imaging Spectrometer) or MODIS (Moderate Resolution Imaging Spectroradiometer) (or similar);
• Local scale: high spatial resolution imagery; specifically, AVNIR 2, SPOT-4/HRVIR, AWiFS, Landsat and /or IRS-P6/LISSIII (or similar).
This according to the availability of such data and also considering the possibility of using the same images for developing the other land core data (i.e. LAI, ETa, Soil Moisture).
Regarding information extraction from the input (remotely sensed) data, the methods used will be adequate to the different imagery spatial resolutions we will be dealing with. At the same time, advantage will be taken in some cases from the multi-temporal nature of satellite images, in order to improve crop identification, based on the different phenology of the different crops. In all cases, automated methods will be applied, followed by a manual edition in the imagery post-processing phase. Images will be processed with automatic classification algorithms (e.g. maximum likelihood, linear discrimination classifier, ISODATA, Support Vector Machines) using the pixel as spatial unit of analysis, eventually complemented with object-oriented analysis. In all cases satellite data pre-processing (geometric and radiometric correction) will be applied as needed.
Nomenclatures will be as far as possible compatible with the definition of the Geoland2 land. We shall use the Land Cover Classification System (LCCS) developed by FAO in order to produce the LCLU nomenclatures. This will allow easy harmonization with other LCLU products. For the production of the LCLU maps, a series of ancillary data (e.g. Globcover, CORINE Land Cover maps, Specific local land cover data, high resolution imagery such as ortho-imagery) is envisaged to be used both to assist the classification and the validation procedures.
The validation of the LCLU maps shall follow a statistically sound accuracy assessment strategy involving the construction of confusion matrixes based on the comparison of the map with a reference database (based on a sound probability design – e.g. stratified random sampling) representing the "ground truth". This comparison will allow for the estimation of the map's standard accuracy measures, i.e. overall accuracy, user's accuracy and producer's accuracy and reliability, i.e. K-hat statistic.
LCLU maps for the test site areas will be developed once, being ready at beginning of the implementation phase. These will not be updated during the project lifetime.
This task will contribute to D2.2 and D2.3.

Task 2.3 - Development of LAI data (lead: AUTh; partner: GMV)
D2.1 will be an input to this task.
Leaf Area Index (LAI) is an important input in spatially distributed modelling of several variables, such as evapotranspiration and vegetation productivity. Remote sensing can facilitate the rapid collection of LAI information over large areas in a timely and cost-effective manner.
In MyWater project we plan to estimate LAI using a most common Least Square Regression (LSR) model, based on empirical correlations between LAI and Spectral Vegetation Indices (SVI) (e.g. Simple Ratio – SR, Normalized Difference Vegetation Index – NDVI, Enhanced Vegetation Index – EVI, Reduced Simple Ratio – RSR). The SVI to use for mapping and monitoring LAI will be derived from satellite data and a preliminary review of the literature indicates for the use of the NDVI as the best practice for estimating LAI. For each test site of MyWater, these indices will first be assessed in terms of their sensitivity to vegetation biophysical parameters, as well as to external factors affecting canopy reflectance.
As base data for the estimation of the SVI, we plan on using ESA or ESA third party missions satellite imagery (e.g. MERIS, MODIS, Landsat, SPOT-4/HRVIR). The selection of the images to use will depend not only on availability but also on the scale for which the service will address. Besides availability and scale images will be selected considering the possibility of being used also for developing the other land core data (i.e. LCLU, ETa, Soil Moisture).
Different LSR models will be tested in order to select the one that best fits the LAI/SVI correlation. Most of LAI/SVI statistical relationships reported in the literature follow one of the following LSR models: (1) linear: LAI = a + bX; (2) exponential: LAI = a ebX; (3) power: LAI = aXb; and (4) quadratic: LAI = aX2 +bX+ c; where, X is the SVI, and a, b, and c are coefficients that vary with the index chosen and the type of vegetation. These mathematical forms shall be tested.
The outlined methodology for developing the LAI models will consist of the following three steps:
• ground-truth data collection;
• pre-processing (geometric and radiometric correction) of the satellite data (if needed);
• development of a SVI-LAI model;
• test and validation of the developed SVI-LAI model.
LAI maps for the test site areas will be developed preferably once every two month during the implementation phase. However, image availability may be a restricting factor

This task will contribute to D2.2 and D2.4.

Task 2.4 - Development of ETa data (lead: AUTh)
D2.1 will be an input to this task.
Actual Evapotranspiration (ETa) is a good estimate of water use in large heterogeneous areas where limited information is available (e.g. no water meters, no regular flow estimates). ETa can be calculated by applying the Surface Energy Balance Algorithm for Land (SEBAL) on the satellite images which have a thermal band (Terra/Aqua MODIS, NOAA AVHRR, Landsat TM/ETM+, and Terra ASTER). SEBAL is a thermodynamically based model, using the partitioning of sensible heat flux and latent heat of vaporization flux as described in (Bastiaanssen et al., 1998). A further customized SEBAL for operational performance under Mediterranean conditions (i.e. small parcel sizes, detailed crop pattern, and lack of necessary data) is the ITA-Water tool, which has been developed by AUTh within the frame of ESA's GSE Land project (Alexandridis et al., 2009).
In MyWater, ITA-Water will be employed to estimate ETa and further on the water used by agriculture and other land cover types at the pixel level for the entire basin of the study area. Terra/Aqua MODIS satellite images with 8days period will be used together with daily meteorological data from local stations to compute broad-band reflectances, surface temperature, and vegetation indices. Using extreme wet and dry pixels for calibrating the algorithm, these information layers are transformed into the terms of surface energy balance equation, which is solved to estimate the latent heat flux and further on the Actual Evapotranspiration in mm/day, for each one of the satellite images.
This spatial component of ETa will be combined with the temporal component (daily potential evapotranspiration estimations from local meteorological stations during the irrigation season) to generate daily simulated ETa values. The daily ETa values are then summed to produce the seasonal evapotranspiration (ETs) at desired time intervals (e.g. ETs per month, irrigation season or hydrological year). In order to achieve higher spatial resolution than that offered by Aqua/Terra MODIS (1x1 km), the modified Brovey resolution improvement algorithm is incorporated within ITA-Water (Chemin and Alexandridis, 2004). This algorithm re-distributes the original value of ETs found in a pixel of 1x1 km to a higher spatial resolution, using as guide the high spatial detail of the Landsat TM/ETM+ image. The advantage of the algorithm is that the initial values of ETs remain globally unchanged, which is an essential prerequisite for estimating water use volumes.
Adaptation of the methodology for optimum operation within each site will be performed, and improvements using auxiliary datasets (e.g. soil type, Soil Moisture) will be examined.
The resulting deliverables will be the improved methodology and the spatially distributed ETa and ETs for the entire study area (wall-to-wall coverage), ready to be used as input to the Soil Moisture estimation algorithms and, more generally, to be incorporated in soil-water resources management GIS models.
ETa and ETs maps will be provided once every 8 days for the test site areas during the implementation phase. Images availability may be a restricting factor.
This task will contribute to D2.2 and D2.5.

Task 2.5 - Development of Soil Moisture data (lead: AUTh)
D2.1 will be an input to this task.
Soil Moisture storage is important for the management of water resources. In fact, the amount of Soil Moisture affects the growth of vegetation and describes the environmental conditions (e.g. desertification risk).
As Soil Moisture exhibits a large spatial and temporal variation as a result of heterogeneity of soil properties, vegetation, and precipitation, the use of remotely sensed data is particularly advantageous for such applications.
The evaporative fraction (Λ) is the key parameter in the Surface Energy Balance Algorithm for Land (SEBAL) to express energy partitioning. The evaporative fraction is related primarily to the available moisture content and an empirical relation was proposed by Bastiaanssen et al. (2000) for the retrieval of the relative Soil Moisture content, the absolute Soil Moisture being expressed as a percentage of the moisture value at full saturation.
AUTh has already developed a module for GRASS GIS software that provides a root zone empirical Soil Moisture output following Bastiaanssen et al. (2000). In MyWater, the output from Task 2.4 will be used in order to retrieve the spatial distribution of Soil Moisture at the regional scale using an improved version of this module.
Improvement and adaptation of the model to take into account the specific type of soil unit for each location (input data from Task 4.1) is expected to increase the accuracy of the results.
Field data will be collected in representative locations of the study areas (i.e. covering all soil types and land cover types) in order to calibrate and verify the developed methodology and alternative models may be applied for comparative reasons, based on data availability (e.g. top Soil Moisture estimation based on available radar images).
The resulting deliverables will be the developed methodology and the spatially distributed Soil Moisture maps at root zone for the test sites, ready to be incorporated in the MyWater service chain.

Soil Moisture maps will be provided once every 8 days for the test site areas during the implementation phase. EO images availability may be a restricting factor.
This task will contribute to D2.2 and D2.6.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	GMV	19.50
9	AUTh	49.50
	Total	69.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D2.1	Detailed data inventory	9	2.00	R	PU	9
D2.2	Best practices	9	2.00	R	PU	21
D2.3	Spatially distributed LCLU	9	18.00	O	RE	21
D2.4	Spatially distributed LAI	9	19.00	O	RE	21
D2.5	Spatially distributed ETa and ETs	9	14.00	O	RE	21
D2.6	Spatially distributed Soil Moisture	9	14.00	O	RE	21
		Total	69.00			

Description of deliverables

D2.1) Detailed data inventory: Detailed inventory on the availability, and other characteristics, of land core data, satellite imagery, EO-based products and ancillary data (for the development of the land core data) over the test site areas [month 9]

D2.2) Best practices: Best practices to develop MyWater land core data on an operational basis for catchment modelling [month 21]

D2.3) Spatially distributed LCLU: Spatially distributed LCLU maps for the test sites [month 21]

D2.4) Spatially distributed LAI: Spatially distributed LAI maps for the test sites (update every 2 months) [month 21]

D2.5) Spatially distributed ETa and ETs: Spatially distributed ETa and ETs maps for the test sites (update every 8 days) [month 21]

D2.6) Spatially distributed Soil Moisture: Spatially distributed Soil Moisture maps for the test sites (update every 8 days) [month 21]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS6	Initial Availability of Land Core/Meteorological/Soil Data	9	21	

WT3:
Work package description

Project Number [1]	263188	Project Acronym [2]	MyWater

One form per Work Package

Work package number [53]	WP3	Type of activity [54]	RTD
Work package title	Meteorological data		
Start month	4		
End month	33		
Lead beneficiary number [55]	7		

Objectives

To provide the meteorological outputs required (i.e. temperature, relative humidity, wind, solar radiation and precipitation) to feed the hydrological models used in MyWater project.

Description of work and role of partners

Task 3.1 - High resolution weather forecast (lead: CPTEC)
The CPTEC will run its numerical weather forecast global and regional models to provide the data needed for the project during its duration. The outputs of the global model (CPTEC global model) will be used to feed the ETa regional model for the downscaling with high resolution, with at least 5 kilometres in the horizontal resolution. The high-resolution outputs will feed the hydrological and other models of the MyWater project with temperature, relative humidity, wind, solar radiation and precipitation. High resolution weather forecast data will be generated two times every day during the implementation phase of the project.
This task will contribute to D3.1.

Task 3.2 - Long range forecast (lead: CPTEC)
The CPTEC produces operational seasonal forecasts using a global atmospheric general circulation model (AGCM) forced with prescribed sea surface temperature. These forecasts are produced every month and are valid for the following six months. The spatial resolution of the current operational version of CPTEC seasonal forecasting system is 1.875 x 1.875 degrees in latitude and longitude. The following forecast variables are available for the entire globe: precipitation, wind, temperature and specific humidity.
CPTEC is one of the few centres that run a long range numerical forecast with global coverage. The numerical outputs will need to be prepared to provide the variables required to feed the hydrological models used in MyWater project.
This task will contribute to D3.2.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
7	CPTEC	28.00
	Total	28.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D3.1	High-resolution numerical weather forecast	7	14.00	O	RE	21

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D3.2	Six-month long-range forecasts	7	14.00	O	RE	21
		Total	28.00			

Description of deliverables

D3.1) High-resolution numerical weather forecast: High-resolution numerical weather forecast outputs for the test site areas 2 times a day (00h and 12h) (updated every day) [month 21]

D3.2) Six-month long-range forecasts: Six-month long-range forecasts produced every month for the test site areas (updated every month) [month 21]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead benefi-ciary number	Delivery date from Annex I [60]	Comments
MS6	Initial Availability of Land Core/Meteorological/Soil Data	9	21	

Project Number [1]	263188	Project Acronym [2]	MyWater

One form per Work Package

Work package number [53]	WP4	Type of activity [54]	RTD
Work package title	Soil Data		
Start month	4		
End month	21		
Lead beneficiary number [55]	6		

Objectives

Soil data and information derived by pedotransfer functions provide an essential constituent to the Land Models component of the MyWater concept. In this WP a common strategy for data storage/processing and the development of an integrated database is carried out, including:
• Review and classification of data available from continental soil databases and collection of the new LUCAS Soil information in the required data format;
• Data gathering for watershed-scale thematic soil datasets;
• Pedotransfer rule development on the basis of the integrated dataset for providing input information on soil water content to the MyWater model;
• Development of multiscale thematic dataset of soil water assessment to be used as an input to MyWater model.

Description of work and role of partners

Task 4.1 - Data gathering (soil depth, soil texture and SOC) (lead: JRC; partners: UP, AUTh)
Main task of this WP is to overview and gather all available soil information sources relevant for the soil water management component of the MyWater model and to design the conceptual integration of these thematic and derived datasets. The work of this task will address,
Contributions to D4.1:
A number of continental and regional scale databases are available to support soil water modelling in Europe. Besides the European Soil Database the BioSoil forest soil monitoring data, a new set of soil data will become available from 2010 through the LUCAS Soil survey, including soil organic carbon and soil texture information of over 22.000 sampling points over the EU.
Contributions to D4.2:
In order to validate soil water models derived by pedotransfer rules (PTR) detailed catchment data are required. Two catchments are selected for data and PTR validation.
The Hungarian test site located in the western part of the country. It includes the catchment area of Zala river near the Lake Balaton. Besides other describing data a soil map database is available at this area. It contains 1:10.000 scale soil maps and cartograms (soil texture, SOC, pH, calcium carbonate etc) 10.000 ha arable fields. Using the soil map database and the pedotransfer rules which were developed and tested on the basis of the Hungarian Detailed Soil Hydrophysical Database it is possible to predict the main hydrophysical parameters of the soils and to calculate the water regime with the actual soil water content of the soil polygons.
The test site in Greece includes the catchment areas of Nestos river located in the northern part of the country. Apart from other data (land cover, meteorological data etc) a soil database will be available early in 2010. The soil database includes thematic maps, 1:20.000 in scale, of more than 20 soil properties (soil texture, SOC, soil depth, bulk density, calcium carbonate, pH, EC, CEC, SAR, macro and micro nutrients etc). Ground truthing activities for measuring actual soil water content will be performed for calibrating and validating models and pedotransfer rules.

Task 4.2 - Generation of database for model input using pedotransfer functions (lead: JRC; partners: UP, AUTh)
Development of an integrated thematic database taking the advantage of the platform of Infrastructure for Spatial Information in Europe (INSPIRE) and through the concept of harmonized protocols for meteorological, earth observation and soil data of the MyWater project. Main task is to prepare a new continental scale coverage of

soil water information which is based on new class pedotransfer rules, worked out and tested on watershed level. The work of this task will address,
Contributions to D4.3:
Modelling component of this WP includes the development of new pedotransfer rules on the bases of available integrated dataset to provide differentiated soil water input information to the MyWater model. This PTR development focuses both on watershed and continental scales. Parallel PTR development will take place for the different scales and will be validated with satellite information.
Contributions to D4.4:
Implementation of a multiscale thematic soil water database - through the European Soil Data Centre - which will be used as an input source to the MyWater model.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
6	JRC	23.00
8	UP	44.50
9	AUTh	6.00
	Total	73.50

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D4.1	Integration of new soil information	6	18.00	R	RE	9
D4.2	Collection of watershed-scale data	6	18.00	R	RE	9
D4.3	Generation of new pedotransfer rules	6	19.00	R	RE	21
D4.4	Multiscale thematic soil water database	6	18.50	O	RE	21
		Total	73.50			

Description of deliverables

D4.1) Integration of new soil information: Integration of new soil information obtained from the LUCAS Soil Survey with the European Soil Database [month 9]

D4.2) Collection of watershed-scale data: Collection of watershed-scale data for an integrated soil database for soil water modelling and validation [month 9]

D4.3) Generation of new pedotransfer rules: Generation of new pedotransfer rules to provide input on soil water characteristics to the MyWATER model [month 21]

D4.4) Multiscale thematic soil water database: Multiscale thematic soil water database [month 21]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS6	Initial Availability of Land Core/Meteorological/Soil Data	9	21	

Project Number [1]	263188	Project Acronym [2]	MyWater

One form per Work Package

Work package number [53]	WP5	Type of activity [54]	RTD
Work package title	Models and Data Integration		
Start month	4		
End month	15		
Lead beneficiary number [55]	2		

Objectives

The main objectives of this WP are:
• Implementation of methodologies to integrate catchment models and EO data;
• Assess the impact of EO and non EO data uncertainty on model results;
• Develop innovative methodologies of simultaneous improvement of EO analysis and catchment modelling.

Description of work and role of partners

The approaches that will be developed in the framework of MyWater will allow improving the evaluation of the ecological status of the water bodies in two major components:
• The integration of different data sources and the models will able to have a more clear perception of the system variability and of the relations between causes and effects (this is of prime importance to a proper management);
• The ability to manage data in an easier way and the ability to simulate scenarios will contribute to improve the knowledge of the relations between the ecological elements (more difficult to simulate and monitoring) and the hydromorphological and physico-chemical parameters. Any advances in these fields will contribute to a more objective evaluation of the real ecological status of a water body.
Presently, the experience is showing that, with a few exceptions, the classification of the ecological status of the water bodies is being made using limited data sets and a limited knowledge of the real representativity of this data. The use of the models in this context, even without a deep validation, is able to put immediately in evidence some drivers that may explain some observed behaviours. MyWater will positively contribute to make available “easy to use” approaches that may answer some of these concerns.
SWAT, Mohid Land, and Aquarius are the catchment models that will be used. Results in this work package will be based on these models. Deliverables will show always the results of all models explaining differences and advantages and disadvantages of each model in the user perspective. Model results will also be coupled with CeQualW2 model to evaluate the impact of the different model results on the water availability and quality on the reservoir. Reservoir models will be coupled using OpenMI which has already been implemented on SWAT and is being implemented in Mohid-Land in FP7 Lenvis project. Aquarius is a non-linear reservoir model used for simulating the Rijnland catchment hydrology and reservoir control (van Andel et al., 2008b), which will not be coupled with OpenMI. For overland and urban flow also the Price2D model and SWMM will be considered, further developed and applied.
Large part of the work will be part of a PhD research (IHE) towards innovative hydrological modelling approaches. In these approaches the calibration and validation routine is changed to incorporate the uncertainty of EO analysis input data. The downstream hydrological data is used as indicator for improvement of the EO data interpretation, then the improved interpretation of EO data is used as input to the catchment models before calibration to complete the feedback loop. To represent the dynamic uncertainties in input data, model parameters, and model predictions, ensemble prediction methods will be used. These include the use of ensemble meteorological forecasts and ensemble hydrological predictions (Schaake et al., 2007). The PhD research at IHE will thus contribute to innovative ways of integrating catchment models with EO based input data as identified in the following three separate tasks and the resulting deliverable, D5.1).

Task 5.1 - Integration of catchment models with land core data (lead: IST; partners: HR, IHE)
Experimental measured data (e.g. EO data already available for example developed in other projects) will be used in models as input, validation and assimilation. LCLU data can only be used as input data. LAI could be used as input data replacing the traditional plant growth models included in the models. Soil Moisture and ETA

(and also LAI) can be used for model validation, or they can be used for model assimilation. Tests will be made to evaluate what is the use that fits better the service in terms of accuracy and efficiency.
Considering that data will have a spatial grid size dependent on the satellite (and not on the model), grids will have to be standardized. Methods for interpolation data grid in to model grid will be used (bilinear, spline 2D, triangulation, etc). Model sensitivity tests will be made to evaluate:
• Impact of using different interpolation methods;
• Impact of using different Land Core data grid sizes;
• Impact of using different model grid sizes.
In the case of LCLU a Legend also has to be derived. Models will be used to assess the importance of each land use for accessing the global water balance. For example it will assess the importance of distinguish eucalyptus LCLU from other LCLU, in terms of watershed water balance.
This task runs parallel with WP2.
This task will contribute to D5.1.

Task 5.2 - Integration of catchment models with meteorological data (lead: IST, partners: HR, IHE)
Meteorological forecasts will be produced by WP3. These forecasts will have global models and local models. The first have coarse grid and the second have a finer grid. Models will be tested with both grids. Results will be correlated with EO data on Soil Moisture and ETa, in order to evaluate if Soil Moisture and ETa estimated by the models are spatially correlated.
Forecast will include short to medium range forecast but also long range forecasts. The first will generate 7 days forecasts with a lower uncertainty than the second that will generate 6 months forecasts which has higher uncertainty. Hydrology simulations based on these forecasts will be compared with simulations with real meteorological data in order to evaluate the uncertainty of hydrologic models.
Apart from forecasts also nowcasts will be used, in particular fine gridded radar-based data for detailed analysis of rainfall runoff relationships as well as 2D overland flow modelling. Models will describe both rural and urban catchments. In case of urban catchments also the drainage network and its control is of importance for effect analysis.
This task will contribute to D5.1.

Task 5.3 - Integration of catchment models with soil data (lead: IST; partner: IHE)
Soil data will be generated by WP4. This will include data in terms of type of soil with associated soil parameters generated by pedotransfer functions. This information will be available using maps with different spatial detail and different pedotransfer functions.
The pedotransfer function results are not only dependent on the equation that was derived but also on soil parameters used as input. This generates different soil parameters that will be used in the models generating different results.
Model sensitivity tests will be made to evaluate:
• Impact of different pedotransfer functions on overall results;
• Impact of considering SOC in pedotransfer functions;
• Impact of spatial detail of soil data.
Soil depth is a parameter that can greatly impact model results. A sensitive analysis to this parameter and other soil relevant parameters will be done to evaluate their importance in the overall model results. In addition, It is well-known that the soil data conditions have a significant impact on the geotechnical stability of the flood alleviation structures such as dams and dikes. It this task a simulation of dike bursts for conditions of excessive infiltration and overland 2D flow will be carried out.
The main output of this task will be an assessment of the soil parameters that should be measured first for more detailed studies. This is important considering the high costs associated with soil condition monitoring.
This task will contribute to D5.1.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
2	IST	18.00
4	IHE	11.00
5	HR	12.00

WT3:
Work package description

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
	Total	41.00

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D5.1	Integration of catchment models with EO based input data	2	41.00	R	RE	15
		Total	41.00			

Description of deliverables

D5.1) Integration of catchment models with EO based input data: Integration of catchment models with EO based input data (methodologies and results) [month 15]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS6	Initial Availability of Land Core/Meteorological/Soil Data	9	21	

WT3:
Work package description

Project Number [1]	263188	Project Acronym [2]	MyWater

One form per Work Package

Work package number [53]	WP6	Type of activity [54]	RTD
Work package title	Service Chain		
Start month	4		
End month	12		
Lead beneficiary number [55]	3		

Objectives

Define the data workflow and processing steps (service chain) necessary to transform data in information useful to Service Cases users.

Description of work and role of partners

In WP2, WP3, WP4 and WP5 the base data and methods used to generate the MyWater services will be defined.
This work package will define the service chains (technical solution) necessary to transform the MyWater data and methods in information that is useful for each Service Case.
Based in the specifications of each Service Case a set of Service Chains will be developed. A Service Chain is the technological implementation of a pre-defined methodology that defines the data workflow and processing steps necessary to provide, water quality and quantity information fitted to the end-user needs.
The idea is to breakdown in unitary blocks the technical procedures needed to go from GMES data to processed information useful to MyWater end-users.
The Service Chain design will be based in some of ISO9001:2008 requirements:
• a set of procedures that cover all key processes in the business. This is goal of task6.2. This requirement is in the base of the Service Chain and Service Case concepts (Task 6.1 and Task 6.2);
• monitoring processes to ensure they are effective and keeping adequate records. This requirement is related with Log module of the MyWater platform (Task 6.3);
• checking output for defects, with appropriate and corrective action where necessary. This requirement is related with the validation methodology to be develop to ensure quality Service Cases (Task 6.4).

Task 6.1 - Target Service Cases (lead: HID; partners: IST, IHE, HR, CPTEC, AUTh, UEM)
One important input to this task is the D9.1 - User requirements report and WFD requirements in European cases.
The MyWater concept can support (from the conceptual point of view) many services related with water management. However, the following Service Cases will be the focus of the project:
• Early flood warning system;
• Support to Irrigation activities;
• Desertification risk assessment;
• Reservoir Management.
For each of these Service Cases, technical requirements will be defined. The idea is to define, in a first step the information (or products) that can be useful to end-users based on MyWater data and products. In a second step it is necessary to evaluate what characteristics the products need to have a significant added value for the end-users of the present activity. The characteristics that need to be analysed are:
• Formats;
• Spatial and temporal resolution;
• Accuracy of the products (reanalysis and forecasts);
• Actualization frequency;
• Unidirectional or bidirectional. A bidirectional product will be a product that can be built or validated online together with the end-user. For example, a irrigation service must be able to upload the irrigation patterns of the farmers to generate information adapted to the end-user needs;

• Exploitation requirements. The end-user may want a static product (table or an image) or something we can explore in a dynamic way (e.g. zoom, overlap layers) or even do simple queries (e.g. configure alerts).
This task will contribute to D6.1.

Task 6.2. Definition of the necessary services chains (lead: HID, partner: HR)
One important input to this task is the D9.1 User requirements document and the outcomes task 6.1.
The MyWater data workflow is quite complex. A software platform that focuses on the management of this workflow is therefore required. However, to develop an efficient tool it is necessary, before even starting its design, to define in detail all the necessary technical steps to generate a specific product used in a Service Case (e.g. short range water quantity forecasts to be used in the early flood warning system). Via a Service Case several products will be disseminated. A Service Chain can be seen as the necessary technical procedures to build, validate and disseminate a product via a specific Case Service.
This task is important not only from the MyWater development point of view but also from the Service Case management point of view. These services to be effective need a periodical quality validation (see task 6.4) of their Service Chains. In the quality validation procedures if a problem is detected it is necessary to have a clear definition of the entire Service Chain not only to detect the problem origin but also to take efficient corrective actions.
So for every product disseminated in a Service Case a detail report will be done describing all the technical unitary procedures. Examples of unitary technical procedures are:
• Download a file from a ftp or similar action;
• Convert a file to a new format;
• Read and write from a data base;
• Interpolate from a grid to another;
• Prepare the input files of a numerical model;
• Run a numerical model;
• Write files;
• End-user uploading data;
• Etc.
This task will contribute to D6.1.

Task 6.3 – Record policy along the Service Chain (lead: HID)
The idea of associate records to the technical unitary procedures along a Service Chain has a similar goal in the ISO9001:2008. A way of describing the goal of “Records” in ISO9001:2008 is: ”Records should show how and where raw materials and products were processed, to allow products and problems to be traced to the source.”.
In the MyWater platform “raw materials and products” is environmental data. In conclusion to have an efficient quality control it is necessary to have a detail record off all procedures.
In this task will be defined the specifications to be follow in the development of the MyWater platform log. This would be done taking in consideration the validation to be implemented.
This task will contribute to D6.2.

Task 6.4 Validation methodology (lead: HID)
The MyWater data flow can become quite complex and needs a robust validation methodology to assure quality Service Cases. This methodology will have two components, one based on automatic tests and another based on internal audits.
The validation based on automatic tests will allow the operator to validate in a continuous way the products being delivered.
The operator can monitor the automatic records generated by the MyWater platform. The automatic validation will be based in a specific module developed for the MyWater platform. This module will allow the configuration of automatic validation tests that can be applied to any data set that results from any technical unitary procedure. This will allow the validation of the data being used and confirm if a specific Service Chain has consistent values and evolution in time and space. Examples of data validation are:
• Min / Max ;
• Maximum slope (time and space);
• Definition of intervals of validity and detection of erroneous values.
This validation is configured by the MyWater operator.
The internal validation audits will have two main goals:
• Performing the periodical scientific validation of the numerical products. The idea is to produce a report where the model errors are described and discussed. The analyzed period must be at least the period between the last audit and the present one;

• Checking the technical integrity of each Service Chain. This consists in periodical verifications to verify that for usual and extreme predefined scenarios the whole MyWater platform has an operational Service Chain.
These validations must be a responsibility of the MyWater administrator.
This task will produce a Validation manual that will work as a guide for both types of validation procedures.
This task will contribute to D6.3.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
2	IST	1.00
3	HID	9.00
4	IHE	1.00
5	HR	1.00
7	CPTEC	1.00
9	AUTh	1.00
10	UEM	1.50
	Total	15.50

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D6.1	Definition of the Service Cases and associated Services Chains	3	7.50	R	PU	12
D6.2	Record specifications for the MyWater platform	3	4.00	R	RE	12
D6.3	Validation manual	3	4.00	R	PU	12
		Total	15.50			

Description of deliverables

D6.1) Definition of the Service Cases and associated Services Chains: Definition of the Service Cases and associated Services Chains [month 12]

D6.2) Record specifications for the MyWater platform: Record specifications for the MyWater platform [month 12]

D6.3) Validation manual: Validation manual [month 12]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS5	Service Chain Definition	3	12	

Project Number [1]	263188	Project Acronym [2]	MyWater

One form per Work Package

Work package number [53]	WP7	Type of activity [54]	RTD
Work package title	MyWater Platform Development		
Start month	7		
End month	27		
Lead beneficiary number [55]	3		

Objectives

Design and develop a platform that allows managing in an efficient way the data workflow needed to go from GMES core services and local data to Service Cases.

Description of work and role of partners

As described earlier the MyWater platform can be divided in three layers: import, processing/storing and exploitation/publication. The development will start at month 7. A first version (V0) will be delivered at month 21 with basic functionalities for testing the Import layer and the data processing and storing layer under real conditions. This version will include the necessary components and modules for running the models, including centralised 2D computing, HPC and multi threading approaches (parallelization) for the case studies where needed.
A second version with all the functionalities will be delivered at month 24 (V1.0) which will include the main components of the thin client and the web interfaces of the exploitation / publication layer. In month 24 the first tests of the Service Cases under real conditions will be executed. A final version of the MyWater platform (V1.1) with corrections based on the experience of end-users in using V1.0 will be delivered at month 27.

Task 7.1 - Design, technologies to use and development methodology (lead: HID; partners: HR, IHE)
This task will be divided in three steps:
• Based on the requirements such as defined in WP6 (technical) and WP9 (end-user), this work package will define a detailed software design;
• Evaluation of the best software development technologies will be carried out, in order to achieve the design goals. Typical questions that will be investigated are: What type of language (e.g. .net or Java)? How to handle the data access layer (e.g. NIbernate or Entity Framework)? What type of design patterns do we use?;
• The software development methodology is a critical point. The WP will use an approach known as “Agile software development”. The implementation of this methodology will be discussed with the partners involved as part of the platform software development. The version control methodology will be also discussed (e.g. Trac + subversion).
This task will contribute to D7.1.

Task 7.2 – MyWater platform - baseline structure (lead: HID; partners: HR, IHE)
D7.1 will be an input to this task.
The MyWater platform will be the result of the aggregation of several components with focus on specific tasks (e.g. download the core data (GMES services / land core data), running models, reporting, and exploitation of geospatial data). The MyWater platform will be implemented in different geographical areas with different technologic demands. In some cases the end-user may only want to have access to information published on the internet, in other cases might want to do some geospatial data exploitation and even perform some light numerical modelling (e.g. dispersion of a contaminant along a river).
To allow this flexibility, it is necessary to build a framework from which every tool can be configured and used independently, but their actions can be synchronized.
The heart of this framework will be a database structure where all input and output data will be stored or indexed (values or metadata). Another important component is the scheduler manager where all periodic actions will be configured. The graphical engine is also a core component. Two types of graphical engines will be developed:

• Time Series Editor: it is a basic charts engine. A good approach to monitor processes with high frequency variability, to compare model results with sensors data;
• Map Editor (GIS): aims to do horizontal maps in a GIS environment. Some of the functionalities will be:
• Load common formats (eg. Shapefiles, Netcdf, HDF, etc);
• Visualization of model results and measured spatial fields (e.g. satellite sensors, radar) from an aerial perspective.
This task will contribute to D7.2, D7.3; D7.4, D7.5 and D7.6.

Task 7.3 – Import layer (lead: HID; partner: IHE)
D7.1 will be an input to this task.
In this task a tool it will be developed which is able to convert and prepare the data in format ready to be use by the MyWater platform. This tool will be able to download periodically necessary data to run numerical models focused on water quantity and quality in a automatic way. An important issue will be the data conversion engine, necessary to adapt the information provided by GMES core services to the numerical model input formats that change widely from model to model. In the case of MOHID Land, the input formats are ASCII with XML type structure and HDF5. The ASCII is used to store time series and stationary spatial fields while HDF5 is used to store spatial fields variable in time. In the case of SWAT (catchment model) and CE-QUAL-W2 (reservoir model), Price2D (urban flood model) and SWMM the input and output is ASCII.
This task will contribute to D7.2, D7.3; D7.4, D7.5 and D7.6.

Task 7.4 – Automatize numerical models (lead: HID; partners: IST, HR, IHE)
D7.1 will be an input to this task.
The aim of this task is to develop a tool which is able to run automatically numerical models in a generic way (on demand or periodically). The idea is to program generic classes for the common actions to all numerical models: get input data from the MyWater data base, validate the input data, create the input data files, start run, check for run-time errors, check for run ending, automatic validation of the output results and store the output results in the MyWater data base. This tool will be developed with the goal of reducing the workload needed to automatize new numerical models.
In the framework of this project, the follow numerical models will be automatized:
• SWAT;
• MOHID Land;
• CE-QUAL-W2;
• Price2D;
• SWMM.
This task will contribute to D7.2, D7.3; D7.4, D7.5 and D7.6.

Task 7.5 – Data Exploitation and Publication (lead: HID; partner: HR)
D7.1 will be an input to this task.
Following the add-on philosophy, the following tools to support end-users in the data exploitation or their easy access to information will be developed:
• Reporting tools which are able to aggregate pictures generated by the graphical engines and data tables. Two types of tools will be developed: one to generate web reports, and another for document reports. The latter will be produced by using standard formats (e.g. Office, open XML, pdf, XPS, etc);
• Web tool that allows end-users to explore MyWater data in GIS environment;
• Smart client that allow Bidirectional interaction. In this case the end-user will have the same exploitation functionalities of the web tool and additionally will be able to do light numerical simulations (e.g. dispersion of a contaminant along a river). This smart client will also allow end-users to upload information to the MyWater platform (e.g. soil characteristics, irrigation patterns);
• Tools to implement the MyAlert concept. Two tools will be developed: one will be an ad-on of the MyWater platform and will allow the operator of the Central Application to configure alerts for a specific end-user. The second tool will be web-based and will allow the end-user to define and adapt their own alerts, to share the alerts configuration with other local users. The alerts will be broadcasted via SMS, email and RSS. These alerts will aim to synthesize the complex 4D MyWater data in intuitive messages focused on the interests of each local user. An integral part of the MyAlert platform will be a flood forecasting and warning system.
This task will contribute to D7.2, D7.3; D7.4, D7.5 and D7.6.

WT3:
Work package description

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
2	IST	3.00
3	HID	30.00
4	IHE	2.00
5	HR	13.50
	Total	48.50

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D7.1	MyWater desing and technologies	3	5.50	R	RE	9
D7.2	MyWater platform V0	3	11.00	O	RE	21
D7.3	MyWater platform V1.0	3	11.00	O	RE	24
D7.4	First version of the MyWater user manual	3	5.00	R	PU	24
D7.5	MyWater platform V1.1	3	11.00	O	RE	27
D7.6	Second version of the MyWater user manual	3	5.00	R	PU	27
		Total	48.50			

Description of deliverables

D7.1) MyWater desing and technologies: MyWater desing and technologies used [month 9]

D7.2) MyWater platform V0: MyWater platform V0 [month 21]

D7.3) MyWater platform V1.0: MyWater platform V1.0 [month 24]

D7.4) First version of the MyWater user manual: First version of the MyWater user manual [month 24]

D7.5) MyWater platform V1.1: MyWater platform V1.1 [month 27]

D7.6) Second version of the MyWater user manual: Second version of the MyWater user manual [month 27]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS7	MyWater Version 0.0	3	21	
MS9	MyWater Version 1.0	3	24	
MS10	MyWater Version 1.1	3	27	

Project Number [1]	263188	Project Acronym [2]	MyWater

One form per Work Package

Work package number [53]	WP8	Type of activity [54]	RTD
Work package title	Test Site Implementation		
Start month	16		
End month	36		
Lead beneficiary number [55]	2		

Objectives

The main objectives of this WP are:
• Model implementation and validation with data provided by users;
• Implementation of MyWater platform in study sites;
• Evaluation of implementation by users.

Description of work and role of partners

The MyWater project has succeeded in attracting a very well geographical spread of the case studies and respective end-users (Case study locations: Delft/Rijnland in the Nederlands, Costa do Estoril in Portugal, Thessaloniki in Greece, Umbeluzi in Mozambique, Pomba in Brazil).
MyWater will generate information and tools essential for the success of the implementation of the Water Framework Directive which will be measured by the number of water bodies recovered. The implementation of MyWater will contribute to the assessment of the ecological status of the above referred water bodies.
Water quantity determines river flow and morphology and is a major factor for water quality. These factors together with riparian vegetation properties permit the quantification of the most relevant pressures affecting the ecological status of the aquatic ecosystems, being essential for planning the actions that can manage the improvement of their quality.
For example the Torrão reservoir (Tâmega sub-catchment) has just been classified as eutrophic. This water body might be classified as having insufficient ecological quality in the framework of the Water Framework Directive. The implementation of MyWater tools in this sub-catchment is a guarantee that the quality of the products will be assessed carefully by the local end-users.

Task 8.1 - Model implementation and validation (lead: IST, partners: HID, IHE)
D5.1, D5.2 and D5.3 will be an input to this task.
Models that were setup in WP5 will be implemented and validated using data from users. The work done in WP5 will be performed using readily available data.
In the beginning of this task EO data will start being produced continuously, allowing for a pre-operational setup of the model. At this stage model results and EO data provided by WP2, WP3 and WP4 on ETA, Soil Moisture and LAI will be compared with data from partners obtained on previous or ongoing projects These projects include: GSE-Land (www.gmes-gseland.info) and Carbo Europe (www.carboeurope.org).
For LAI, field campaigns will be done using hemispheric cameras. Whenever possible, local users and/or MyWater partners located in the countries of the study sites will provide support by performing the field campaigns, thus reducing travelling costs for field data collection.
This task will contribute to D 8.1 and D8.3.

Task 8.2. MyWater Test Site Implementation (lead: IST, partners: HID, IHE, HR)
MyWater platform will be setup for all the project users. The site implementation will have to include the user data availability. It will also have to include user hardware constraints, which could lead to off-site implementation but with a remote user access allowing still a complete control of the system.
This task will contribute to D8.2.

Task 8.3. MyWater Trials and Evaluations (lead: IST, partners: HID, IHE, HR, CPTEC, AUTh, UEM)
Evaluation of product will be made by user with support from MyWater partners using the validation manual developed in WP 6 (task 6.4).

User satisfaction will be assessed based on utility questionnaires. The questions to be answered will be grouped into the following sections:
• Assessment of impact on the user activity and also to evaluate the benefit estimated by the user;
• Analysis of utility for end-user-organization, where spatial and temporal accuracy and reliability of MyWater service will be evaluated in detail;
• Training review where the user will evaluate the quality and usefulness of training provided by the consortium.
Besides the above, users will also be asked to state their approval of MyWater by providing commitment letters, demonstrating their wiliness in continuing using the products developed under MyWater even after the project end.
This task will contribute to D8.3.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
2	IST	16.00
3	HID	11.00
4	IHE	14.00
5	HR	2.00
7	CPTEC	3.00
9	AUTh	3.00
10	UEM	3.50
	Total	52.50

List of deliverables

Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D8.1	Model implementation and validation	2	12.00	R	RE	21
D8.2	MyWater platform study site implementation	2	30.00	R	PU	36
D8.3	Utility report from the user	2	10.50	R	PU	36
		Total	52.50			

Description of deliverables

D8.1) Model implementation and validation: Model implementation and validation [month 21]

D8.2) MyWater platform study site implementation: MyWater platform study site implementation [month 36]

D8.3) Utility report from the user: Utility report from the user [month 36]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS8	Start of Trials and Evaluations	2	21	

WT3:
Work package description

Project Number [1]	263188	Project Acronym [2]	MyWater

One form per Work Package

Work package number [53]	WP9	Type of activity [54]	OTHER
Work package title	User and Market Analysis		
Start month	1		
End month	36		
Lead beneficiary number [55]	1		

Objectives

The objectives of the present work package are:
• Evaluation and demonstration of the commercial feasibility and the business potential of the concept proposed;
• Preparation of a preliminary business plan to demonstrate the feasibility of the service commercialisation;
• To elaborate a thorough business and exploitation plan, assessing the business potential of the application(s) addressed by the MyWater project, possibilities to capture this potential and support to decision making for a large scale adoption of the concept proposed by the project.

Description of work and role of partners

The activities of the “User and Market Analysis” work package are structured in order to evaluate and demonstrate the commercial feasibility and the business potential of the concept proposed from different perspectives (commercial, technical) as well as an assessment of the detailed end-user requirements.
At the end of the activities, the work package will address the elaboration of a business and exploitation plan, which will contain an assessment of the business potential of the application and how this potential can be captured and can support decision making for a large scale adoption of the concept.
The work package will be structured in 4 different sub-work packages or activities:
• WP9.1 – Assessment User Needs (GMV, IST, IHE, HR, CPTEC, AUTh);
• WP9.2 – Assessment of Competing Solutions (GMV, HID);
• WP9.3 – Preliminary business model and market assessment (GMV, HID);
• WP9.4 – Business and Exploitation Plan (GMV, HID).

WP9.1 – Assessment of User Needs (lead: GMV; partners: IST, IHE, HR, CPTEC, AUTh)
This work package will deal with the analysis of the user requirements. In particular, will be analysed the requirements of the users already engaged in MyWater, and the government and authorities for water management systems.
This task will include a description of WFD requirements met by the model results and Satellite data. Namely it will include:
• GIS layers of information of sub-basins, river network, flows, ground water recharge, etc - The implementation of the WFD includes the extensive use of Geographical Information Systems (GIS) that can assist catchment characterisation and overall reporting requirements;
• Screening level assessment maps like maximum run-off and maximum percolation (the first is relevant for article 16 and the second for article 17 of WFD) - The WFD Article 5 requirement for assessment of ‘pressures and impacts’ during River Basin characterisation may be most appropriately achieved by a ‘screening level’ assessment.
This task will contribute for D9.1.

WP9.2 – Assessment of Competing Solutions (lead: GMV; partners: HID)
This work package will deal with the current situation regarding the use of similar or other technologies for water management. Different related activities running or envisaged in the short- / mid-term will be assessed, addressing the analysis of the technologies proposed / used. Projects finalised or open will be taken as a reference to characterise the current state of water management technology.
This task will contribute for D9.2.

WP9.3 – Preliminary business model and market assessment (lead: GMV; partners: HID)

This work package will deal with the evaluation and demonstration of the commercial feasibility and the business potential of the concept proposed. A preliminary business plan will be prepared as part of this activity to demonstrate the feasibility of the service commercialisation.
The proposed business model and initial commercial feasibility analysis will consider a market potential assessment and expected economics (relevant costs and revenues).
The market assessment will: analyse the total potential market for the MyWater tool; determine the acceptability of the proposed solution to stakeholders; analyse the competitive environment and segmentation of the market.
The market assessment will be developed using a common range of methodologies to help define and understand customer audiences and key competitive factors, including:
• Research and analysis of secondary sources;
• Market sizing;
• Market attractiveness assessment;
• Competitive analysis and benchmarking;
• Questionnaires to the markets players;
• Market definition and segmentation surveys;
• Trend analysis.
Some other elements which will be considered to perform this business analysis are existing requirements (e.g. national authorities) and constraints (EU regulations, interoperability).
The activities to develop under the framework of this WP shall be coordinated by GMV with collaboration of HR and HID partners.
This task will contribute for D9.3.

WP9.4 – Business and Exploitation Plan (lead: GMV; partners: HID)
This work package will be building upon the available deliverables and project outcomes and will assess the business potential of the addressed solution for water management and how its potential can be captured for large scale adoption of the concept. The plan will include, among others, the following elements:
• Concept or product description;
• Assessment of the market potential;
• Marketing strategy and competition analysis;
• Business model (e.g. make vs. buy, sources or revenues, pricing strategy) and exploitation economics (e.g. break-even analysis);
• Organization and team;
• Implementation plan;
• Rough projected financials (i.e. profit and loss);
• Identification and discussion of main risks.
This task will contribute for D9.4.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	GMV	3.50
2	IST	1.00
3	HID	1.00
4	IHE	1.00
5	HR	1.00
7	CPTEC	1.00
9	AUTh	1.00
	Total	9.50

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D9.1	End-users requirements documentand WFD requirements in European cases	1	5.00	R	PU	6
D9.2	Competing solutions analysis document	1	1.00	R	PU	6
D9.3	Business model and initial commercial feasibility study	1	1.50	R	RE	9
D9.4	Business and Exploitation Plan	1	2.00	R	RE	36
		Total	9.50			

Description of deliverables

D9.1) End-users requirements documentand WFD requirements in European cases: End-users requirements document and WFD requirements in European cases [month 6]

D9.2) Competing solutions analysis document: Competing solutions analysis document [month 6]

D9.3) Business model and initial commercial feasibility study: Business model and initial commercial feasibility study (including market potential assessment and expected economics) [month 9]

D9.4) Business and Exploitation Plan: Business and Exploitation Plan [month 36]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS2	Assessment of User Needs and Competing Solutions	1	6	
MS3	Preliminary Market Analysis	1	9	
MS11	Business and Exploitation Plan	1	36	

WT3:
Work package description

Project Number [1]	263188	Project Acronym [2]	MyWater

One form per Work Package

Work package number [53]	WP10	Type of activity [54]	OTHER
Work package title	Dissemination, Training and Support		
Start month	1		
End month	36		
Lead beneficiary number [55]	4		

Objectives

The objectives of the present work package are:
• Dissemination of MyWater concepts and products;
• To develop a training and support program that will allow an effective use of the MyWater products by the local partners and further uptake of the MyWater products by other potential partners in the region;
• Give specialised courses in each of the case study regions, using the MyWater training and support program.

Description of work and role of partners

The activities undertaken by the project team will be of interest to technicians and managers working in catchment areas worldwide. The project dissemination strategy will ensure that both the scientific and end-user communities are kept well-informed of findings, with a view to ensure that these can be readily implemented with social and economic benefits.
To guarantee an effective and proper use of the operational systems to be put in place, it is of fundamental importance that the operators of the system get the effective training. In order to achieve this purpose, MyWater will conduct training and support actions focusing on operational systems implementation and management.
The idea is to develop training and support methodologies to enable a sustainable dissemination of MyWater services and tools in the case study regions.
The dissemination strategy focuses on four types of dissemination activities:
• Website;
• Publications in international peer-reviewed journals and conferences;
• Dedicated session in an international conference;
• Specialised courses in the regions of the case study areas.

Task 10.1 – Project Website (lead: GMV)
A project web site with several access criteria will be built. This will be a suitable format for disseminating the ongoing progress of the project to end-users and stakeholders who are interested. The MyWater deliverables will be posted on the website, and all the news on progress of the project, pilot and product developments and set-up of the case studies will be reported on a three-monthly basis. In addition the dissemination activities described hereafter (publications and courses) will be announced on reported on the MyWater website, and the website will have a support forum. In this way the website will both provide in a professional reporting of the project results, as well as in the need of providing an attractive portal to potential end-users and the EU citizens. The website will also have a section fully written in Portuguese specifically addressing Portuguese speaking users.
This task contributes to D10.1.

Task 10.2 – General dissemination activities (lead: IHE; partners: GMV, IST, HID, HR, AUTh)
General dissemination activities will focus on peer-reviewed publications in international journals, conference presentations, posters and presentations. Because of the innovations within this project on the enhancement of water management services through novel combinations of EO data and hydrological modelling approaches, a number of scientific articles will be published in international peer-reviewed journals. Especially the PhD students will contribute to this task. A detailed plan of conferences to present at and journals to publish in, will prepared as a dissemination plan.
Other dissemination activities will consist in:

• The production of Flyers presenting MyWater, both in English and in Portuguese languages (flyers in Portuguese will specifically address users in Mozambique and Brazil);
• Production of Policy Briefs to be distributed among policy makers – the Policy Brief is a document which outlines the rationale for choosing a particular policy alternative or course of action in a current policy debate. The purpose of the policy brief is to convince the target audience of the urgency of the current problem and the need to adopt the preferred alternative or course of action outlined and therefore, serve as an impetus for action – Two policy briefs will be produced. The 1st policy brief will highlight the aims of the project (from policy point of view). The 2nd policy brief will summarise the findings of the project and their impact on the water management policies regarding the use of EO products. This will include the findings for each case study country, therefore will be prepared by IHE (Rijnland case study) IST (Portugal, Mozambique, and Brasil case study) and AUTh (Greece case study);
• Also, a special deliverable aiming at contributing for the Blueprint on Water Scarcity (EC DG ENV) will be prepared.
After two years (two-third) of the project a special session in a prestigious international conference will be organised by the project. For now it is aimed to have a special session in the General Assembly of the European Geophysical Union (EGU 2013, Vienna). The session will attract many speakers from outside the project consortium. This will provide input for the finalising stage (last year) of the project. At the same time the audience with researchers from all over the world in EO and water resources management fields, including those researchers involved in related EU projects and programmes, provides a very good ground for disseminating the MyWater results.
This task contributes to D10.2, D10.3, D10.4, D10.5, D10.6 and D10.7.

Task 10.3 – MyWater training and support (lead: IHE, partner: HR, HID, IST, AUTh, CPTEC)
A course program for using the MyWater platform and using the MyWater services for a particular water management application will be developed by IHE with input material from all the consortium members. The course will be customised and given (during the projects duration) for the three regions of the case studies: Southern Africa, South America and Europe – in Europe we foresee to have the course in Portugal. A special attention shall be given to the lecturing language to be used in the courses. Therefore, lecturers with proficiency in the case studies local languages will be present. For Portuguese speaking countries this can be easily guaranteed by the Portuguese project partners.. IHE will draw on its international networks, such as the WaterNet to invite attendees well representing operational water management organisations in the region countries. This aims at the “Mushroom” effect of spreading the results from the local to the regional level. For these courses and for strengthening the MyWater website, attractive course material will be used. This will also include animations and visualisations of validation results, using state-of-the-art hydrological modelling software. The course expected audience will be of about 20 persons.
Specific components of the course will train the use of the MyWater tools, how to do data analysis and reporting, and the ways to use the MyWater products in daily water management. For a sustainable uptake of products emphasize will be needed on assuring capacity in operational catchment modelling from the technical point of view and interaction with local water users from the social point of view. For daily water management interaction with several actions will be promoted in the following subjects:
• Catchment operational modelling;
• MyWater services and tools;
• Interaction with local users.
These training sessions will consist of face to face lectures, but mainly hands-on demonstrations and inter-active sub-group discussions.
This task contributes to D10.8.

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
1	GMV	1.50
2	IST	1.00
3	HID	1.50
4	IHE	13.50

Person-Months per Participant

Participant number [10]	Participant short name [11]	Person-months per participant
5	HR	3.00
7	CPTEC	1.00
9	AUTh	1.00
	Total	22.50

List of deliverables

Deliverable Number [61]	Deliverable Title	Lead beneficiary number	Estimated indicative person-months	Nature [62]	Dissemination level [63]	Delivery date [64]
D10.1	Project website	1	1.50	O	PU	3
D10.2	Dissemination plan	4	5.00	R	PU	9
D10.3	Flyers	4	1.50	O	PU	24
D10.4	1st Policy brief	4	0.50	O	PU	6
D10.5	2nd Policy brief	4	0.50	O	PU	36
D10.6	Contribution to the Blueprint on Water Scarcity	2	2.00	R	PU	36
D10.7	Special MyWater session at a prestigious international conference	4	5.00	O	PU	24
D10.8	Course material	4	6.50	R	PU	36
		Total	22.50			

Description of deliverables

D10.1) Project website: Project website providing online information about the project: description, activities, achievements, partners, news [month 3]

D10.2) Dissemination plan: Dissemination plan describing strategies adopted during the dissemination and exploitation activities, including the dissemination channels (web, events, publications) [month 9]

D10.3) Flyers: Flyers presenting MyWater, both in English and in Portuguese languages (flyers in Portuguese will specifically address users in Mozambique and Brazil) [month 24]

D10.4) 1st Policy brief: 1st Policy brief to be distributed among policy makers [month 6]

D10.5) 2nd Policy brief: 2nd Policy brief to be distributed among policy makers [month 36]

D10.6) Contribution to the Blueprint on Water Scarcity: Contribution to the Blueprint on Water Scarcity [month 36]

D10.7) Special MyWater session at a prestigious international conference: Special MyWater session at a prestigious international conference [month 24]

D10.8) Course material: Course material on the use of the MyWater tools, and facilitated customised courses in the case countries with regional attendance [month 36]

Schedule of relevant Milestones

Milestone number [59]	Milestone name	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS1	Project Kick-off	1	1	
MS4	Dissemination Plan Availability	4	9	
MS12	End of project	1	36	

WT4:
List of Milestones

Project Number [1]	263188	Project Acronym [2]	MyWater

List and Schedule of Milestones

Milestone number [59]	Milestone name	WP number [53]	Lead beneficiary number	Delivery date from Annex I [60]	Comments
MS1	Project Kick-off	WP1, WP10	1	1	
MS2	Assessment of User Needs and Competing Solutions	WP9	1	6	
MS3	Preliminary Market Analysis	WP9	1	9	
MS4	Dissemination Plan Availability	WP10	4	9	
MS5	Service Chain Definition	WP6	3	12	
MS6	Initial Availability of Land Core/ Meteorological/Soil Data	WP2, WP3, WP4, WP5	9	21	
MS7	MyWater Version 0.0	WP7	3	21	
MS8	Start of Trials and Evaluations	WP8	2	21	
MS9	MyWater Version 1.0	WP7	3	24	
MS10	MyWater Version 1.1	WP7	3	27	
MS11	Business and Exploitation Plan	WP9	1	36	
MS12	End of project	WP1, WP10	1	36	

WT5:
Tentative schedule of Project Reviews

Project Number [1]	263188	Project Acronym [2]	MyWater

Tentative schedule of Project Reviews

Review number [65]	Tentative timing	Planned venue of review	Comments, if any
RV 1	1	Project Kick-Off Meeting - Teleconference	Kick-off of project activities
RV 2	6	Intermediate Meeting #1- Teleconference	Review project progress and approve pending deliverables. Review Preliminary Market Analysis and Target Service Cases
RV 3	12	Progress Meeting #1 - GMV	Review project progress and approve pending deliverables. Review Service Chain Definition.
RV 4	21	Intermediate Meeting #2- Teleconference	Review project progress and approve pending deliverables. Verify completion of Milestones 6 and 7 and, hence, approve the “Start of Trials and Evaluations” (Milestone 8).
RV 5	24	Progress Meeting #2 - User site TBD	Review project progress and approve pending deliverables. Verify completion of Milestones 9.
RV 6	30	Intermediate Meeting #3 - Teleconference	Review project progress and approve pending deliverables. Review Progress of Trials.
RV 7	36	Final Review Meeting - Commission premises	Approval of project deliverables and close of project activities

WT6:
Project Effort by Beneficiary and Work Package

Project Number [1]	263188	Project Acronym [2]	MyWater

Indicative efforts (man-months) per Beneficiary per Work Package

Beneficiary number and short-name	WP 1	WP 2	WP 3	WP 4	WP 5	WP 6	WP 7	WP 8	WP 9	WP 10	Total per Beneficiary
1 - GMV	20.00	19.50	0.00	0.00	0.00	0.00	0.00	0.00	3.50	1.50	44.50
2 - IST	0.50	0.00	0.00	0.00	18.00	1.00	3.00	16.00	1.00	1.00	40.50
3 - HID	0.50	0.00	0.00	0.00	0.00	9.00	30.00	11.00	1.00	1.50	53.00
4 - IHE	0.50	0.00	0.00	0.00	11.00	1.00	2.00	14.00	1.00	13.50	43.00
5 - HR	0.50	0.00	0.00	0.00	12.00	1.00	13.50	2.00	1.00	3.00	33.00
6 - JRC	0.00	0.00	0.00	23.00	0.00	0.00	0.00	0.00	0.00	0.00	23.00
7 - CPTEC	0.50	0.00	28.00	0.00	0.00	1.00	0.00	3.00	1.00	1.00	34.50
8 - UP	0.50	0.00	0.00	44.50	0.00	0.00	0.00	0.00	0.00	0.00	45.00
9 - AUTh	0.50	49.50	0.00	6.00	0.00	1.00	0.00	3.00	1.00	1.00	62.00
10 - UEM	0.50	0.00	0.00	0.00	0.00	1.50	0.00	3.50	0.00	0.00	5.50
Total	24.00	69.00	28.00	73.50	41.00	15.50	48.50	52.50	9.50	22.50	384.00

WT7:
Project Effort by Activity type per Beneficiary

Project Number [1]	263188	Project Acronym [2]	MyWater

Indicative efforts per Activity Type per Beneficiary

Activity type	Part. 1 GMV	Part. 2 IST	Part. 3 HID	Part. 4 IHE	Part. 5 HR	Part. 6 JRC	Part. 7 CPTEC	Part. 8 UP	Part. 9 AUTh	Part. 10 UEM	Total
1. RTD/Innovation activities											
WP 2	19.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.50	0.00	69.00
WP 3	0.00	0.00	0.00	0.00	0.00	0.00	28.00	0.00	0.00	0.00	28.00
WP 4	0.00	0.00	0.00	0.00	0.00	23.00	0.00	44.50	6.00	0.00	73.50
WP 5	0.00	18.00	0.00	11.00	12.00	0.00	0.00	0.00	0.00	0.00	41.00
WP 6	0.00	1.00	9.00	1.00	1.00	0.00	1.00	0.00	1.00	1.50	15.50
WP 7	0.00	3.00	30.00	2.00	13.50	0.00	0.00	0.00	0.00	0.00	48.50
WP 8	0.00	16.00	11.00	14.00	2.00	0.00	3.00	0.00	3.00	3.50	52.50
Total Research	19.50	38.00	50.00	28.00	28.50	23.00	32.00	44.50	59.50	5.00	328.00
2. Demonstration activities											
Total Demo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3. Consortium Management activities											
WP 1	20.00	0.50	0.50	0.50	0.50	0.00	0.50	0.50	0.50	0.50	24.00
Total Management	20.00	0.50	0.50	0.50	0.50	0.00	0.50	0.50	0.50	0.50	24.00
4. Other activities											
WP 9	3.50	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	9.50
WP 10	1.50	1.00	1.50	13.50	3.00	0.00	1.00	0.00	1.00	0.00	22.50
Total other	5.00	2.00	2.50	14.50	4.00	0.00	2.00	0.00	2.00	0.00	32.00
Total	44.50	40.50	53.00	43.00	33.00	23.00	34.50	45.00	62.00	5.50	384.00

WT8:
Project Effort and costs

Project Number [1]	263188	Project Acronym [2]	MyWater

Project efforts and costs

Benefi-ciary number	Beneficiary short name	Estimated eligible costs (whole duration of the project)						Total receipts (€)	Requested EU contribution (€)
		Effort (PM)	Personnel costs (€)	Subcontracting (€)	Other Direct costs (€)	Indirect costs OR lump sum, flat-rate or scale-of-unit (€)	Total costs		
1	GMV	44.50	240,277.84	0.00	23,798.61	154,103.86	418,180.31	0.00	326,771.53
2	IST	40.50	97,650.28	0.00	41,000.00	177,569.56	316,219.84	0.00	242,172.61
3	HID	53.00	172,825.00	0.00	22,500.00	117,195.00	312,520.00	0.00	240,720.00
4	IHE	43.00	102,995.11	0.00	108,500.43	98,866.27	310,361.81	0.00	273,581.45
5	HR	33.00	239,250.00	0.00	35,200.00	164,670.00	439,120.00	0.00	345,590.00
6	JRC	23.00	167,343.00	0.00	36,585.00	122,356.80	326,284.80	0.00	244,713.60
7	CPTEC	34.50	95,350.00	0.00	18,300.00	68,190.00	181,840.00	0.00	138,000.00
8	UP	45.00	46,850.00	0.00	19,125.46	39,585.28	105,560.74	0.00	80,010.55
9	AUTh	62.00	174,354.31	0.00	93,300.00	160,592.59	428,246.90	0.00	322,985.17
10	UEM	5.50	31,792.50	0.00	16,650.00	29,065.50	77,508.00	0.00	59,287.09
	Total	384.00	1,368,688.04	0.00	414,959.50	1,132,194.86	2,915,842.40	0.00	2,273,832.00

1. Project number

The project number has been assigned by the Commission as the unique identifier for your project. It cannot be changed. The project number **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

2. Project acronym

Use the project acronym as given in the submitted proposal. It cannot be changed unless agreed so during the negotiations. The same acronym **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

53. Work Package number

Work package number: WP1, WP2, WP3, ..., WPn

54. Type of activity

For all FP7 projects each work package must relate to one (and only one) of the following possible types of activity (only if applicable for the chosen funding scheme – must correspond to the GPF Form Ax.v):

• **RTD/INNO =** Research and technological development including scientific coordination - applicable for Collaborative Projects and Networks of Excellence

• **DEM =** Demonstration - applicable for collaborative projects and Research for the Benefit of Specific Groups

• **MGT =** Management of the consortium - applicable for all funding schemes

• **OTHER =** Other specific activities, applicable for all funding schemes

• **COORD =** Coordination activities – applicable only for CAs

• **SUPP =** Support activities – applicable only for SAs

55. Lead beneficiary number

Number of the beneficiary leading the work in this work package.

56. Person-months per work package

The total number of person-months allocated to each work package.

57. Start month

Relative start date for the work in the specific work packages, month 1 marking the start date of the project, and all other start dates being relative to this start date.

58. End month

Relative end date, month 1 marking the start date of the project, and all end dates being relative to this start date.

59. Milestone number

Milestone number:MS1, MS2, …, MSn

60. Delivery date for Milestone

Month in which the milestone will be achieved. Month 1 marking the start date of the project, and all delivery dates being relative to this start date.

61. Deliverable number

Deliverable numbers in order of delivery dates: D1 – Dn

62. Nature

Please indicate the nature of the deliverable using one of the following codes

R = Report, **P** = Prototype, **D** = Demonstrator, **O** = Other

63. Dissemination level

Please indicate the dissemination level using one of the following codes:

• **PU =** Public

• **PP =** Restricted to other programme participants (including the Commission Services)

• **RE =** Restricted to a group specified by the consortium (including the Commission Services)

• **CO =** Confidential, only for members of the consortium (including the Commission Services)

• **Restreint UE =** Classified with the classification level "Restreint UE" according to Commission Decision 2001/844 and amendments

• **Confidentiel UE =** Classified with the mention of the classification level "Confidentiel UE" according to Commission Decision 2001/844 and amendments

• **Secret UE =** Classified with the mention of the classification level "Secret UE" according to Commission Decision 2001/844 and amendments

64. Delivery date for Deliverable

Month in which the deliverables will be available. Month 1 marking the start date of the project, and all delivery dates being relative to this start date

65. Review number

Review number: RV1, RV2, ..., RVn

66. Tentative timing of reviews

Month after which the review will take place. Month 1 marking the start date of the project, and all delivery dates being relative to this start date.

67. Person-months per Deliverable

The total number of person-month allocated to each deliverable.

PART B

TABLE OF CONTENTS

LIST OF FIGURES

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LIST OF ABREVIATIONS

AGCM	Atmospheric General Circulation Model
ALOS	Advanced Land Observation Satellite
ARH-Norte	Administração da Região Hidrográfica do Norte (Portugal)
ASAR	Advanced Synthetic Aperture Radar
ASCII	American Standard Code for Information Interchange
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
AUTh	Aristotle University of Thessaloniki (Greece)
AVHRR	Advanced Very High Resolution Radiometer
BR	Brazil
BRDF	Bidirectional Reflectance Distribution Function
CEO	Chief Executive Officer
CIS	Core Information Services
CMS	Core Mapping Services
CORINE	Coordination of information on the environment
CPTEC	Centro de Previsão de Tempo e Estudos Climáticos (Brazil)
CST	Committee of Science and Technology
DEM	Digital Elevation Model
DSS	Decision Support Systems
EC	European Commission
EEA	European Environment Agency
EGU	European Geophysical Union
EMSA	European Maritime Safety Agency
ENVISAT	Environmental Satellite (Earth-observing satellite built by ESA)
EO	Earth Observation
ESA	European Space Agency
ESDAC	European Soil Data Center
ETa, ETA	Actual evapotranspiration
ETo	Reference crop evapotranspiration
EU	European Union
EUSIS	European Soil Information System
EVI	Enhanced Vegetation Index
FAO	Food and Agriculture Organization (United Nations agency concerned with the international organization of food and agriculture)
FP	Framework Program
FTP	File Transfer Protocol
GIS	Geographical Information System
GLOSIS	Global Soil Information System
GMES	Global Monitoring for Environmental Security
GMV	GMV (Portugal)
GR	Greece
GRASS	GRAphics Symbiosis System
GSE	GMES Service Element
GUI	Graphical User Interface
HDF	Hierarchical Data Format
HDF5	Hierarchical Data Format (Version 5)
HR	Hydrologic Research (The Netherlands)
HRVIR	Haute Resolution Visible Infra Rouge
HTTP	Hypertext Transfer Protocol
HUDSHYD	Hungarian Detailed Soil Hydrophysical Database
HWSD	Harmonized World Soil Database

IAHR	International Association of Hydraulic Research
ICT	Information and Communication Technologies
ID	Identification
IEEE	Institute of Electrical and Electronics Engineers
IEM	Integral Equation Model
IHE	UNESCO-IHE Institute for Water Education, The Netherlands
IHP	International Hydrological Programme
INPE	Instituto Nacional de Pesquisas Espaciais
INSEA	Data Integration System for Eutrophication Assessment in Coastal Waters
INSPIRE	Infrastructure for Spatial Information in Europe
IPR	Intellectual Property Rights
ISO	International Organization for Standardization
ISODATA	Clustering Iterative Self-Organizing Data Analysis Technique
IST	Instituto Superior Técnico (Technical University of Lisbon)
IT	Information Tecnology
IWA	International Water Association
JERS	Japanese Earth Resources Satellite
JRC	Joint Research Centre
KA	Kirchhoff Approximation
LAI	Leaf Area Index
LandSAF	Land Surface Analysis Satellite Applications Facility
LCCS	Land Cover Classification System
LCLU	Land Cover Land Use
LIDAR	Light Detection and Ranging
LMCS	Land Mapping Core Services
LPIS	Land Parcel Identification Systems
LSR	Least Square Regression
MERIS	Medium Resolution Imaging Spectrometer
MGT	Management
MM5	Mesoscale Meteorological Model, Version 5
MMU	Minimum Mapping Unit
MODIS	Moderate-Resolution Imaging Spectroradiometer
MOHID	Modelo Hidrodinâmico (in Portuguese)
MOS	Monin-Obukhov Similarity
MS	Microsoft
MyWater	Merging Hydrologic models and EO data for reliable information on Water
MZ	Mozambique
NAPL	Nonaqueous phase liquids
NASA	National Aeronautics and Space Administration
NDVI	Normalized Difference Vegetation Index
NL	The Netherlands
NOAA	National Oceanic and Atmospheric Administration
ORNL	Oak Ridge National Laboratory
OTH	Other
PC	Project Coordinator
PDF	Portable Document Format
PIK	Potsdam-Institut für Klimafolgenforschung
PMB	Project Management Board
PT	Portugal
PTR	Pedotransfer Rules
PTRDB	Pedotransfer Rules Database
PU	Public

RBDMP	River Basin Districts Management Plans
RE	Restricted
RSR	Reduced Simple Radio
RSS	Really Simple Syndication
RTD	Research and Technological Development
SA	Scientific & Technological Advisor
SAR	Synthetic Aperture Radar
SEBAL	Surface Energy Balance Algorithm for Land
SGDBE	Soil Geographical Database of Eurasia
SME	Small and Medium Enterprise
SMS	Short Message Service
SOC	Soil Organic Matter
SPADE	Soil Profile Analytical Database of Europe
SPM	Small Perturbation Model
SPOT	Satellite Pour l'Observation de la Terre
SQL	Structured Query Language
SR	Simple Radio
SRTM	Shuttle Radar Topographic Mission
STREP	Specific Targeted Research Projects
SVI	Spectral Vegetation indices
SWAT	Soil Water Assessment Tool
UNCCD	United Nations Convention to Combat Desertification
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention for Climate Change
UP	University of Pannonia (Hungary)
US	United States
USA	United States of America
WBS	Work breakdown Structure
WFD	Water Framework Directive
WIS	World Meteorological Organization Information System
WMO	World Meteorological Organization
WP	Work Package
XML	EXtensible Markup Language
XPS	XML Paper Specification
XY	X and Y coordinates

B1. CONCEPT AND OBJECTIVES, PROGRESS BEYOND STATE-OF-THE-ART, S/T METHODOLOGY AND WORK PLAN

B1.1. CONCEPT AND PROJECT OBJECTIVES

B1.1.1. Concept

In the entire world we are experiencing changing water resources needs mainly as a result of changes in land use in developing countries by occupation of natural landscapes with agriculture. This land use changes also happen in EU for which a good example is south of Portugal where changes are happening from natural areas and non-irrigated agricultural areas to irrigated agricultural areas (e.g. olive groves and vineyards).

The change in land use cause changes in three global variables of the watershed: Evapotranspirated water, Biomass production and Soil Organic Matter (SOC). Evapotranspirated water is the only water effectively lost from the watershed and mainly because of plant growth (the rest either is stored in the watershed or it flows out of the watershed), thus being very important to manage scarce water resources. This variable is also relevant as input for weather forecast models. Biomass production has impact on nutrient budgets, and consequently on water quality, while being an important economic and food safety variable. Organic matter in the soil decreases with intensive agriculture, which can lead (among others) to a decrease of soil water holding capacity. Because of this, SOC is used has an indicator of desertification affecting sustainability of the watershed.

When we look at other constraints of water availability we may also find in the top of the list the meteorology. The amount of rain and solar radiation define in large extent the river flows (including floods and droughts).

Besides land use changes and meteorology, other variables such as the type of the soil and the use of the catchment play also a relevant role in the water availability and in its quality. In this perspective, the way how a watershed is managed may have relevant consequences on the availability of the water resources, with potential effects on health, drinking water availability and quality, irrigation practices, bathing water quality, licensing new projects, etc. These managing actions must take in consideration both the socio-economic aspects and the ecological aspects.

These principles are well defined in the water framework directive (WFD[1]) which objectives stress the need of achieving a good ecological status in all water bodies. In the framework of this process all the European Countries are implementing River Basin Districts Management Plans (RBDMP). The goals of these RBDMP are to provide the basin managers guidelines and tools that may help them to get an overall perspective of the problems and best solutions that may lead to the achievement of the final goal of achieving the good ecological status without compromising the local human activities. This objective it is not easy to attain and, in order to be successful, needs to be supported on the best available knowledge. MyWater intends give a major contribution on this matter by bringing accurate and accessible tools and services to support managers to gather the best information to help them to take well supported decisions in this field.

The MyWater project will focus on obtaining reliable information on water quantity, quality and usage for appropriate water management. This objective is to be obtained by joining three scientific research areas: earth observation, catchment modelling and meteorology (Figure 1). Data from these different sources will be integrated through unique interface platform. This platform will allow a quasi-automatic service chains which output user tailored results like: drinking water needs (quantity and quality), agriculture water needs, water health related indicators, flood scenarios, desertification scenarios, etc.

Earth observation satellites can be used to identify LCLU, measure evapotranspirated water, Leaf Area Index (LAI) (from which can be derived Biomass production using catchment models) and Soil Moisture (which is affected by organic matter in the soil). On the other hand catchment models can estimate of all this parameters and allow confirming or complementing the satellite data. These models calculate Soil Moisture based on infiltrated water,

[1] Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy.

soil properties and evapotranspiration. A potential evapotranspiration, in turn, is determined using climatic variables, plant characteristics and development stage, which is transformed in Actual Evapotranspiration (ETa) as function of Soil Moisture. Development stage of the plant is determined with an explicit plant growth model which is driven by Soil Moisture, soil nutrients and air temperature. Meteorological data will provide information related to water availability (e.g. solar radiation, precipitation).

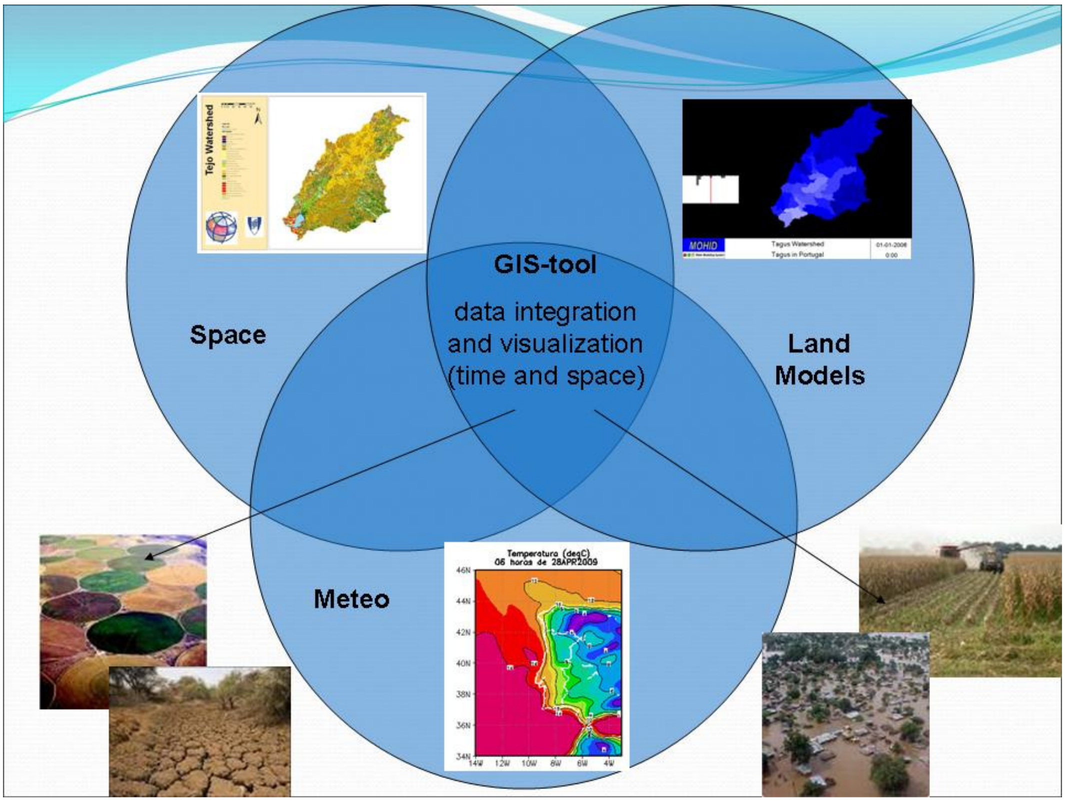

Figure 1 – MyWater conceptual diagram.

The proposed water services accuracy will be assessed by comparing results on: evapotranspirated water, LAI and Soil Moisture. Considering that their determination is based in two completely independent methods (satellite and models) the accuracy is expected to be high. Reliability on the service is also high because if one of the sources of information fails the other is available.

Water quantity and quality will be assessed at short time scales (relevant for floods and beach water quality), at medium time scales (relevant for drinking water, irrigation and agriculture production) and at long time scales (relevant for drought and desertification). Spatially the assessment will be from local plot scale to watershed scale, and will be independent from administrative boundaries.

The main user group of the proposed approach will be the water users, being the farmers, the tourism and the water utilities. Although all these players are sharing a same resource (the water) their requirements (in terms of quantity and quality) and their concerns are often ruled by different perspectives, introducing stresses in the water use.

Among others, the project will include applications to Africa case studies coordinated by African teams with collaboration of the European teams will provide training and perform demonstration activities. An example of application is the Umbeluzi watershed in Swaziland and Mozambique where many users are dependent on a scarce resource: water. One of the users is AdM (Waters of Mozambique) which provides drinking water to Maputo city (with about 1.5 million inhabitants). In fact Maputo relies on a watershed with limited resources and multiple uses and pressures (Figure 2). The major documented pressure in this watershed is the increase of sugarcane area (Figure 3). However, the generalized replacement of traditional uses of soil with new uses and new agriculture practices have promote soil erosion.

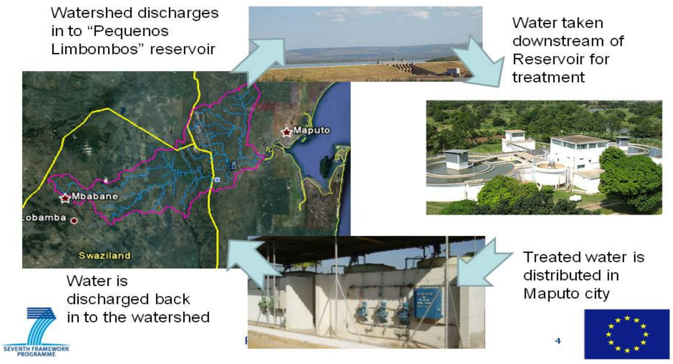

Figure 2 – Example of a study site.

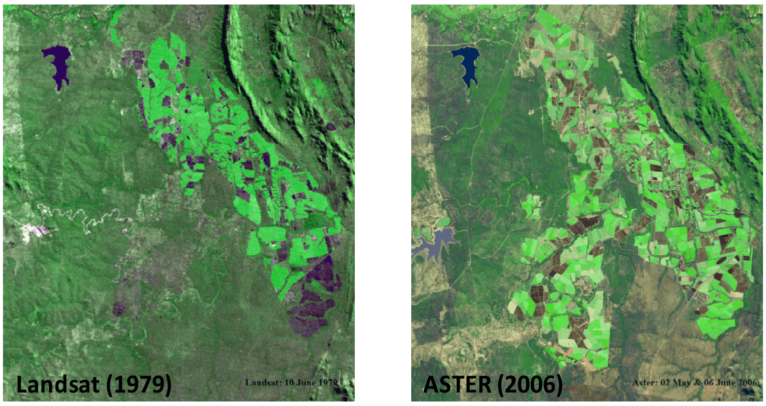

Figure 3 – Increase in Sugar cane area in Umbeluzi watershed (source: UNEP).

B1.1.2. Objectives

The availability of tools and services capable to help decision makers to gather the best information, in order to be able to take well supported decisions is of the major relevance. Also, the development of new approaches that may help to relate the hydromorphologic aspects and/or the physicochemical status with the ecological status, would introduce a major efficiency in the monitoring programs with a corresponding reducing of costs.

Project MyWater will address these issues. In the framework of MyWater, tools and services that may be useful to improve the water availability and quality will be developed, targeted to watershed managers and users. In this context the following actions will be performed:

- Development of grid models able to simulate the horizontal and vertical transport based on land core services that include Land Cover Land Use specification, Leaf Area Index (LAI) assessment, Actual Evapotranspiration (ETa) and Soil water content;
- Development of web-based data services for obtaining, sharing and publishing data;
- Development of technological MyWater platform to help users managing the data and evaluating the models results in a comprehensible way;
- Provide support and training services fitted to the needs of different users.

Those tools and services will fill a gap on catchment and water management and will also give value to the GMES core service products.

MyWater project aim can though be summarized by the following sentence:

To develop and validate data-models approaches to supply access to multiple sources of data, in view of obtaining reliable information on watershed water availability and quantity assessments in different environments and with different technologic support.

B1.2. PROGRESS BEYOND THE STATE-OF-THE-ART

B1.2.1. Innovative aspects

The estimation of Evapotranspiration has a crucial role in agriculture for managing irrigation needs. This is usually achieved by estimating the crop evapotranspiration (ETc). In the crop coefficient approach, the most popular, the ETc is calculated by multiplying the reference crop evapotranspiration, ETo, by a crop coefficient, Kc: ETc = Kc ETo. The calculation of these three variables has been standardized by FAO (Allen *et al.,* 1999).

Most of the effects of the various weather conditions are incorporated into the ETo estimation. Therefore, as ETo represents an index of climatic demand, Kc varies predominately with the specific crop characteristics and only to a limited extent with climate. This enables the transfer of standard values for Kc between locations and between climates. This has been a primary reason for the global acceptance and usefulness of the crop coefficient approach and the Kc factors developed in previous studies.

The crop coefficient integrates the effect of characteristics that distinguish a typical field crop from the grass reference, which has a constant appearance and a complete ground cover. Consequently, different crops will have different Kc coefficients. The changing characteristics of the crop over the growing season (plant phenology) also affect the Kc coefficient. However ETc does not provide the Actual Evapotranspiration. It assumes that the plant is not subject to water stress or some non-standard conditions (e.g. lack of nutrients, use of pesticides).

Kc is currently estimated by many EO services to support agriculture and it is provided to farmers as a service for irrigation practices. This Kc is obtained as a function of NDVI, which is an indirect measurement of LAI. The combination of LAI, Soil Moisture and ETa, from satellite and models will enable the production of accurate geo-information on evapotranspirated water and water storage. The potential users of these products are farmers, water regulators and water utilities managers.

SWAT is one of the popular world references on watershed hydrology (Arnold and Fohrer, 2005). SWAT is a catchment model that uses the traditional crop coefficient approach to calculate Actual Evapotranspiration because it calculates explicitly not only Kc but also amount of water in the soil by explicitly calculating water balance of the system soil-plant-atmosphere (Figure 4). This kind of models uses, as input, topography, meteorology, soil type data, land use data and agriculture practices.

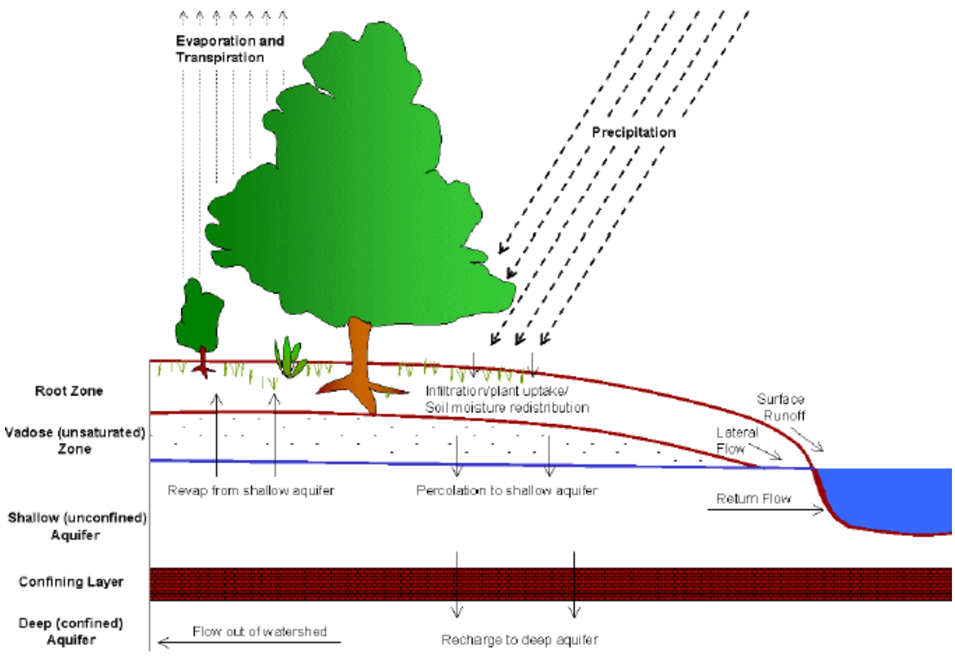

Figure 4 – Water balance of the system soil-plant-atmosphere.

A major innovation of the MyWater project stands in the modelling approach that will combine diversified input data (EO-based maps and maps derived from hydrological models) in order to minimize the uncertainty of outputs and improve the quality of the predictions of the hydrological state at the watershed level.

In addition, the accuracy will increase locally by including in the model data from individual users. For that, a platform will be set-up for users to produce their own simulations, completely adapted to their local data. This platform would run through the internet, making it accessible from any personal computer.

The users have to deal with available water, based on present and future water needs. Present water needs and availability could be estimated using model and satellite data. For future irrigation needs meteorological forecasts from models like MM5 (that produce forecasts for the next 3 or 7 days) can be used to elaborate future scenarios with the catchment model. Forecasts on the tendencies expected for the next 6 months for the weather, could also be used to estimate water needs and availability.

B1.2.2. Adherence of MyWater to GMES

Geoland2 is carried out in the context of GMES Land, a joint initiative of European Commission (EC) and European Space Agency (ESA), which aims to build up a European capacity for Global Monitoring of Environment and Security.

Geoland2 prepares the operational capabilities of the GMES Land Services, through the development of Core Mapping Services (CMS) and Core Information Services (CIS).

The Core Mapping Services produce basic geo-information on LCLU and on a variety of additional biophysical parameters (e.g. vegetation state, radiation budget, water cycle). These form basis for more elaborated geo-information services, the Core Information Services (CIS), which address a wide variety of thematic fields of application (e.g. water quality, forest management, spatial planning)

MyWater intends to benefit from existing GMES capacities developed under Geoland2, namely from the Geoland2 core mapping services, by using, whenever possible, existent Geoland2 products (e.g. landcover datasets, geophysical parameters measurements) as inputs for the catchment models, enabling the generation of services valuable for inland water management.

At the same time, MyWater intends to contribute to Geoland2 by providing new land cover datasets (Mapping Services) and new services to the community (Information Services). In this way MyWater will contribute to extend and upgrade GMES services.

The MyWater project shall contribute to the topics addressed by the water group within the Geoland2 Observatory Water & Soil, i.e. water quality, quantity and management. This shall be accomplished by developing stable, repetitive and quality-assured methods that integrate and optimise the use of earth observation derived information, e.g. Land Use, Land Cover (LCLU) data, with customised thematic, spatial and temporal resolution, and ancillary geospatial data as input to catchment and surface water modelling, as it is addressed by the observatory.

Consistent with Geoland2, MyWater will support the implementation of the Water Framework Directive (WFD) by developing services focused on the provision of spatial information related to land management and irrigation practices within river basins and resulting environmental pressures and state, which can be translated to pollution risks and environmental indicators required from decision makers.

The MyWater project will actively help to disseminate GMES and the use of Geoland2 core mapping services through the development of new information services and share technology both with developed countries and less developed countries in and outside Europe.

In the present context, i.e. the link of MyWater to GMES, the MyWater project also looks forward to connect with the other GMES projects on water management which will be running in parallel. Contacts will be established early in the project to assess possibilities to collaboration and to avoid potential overlaps. Also, at a later stage MyWater will contribute to further initiatives on how GMES can contribute to the Blueprint on Water Scarcity.

Feasibility of the approach

As above referred, maps derived from the Geoland2 core services can be used has input for the MyWater catchment models allowing for the generation of services valuable for inland water management. These services will contribute to the development and establishment of pre-operational capabilities for the efficient use of spatial information related to land management and irrigation practices within river basins. This will be done in close co-operation with key user organisations, such as national and regional environmental authorities and river basin authorities, responsible for the implementation of European policies, directives and standardisation initiatives.

An example of the feasibility of this approach is the water quality services provided by the ESA GSE project AquaSAGE (http://www.gmes-sage.info/ps/aqua/index.php). In this project, Geoland2 core services are used combined with other geo-information data, as input to catchment models addressing water quality and water quantity (Figure 5 and Figure 6).

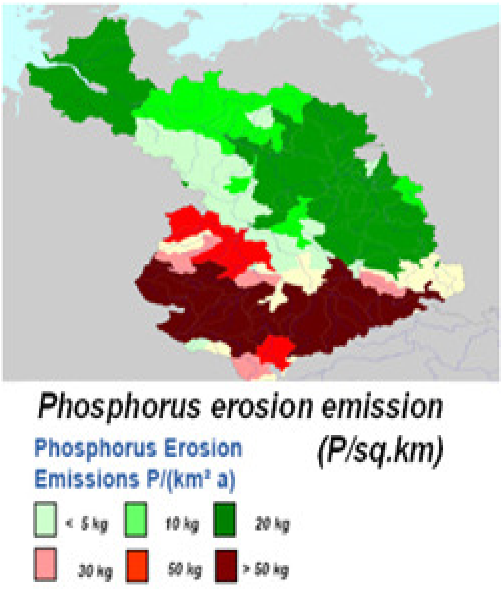

Figure 5 - Water quality: Phosphorus erosion emission map, Germany.

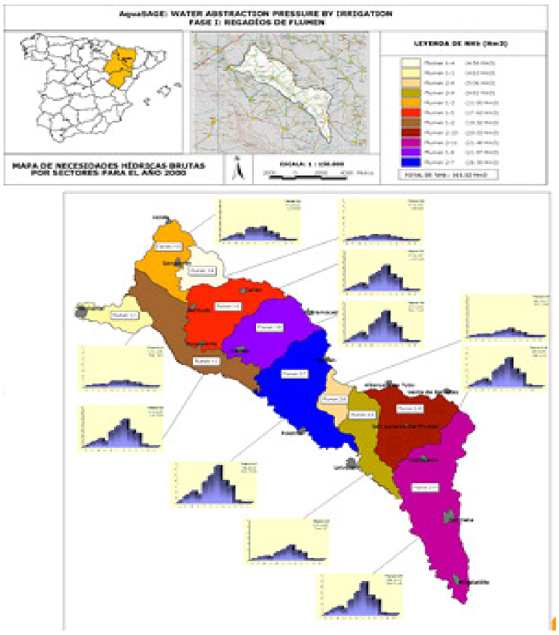

Figure 6 - Water quantity: Water abstraction pressure by irrigation - Irrigation volumes, Spain.

In My Water project, the Geoland2 core services (i.e. Land Cover Land Use specification, Leaf Area Index assessment, Actual Evapotranspiration, and Soil Moisture) will be used whenever possible as input data for the catchment models. For those cases where this data doesn't exist, or fit the models requirements, we will use earth observation satellite imagery for developing such products.

Water authorities and other stakeholders, such as private companies, throughout Europe, South America and Africa, have expressed their interest in testing and using these services in their operational management (e.g. Rijnland water board in The Netherlands, FenaReg in Portugal, AdeM in Mozambique, Cargill in Brazil) – See section 2.2 for complete list of identified interested users.

B1.2.3. GMES specific services for operational water management (LCLU, LAI, ETa and Soil Moisture)

The specific satellite derived products used in this project are LCLU, LAI, Actual Evapotranspiration (ETa), and Soil Moisture.

The LAI and related assessment of crop development have a two-fold function in operational management of a watershed. As in many watersheds agricultural and ecological management (e.g. nature reserves) play an important role. Therefore, as a first function, the LAI and crop development can be used to monitor the status of crops and nature flora throughout the different growing seasons. This information can be used in dialogues between farmers and nature reserve managers with operational water managers for real-time planning and optimisation of water distribution. The other function is common for LAI, ETa and Soil Moisture, being the improvement of watershed prediction models and their present state representation, to result in better hydrological forecast for water management (van Andel, 2009). This improvement follows two different paths: one is the off-line improvement of model structure and parameters in calibration and validation phase; and the other is the on-line improvement of predictions through data assimilation.

The modelling system used determines which products (LAI, ETa and/or Soil Moisture) can be used for off-line model improvement, and how they can be used. In conceptual catchment models that do not have crop growth models, LAI can be used to dynamically represent related model parameters, such as interception capacity and potential evapotranspiration, instead of climatological (monthly) values for example. Soil Moisture and ETa are target variables and can thus be used as calibration data. In catchment models with crop growth models, also LAI can be used as calibration variable. For all products it must be realised that they cannot be used directly, because they (as all measurements) represent estimates of the variable values, not the actual values. Therefore, in this research, an innovative modelling approach with optimal use of uncertain and diversified input data is proposed. In this approach both remote sensing products and catchment modelling services are improved simultaneously.

Also in on-line data assimilation of the remote sensing estimates, uncertainty has to be taken into account to make optimal use of the additional information. LAI can be used for parameter updating. ETa and Soil Moisture can be used for state updating.

Together the off and on-line use of the satellite derived LAI, ETa and Soil Moisture will provide an improved assessment of the real-time hydrological state of the catchment. It has been shown that this results in improved hydrological predictions for the short, medium, and long term (e.g. van Andel, 2009). The benefit of sound hydrological predictions that account for uncertainty (probabilistic predictions) in anticipatory water management has been explicitly shown in several case studies (Roulin, 2007; van Andel, 2009).

LCLU presents enormous importance since it is used in catchment modelling for the estimation of environmental variables (e.g. LAI, ETa) indispensable for water quantity assessment in watersheds.

The following sections address the development of the referred services (i.e. LCLU, LAI, ETa, Soil Moisture) that will be used as input to the catchment models.

Land Use Land Cover (LCLU)

The technical solution baseline for the automatic production of LCLU maps from remotely sensed data is designed along six steps: 1) Definition of the technical specifications of the LCLU maps; 2) Definition of the LCLU mapping strategy; 3) Image segmentation; 4) Image classification; 5) Post-classification processing; 6) Evaluation of the accuracy of the LCLU maps.
The need for implementing image segmentation and post-classification processing depends on the LCLU mapping strategy that is decided to implement. All the other steps are mandatory.

Definition of the technical specifications of the LCLU maps

The technical specifications of the LCLU maps refer to: Nomenclature, Minimum Mapping Unit (MMU) and Map Format. Nomenclature refers to the land cover categories that will be characterized in the LCLU map. MMU is the smallest area represented in the LCLU maps. MMU is strongly affected by the type of images used as input for map production and also by the user requirements. In raster maps the MMU is an area equal or larger than the pixel size of the input images. In vector maps, the MMU is the size of the smallest polygon represented in the map. The decision on the format (vector or raster) and MMU of the LCLU maps to be produced have a huge impact on the methodologies to develop. This decision is strongly influenced by the type of information on LCLU that is required.

Definition of the LCLU mapping strategy

The LCLU mapping strategy to be used depends mainly on the format and MMU to be adopted for the LCLU maps. If the LCLU maps are derived in raster format with a MMU equal to the pixel size of the input images, then image classification is performed at pixel level. If it is decided that the LCLU maps have a MMU larger than the pixel size of the input images, then post-classification processing will be needed.

The production of LCLU maps in vector format is based on a methodology where LCLU maps were derived through an object-oriented image procedure. The methodology consists in:

- Image segmentation to derive objects;
- Image classification at a pixel level;
- Object classification by implementing rules that take into account the abundance and spatial distribution of the pixels classified in previous step;
- Generalization of the map produced in the previous step to guarantee that the MMU is the defined one.

Another possibility to produce the LCLU maps in vector format without the use of objects is to classify EO images at pixel level and then apply post-processing techniques (i.e. generalization) before conversion from raster to vector format. In this case the post-processing techniques are similar to the ones for the production of LCLU maps in raster format.

<u>Image segmentation</u>

Image segmentation refers to the process of partitioning a digital image into multiple segments of similar characteristics (shape and colour, referring the last to the spectral information) called objects.

<u>Image classification</u>

The image classification at pixel level is a step required in both LCLU mapping approaches. There are many classifiers that have been described and tested in scientific literature and in operational LCLU mapping initiatives. However, one cannot say that there is one classifier that performs better for all types of landscape. Yet, we may say that there is a trend to use supervised classifiers, and most likely this is the type of classifier we will propose to use in the project. Recent literature also indicates a preference for non-parametric classifiers (e.g. decision trees, artificial neural networks, support vector machines), mainly because this type of classifiers:

- Do not rely on assumptions of data distribution;
- Are less affected by the Hughes phenomenon (i.e. curse of dimensionality);
- Are more adequate to integrate ancillary data (due to the non-parametric classifiers' ability for classifying data at different measurement scales and units).

Regarding the EO data that will serve as input for the classifier, at least two images per year should be used in order to capture key moments in vegetation phenology. The choice of the dates will depend on the vegetation characteristics, availability of images, cloud cover, topography (because of topographic effect on satellite images) and forest fire season.

The most important step in image classification, when supervised classifiers are used, is the training. In this procedure ancillary data is of the greatest importance in order to help select the best and most accurate training data as possible. Several data may serve as ancillary data such as other land cover maps and high spatial resolution satellite images.

<u>Post-classification processing</u>

Post-classification processing is needed in raster LCLU maps when the MMU is larger than the pixel size of the EO data used as input for classifiers. These operations include exaggeration, merging, aggregation and amalgamation.

Regarding LCLU maps in vector format, post-classification processing is needed to guarantee that the MMU equals the one defined in LCLU map specification.

<u>Evaluation of the accuracy of the LCLU maps.</u>

The validation of the LCLU maps should follow a statistically sound accuracy assessment strategy involving the construction of confusion matrixes based on the comparison of the map with a reference database (based on a sound probability design – e.g. stratified random sampling) representing the "ground truth". This comparison allows for the estimation of the map's standard accuracy measures, i.e. overall accuracy (P), user's accuracy (Ph) and producer's accuracy (Pg).

Leaf Area Index (LAI)

The Leaf Area Index (LAI) is an important vegetation biophysical parameter that corresponds to the ratio of leaf area per unit ground surface area.

The dynamic, rapid and large spatial coverage advantages of remote sensing techniques, which overcome the labor-intensive and time-consuming defect of direct ground-based field measurement, allow remotely sensed imagery to successfully estimate LAI. The premise of retrieving LAI based on spectral remote sensing data relies on the unique spectral response characteristic of green leaves compared with other land surface materials. The selective absorption of solar radiation of green leaves, the high absorption of visible light, and much more red light than infrared light make it possible to generate vegetation indices such as Simple Ratio (SR), Normalized Difference Vegetation Index (NDVI), Enhanced Vegetation Index (EVI), and Reduced Simple Ratio (RSR).

Empirical relationships between LAI and spectral indices were proposed. Equations describing these relationships vary in both mathematical forms (linear, exponential, power, inverse of exponential, etc.) and empirical coefficients, depending on the experiments, the indices used, and the vegetation type (Haboudane *et al.,* 2004; Chen *et al.,* 2002; Qi *et al.,* 2000). The common procedure is to establish an empirical relationship between a given spectral index and LAI by statistically fitting measured LAI values and corresponding values of that spectral index.

Radiative transfer models are another indirect way of retrieving vegetation biophysical properties. Through the use of a spectroradiometer the spectral characteristic of leaves can be retrieved. High spectral resolution (1nm interval) with a 350nm - 2,500nm spectral range is ideal for vegetation mapping and monitoring applications. The high resolution spectrum measurements are important inputs of the geometric optical model (Chen and Leblanc, 1997), the SAIL canopy bidirectional reflectance model (Goel, 1989), and the PROSAIL model (Baret *et al.,* 1992) combination of the last two models.

Also, in recent years, due to the emergence of light detection and ranging (LiDAR) techniques and equipment, numerous methodologies are being developed for point cloud datasets obtained from LiDAR to assess vegetation (Houldcroft *et al.,* 2005).

Evapotranspiration (ETa)

ETa can be calculated by applying the Surface Energy Balance Algorithm for Land (SEBAL) on the satellite images which had a thermal band (Terra/Aqua MODIS, NOAA AVHRR, Landsat TM/ETM+, and Terra ASTER). SEBAL is a thermodynamically based model, using the partitioning of sensible heat flux and latent heat of vaporization flux as described in (Bastiaanssen *et al.,* 1998). Latent heat flux is considered as a residual of the Energy Balance equation:

$\lambda E = Rn - G - H$

In SEBAL, Rn is computed from satellite-measured broad-band reflectances and surface temperature while G is estimated from Rn, surface temperature, and vegetation indices.

As for the sensible heat flux H, it is considered proportional to the ratio between the surface-air temperature difference (dT) and the bulk aerodynamic resistance (rah). First, dT is estimated at extreme pixels then, H is computed by iterative buoyancy correction using the Monin-Obukhov Similarity (MOS) theory.

SEBAL provides a good estimation of the spatial distribution of ETa in agricultural areas on certain sample dates during the cropping season. However, it cannot be used directly in water balance studies because of the wide fluctuation of ETa from day to day, depending on meteorological conditions and availability of water. Therefore, in order to obtain an accurate estimation of the seasonal ETa, daily values have to be simulated. A reliable method for temporal integration has been described in recent literature (Chemin and Alexandridis, 2004). Daily ETo (reference evapotranspiration) was calculated with the standardized Penman-Monteith method (Allen *et al.,* 1999). The fraction ETrFj = ETaj/EToj, where j refers to the satellite image acquisition date, was considered constant for the time period between two consecutive satellite images, and the seasonal ETa (ETs) could be simulated with the following equation:

$$ETs = \sum_{j} \left(ETrFj * \sum_{i=t_j}^{t_{j+1}} EToi \right)$$

where tj and tj+1 delimit each period.

The above mentioned equation is using the time component (ETo) to calibrate the spatial component of ETa calculation (ETrF) in order to better describe the daily fluctuation, which is dependent on meteorological conditions. ETa also depends on the availability of water. Spatial variation of water availability can be described by the satellite images, which were assumed representative for each period.

The spatial resolution of ETs from MODIS or AVHRR images is around 1000 m, which is too coarse to describe the detailed pattern of irrigated land in the Mediterranean basin. This coarse spatial resolution can be subsequently improved to 30m, using a simple linear distribution model (Chemin and Alexandridis, 2004). This model re-distributes the original value of ETs found in a pixel of 1x1 km to a higher spatial resolution, using as guide the high spatial detail of the Landsat TM/ETM+ image. The advantage of the model was to keep the initial values of ETs unchanged, which was an essential prerequisite for estimating water use volumes.

Soil Moisture

Microwave remote sensing technology has demonstrated the potential to map Soil Moisture over large areas and monitor its changes at regular intervals in time. Microwave remote sensors are particularly favoured, not only due to their sensitivity to variations in certain surface parameters but also because of their ability to penetrate most cloud cover conditions and their independence of solar illumination. They can provide recurrent and consistent surface Soil Moisture measurements which can benefit agricultural activities and sustainable water management.

Although, both active and passive microwave sensors were used for Soil Moisture estimation only active sensors meet the spatial resolution and coverage required for many of the applications of consistent Soil Moisture data. Synthetic Aperture Radar (SAR) sensors and more recently the Advanced Synthetic Aperture Radar (ASAR) are mounted on various satellites with spatial resolution from one to thirty meters offer a good potential to retrieve surface Soil Moisture. Ulaby *et al.* (1986) recommends to use long wavelengths (L-band, 24 cm) in order to minimize the effect of vegetation (L-band penetrates further through the canopy and reflects from the soil surface) and with low incidence angles in order to reduce the effect of surface roughness. Unfortunately, the L-band is provided by a few sensors (ALOS/PALSAR, JERS-1/SAR, SIR-C/X-SAR). Therefore, there were several attempts to retrieve Soil Moisture from the C-band available from the following satellites/sensors: ERS-2/AMI, RADARSAT-1,2/SAR, and ENVISAT/ASAT. The theory behind microwave remote sensing of Soil Moisture is based on the large contrast between the dielectric properties of water and dry soil which results in a high dependency of the complex dielectric constant on volumetric Soil Moisture. Given this dependency, it is possible to estimate Soil Moisture by measuring the dielectric constant which is in turn related to the intensity of the radar backscattering coefficient.

Several models relating satellite-based images of SAR backscatter to surface Soil Moisture have been developed. Among them, the semi-empirical ones that represent a compromise between the site dependent empirical models and the complex theoretical models (Kirchhoff Approximation (KA), Small Perturbation Model (SPM), the Integral Equation Model (IEM)). The most widely used semi-empirical models are those developed by Oh *et al.* (1992), Dubois *et al.* (1995) and Shi *et al.* (1997). These models have certain validity ranges and generally, they are only valid for bare soil surfaces. On the other hand, the Water Cloud model (Attema and Ulaby, 1978) adequately represents the backscatter from a vegetation canopy as well as the underlying soil during the crop's phenological cycle. Therefore, the water cloud model was applied in manifold studies where the fusion of SAR data with data from optical sensors for the extraction of the Leaf Area Index (LAI) led to significant improvements of Soil Moisture estimations.

To derive Soil Moisture information visible, near-infrared and thermal satellite imagery is also used. In fact, an empirical relationship between evaporative fraction and the value of relative Soil Moisture content was developed by Bastiaanssen *et al.* (2000) and can be applied to a wide range of soils. Since the evaporative fraction (Λ) is one of the energy balance terms that can be calculated over large areas through the SEBAL model and using remotely sensed data (VIS, NIR, and TIR), the Soil Moisture conditions can then be estimated at the regional scale.

It should be noted that this approach retrieves the moisture content of the entire root zone, and this is an improvement as compared to the skin moisture estimates (5 cm depth) retrievable from microwave sensors (Ahmad and Bastiaanssen, 2003).

B1.2.4. Meteorological data, models and forecasting

A straightforward way to define the atmospheric boundary of catchments models is to impose the results of mesoscale atmospheric forecast models. These types of applications are highly disseminated through the world and are managed by public institutions and private companies. This type of forcing is useful to capture the main characteristics in watershed variability in the watershed. Mesoscale forecast of wind, temperature, Radiation, relative humidity and precipitation can be considered as the data input baseline of catchment hydrology forecasting.

For local studies small scale meteorology has to be applied. Small scale meteorology is a branch of meteorology which studies atmospheric phenomena and processes near the ground at spatial scales of tens of meters to a few kilometres. As the horizontal and vertical resolution increases boundary layer parameterization, micro-physics, sub-grid scale fluxes, radiative fluxes, convective clouds and precipitation parameterizations must be adjusted, if not modified, to describe correctly the new phenomena.

Developments in numerical atmosphere modelling and atmosphere remote sensing have resulted in a readily available suite of meteorological products for water professionals. National weather service's offer model output time series and images directly, e.g. through File Transfer Protocol (FTP), to water management agencies that can automatically process and forward these time series as input to hydrological models for decision support. Next to this increase in real-time availability of meteorological data, another important development is the use of re-analysis and hindcasting. Hindcasting means that when a new meteorological product becomes available a data set is prepared of what would have been the results of the product if it had been used for the past so many years. This data set can be used to compare a new product with the old products and to train the use of the new product (van Andel *et al.,* 2008[a]; van Andel, 2009).

The need or significance to include weather forecasts in the preparation of water system predictions differs per application and type of water system. For management actions that need little time to become effective, like the control of weirs and gates in irrigation canals, not much lead-time is required and therefore the significance of weather forecasts is less. Early warning and evacuation measures take a long time to become effective, but for large rivers long forecast horizons can be achieved using upstream measurements and river simulation models, without using weather forecasts. Therefore, also in this case the significance of weather forecasts is limited. For flood control measures that need a long time to become effective, like lowering reservoir levels, in fast responding catchments and in catchments where flooding problems follow directly from extreme rainfall events (pluvial flooding), the significance of the use of weather forecasts is very large. Also for drought management, where seasonal forecasts are needed, the significance of long-range weather forecasts (rainfall and temperature) is large. In Figure 7 a number of application areas for the use of weather forecasts in operational water management have been tentatively positioned according to their required lead-time and the significance of the meteorological forecast.

The model that will be used in MyWater is the the ETa model. This model has an E grid from Arakawa (Arakawa and Lamb, 1977) and vertical coordinate η (Mesinger, 1984). This coordinate has the feature of reducing the errors in calculation of horizontal derivatives near topography when compared to sigma coordinate. The split explicit technique is utilized during the integration (Gadd, 1978). The Eta, CPTEC version, has complete representation of the physical processes, which includes convective (Janjic´, 1994) and explicit precipitation (Zhao *et al.,* 1997). The turbulent processes are treated through the Mellor-Yamada scheme (Mellor and Yamada, 1974, 1982). Parameterization of radiation was developed by Geophysical Fluid Dynamics Laboratory and follows Fells and Schwarzkopf (1975) for outgoing longwave radiation, and Lacis and Hansen (1974) for shortwave radiation. The surface scheme is represented by NOAH scheme (Ek *et al.*, 2003).

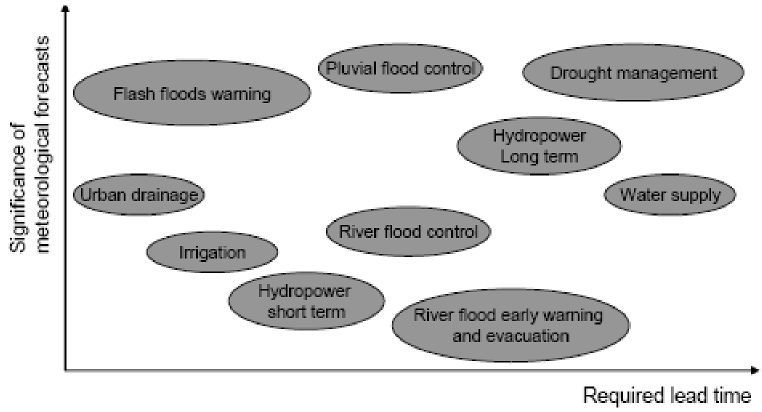

Figure 7 - Significance of meteorological forecasts for operational water management applications (van Andel, 2009).

B1.2.5. Soil data

A number of continental and regional scale databases are available to support soil water modelling in Europe. Besides the European Soil Database and data from the BioSoil forest soil monitoring a new set of soil data will become available from 2010 through the LUCAS Soil survey, including soil organic carbon and soil texture information of over 22.000 sampling points over the EU. Pedotransfer rules for continental scale will be developed on the basis of these datasets.

Regional, catchment scale soil data base of the model development include two independent detailed datasets; one from a Mediterranean and one from a transitional region between temperate sub-oceanic and temperate continental climate.

The information available in the Mediterranean is a local soil database in the northern part of Greece that covers an area of 300.000 ha part of which is the catchment area of Nestos river. Soil sampling scheme included 5.000 sampling sites and 900 soil profiles. Data include texture, organic matter, pH, electrical conductivity, calcium carbonate, bulk density, CEC and exchangeable bases, macro and micro nutrients. Soil thematic interpolation maps in 1:20.000 scale are available as well. The whole soil database can be used for deriving and testing pedotransfer functions that will be applied in the catchments area of Nestos river (Greece).

The soil database of the temperate climate is the Hungarian Detailed Soil Hydrophysical Database (HUDSHYD) was developed to collect all the existing information about measured soil physical parameters in Hungary. Recently this is the largest detailed national hydrophysical database, currently contains information about *15000* soil horizons belonging to *4000* soil profiles. The *General Parameters* of the database are basic information about the soil profiles (identifier, origin, location, soil type and subtype, genetic horizons and location on the topographical map of Hungary). The *Chemical Parameters* are the pH_{H2O}, pH_{KCl}, calcium-carbonate (%), salt content (%), changeable Na (S%), humus content (%) and the CEC. The *Physical Parameter modul* contains information about the following parameters: pF values (vol %) (pF 0, pF 2.5, pF 4.2, pF 6.2); particle size distribution (mass %); bulk density (g/cm3); Liquid limit (according to Arany); hygroscopicity (vol %); hydraulic conductivity (cm/day).

On the basis of the Hungarian Detailed Soil Hydrophysical Database were developed and tested pedotransfer rules to estimate soil water retention and conductivity from the data of the available soil maps and cartograms. These pedotransfer rules can be useful to predict the water regime of selected pilot area (catchment area of Zala river) where 1:10.000 scale soil maps and cartograms are available on 10.000 ha.

The following data with the continental to regional coverage are available or will be collected for MyWater research:

- A new set of soil data from LUCAS Soil survey 2009 (on-going): Soil analytical data coming from over 20,000 new sampling locations throughout Europe, including texture, organic carbon, pH, carbonates, nutrients. The database will be available at the JRC by June 2010 and is planned to be integrated to the project information pool by 2011;

- The Soil Geographical Database of Eurasia at scale 1:1,000,000 (SGDBE), which is a digitized European soil map and related attributes (version 4 beta). This data base is part of the European Soil Information System (EUSIS);
- The PedoTransfer Rules Database (PTRDB), version 2.0, which holds a number of pedotransfer rules which can be applied to the SGDBE; the results of the application of the pedotransfer rules to the SGDBE are delivered as a table with new attributes related to the European soil map;
- Soil Profile Analytical Database of Europe (SPADE). Two types of profile data are provided: measured profiles and estimated profiles. Measured profile data come from geo-located profiles taken in the field. Estimated profile data come from profiles that should be representative for a specific soil typological units of the SGDBE and have been estimated by experts. Data include on texture (and particle size grades), organic matter content (C, N), structure, total nitrogen content, pH, ESP or SAR, calcium carbonate content, calcium sulphate content, electric conductivity, CEC and exchangeable bases, soil water retention, bulk density, root depth, groundwater level and parent material for the different soil horizons;
- BioSoil forest soil monitoring data, including biodiversity characteristics; the upcoming LUCAS Soil cropland soil monitoring data. Point information covering all biophysical regions in Europe. BioSoil study includes all sites of the 16 km x 16 km Level I network of the countries covered by the ICP-Forests. (Forest Focus Regulation (EC) N° 2152/2003);
- European River Catchment Database (Version 2; CCM2). The European River Catchments were created using as main input the CCM River and Catchment Database version 2.0, extracting watersheds order 5 (CCM2 wso5);
- CORINE Land Cover database (CLC): The standard CLC nomenclature includes 44 land cover class in 3 level hierarchies. The first level with 5 items, indicates the major land cover classes on the planet, The second level with 15 items is for use on scales 1:500 000 and 1:000 000, The third level, 44 items, is for use on scale 1:100 000. The Minimal Mapping Unit identified in CLC is 25 hectares and the minimum width of linear feature (e.g. water course, road, etc.) is 100 m;
- DanubeSIS database including more detailed data for 7695 point, differentiated between topsoil and sub soil on different soil parameters (texture, depth to bed rock, parent material, organic material, ground water level) covering the whole Danube catchment;
- SRTM Digital Elevation Model. Originally the NASA Shuttle Radar Topographic Mission (SRTM) has provided digital elevation data (DEM) for over 80% of the globe, 3 arc second (approx. 90m resolution). Later processed for the no-data or voids. The already processed SRTM V4 data is as of now available at a mirror site at the JRC;
- Harmonized World Soil Database v 1.0 (HWSD): The Harmonized World Soil Database is a 30 arc-second raster database with over 15000 different soil mapping units that combines existing regional and national updates of soil information worldwide (European Soil Database, SOTER, Soil Map of China, WISE) with the information contained within the 1:5 000 000 scale FAO-UNESCO Soil Map of the World;
- GLOBAL soil datasets: available from the US ORNL Distributed Active Archive Center (THREDDS Data Server Catalog Service) containing Annual Soil Respiration data, Plant-extractable water capacity of soils, Gridded surfaces of selected soil characteristics, Organic Soil Carbon and Nitrogen, Soil profile data, Soil texture and derived water holding capacities, Soil types (0.5-degree grid), Soil types (1 degree grid), Derived soil properties (0.5-degree grid).

Based on the integration of these datasets for soil water research, new pedotransfer rules will be developed which are applicable from catchment scale to continental scale assessments. The structure will allow efficient searching for key attribute parameters, indicators, soil processes, methodologies, scientific basis and rationale. Soil data of the MyWater model will be linked through the European Soil Data Center (ESDAC). ESDAC publishes and provides access to metadata and data, and allows the delivery, viewing and analysis of soil water information. Different levels of accessibility rights (i.e. full access; viewing) are defined. (As a principle, data generated through the EU financed project is to be made directly accessible through the ESDAC.) The user is able to discover and view the public information/maps of his/her choice letting the Geo-Portal contact the necessary servers and combine the data (http://inspire.jrc.it/). Researchers of the MyWater project have full access to the produced time-series information for soil processes analysis.

B1.2.6. Catchment models

In the framework of the WFD, models usage can be extremely valuable for defining the ecological status of water bodies. Today, this definition is still highly dependent on measurements, which, in general may give the general trend, but fail to get the extreme values. This is because they usually are limited in time and space largely due to cost of sampling and laboratory estimations. Even the automatic samplers are either limited by maintenance costs or by accuracy. This is why it is important to use models to simulate water quality in reservoirs and estuaries or to compute the flows and loads produced in the catchments. Besides this it is necessary to propose mitigation actions to restore the water quality in the reservoirs. This is only possible using models that allow producing scenarios under the mitigation actions.

Long-established models have been used throughout the world to solve the hydrologic balance centred on the soil (mainly for agricultural applications). Examples of these models are HYDRUS (Simunek *et al.,* 2005), RZWQM (Shaffer *et al.,* 1999) and DSSAT (Jones *et al.,* 2003). Catchment models have progressively replaced this plot scale models though keeping the soil as the centre of the global water budget. These models allow watershed extrapolation. Two examples are MOHID LAND (Chambel-Leitão *et al.,* 2007; Trancoso *et al.,* 2009) and SWAT (Arnold and Fohrer, 2005) models, available for the consortium. MOHID LAND has the advantage of being object oriented programmed (which allows easily to introduce new processes and coupling models) and also benefits of being applicable in detailed studies like 1D soil simulations. SWAT model has the advantage of being a model used around the world for environment assessment (Arnold and Fohrer, 2005).

Both this models calculate explicitly plant growth, Actual Evapotranspiration and Soil Moisture by explicitly calculating water balance of the system soil-plant-atmosphere. The traditional approach to validate these models is to use measured flow. However flow measurements are also prone to errors because they are not measured directly but obtained from water level measurements from river. Satellite data on LAI, Actual Evapotranspiration and Soil Moisture, originates the opportunity for new model validation procedure.

Traditionally this kind of models use, as input, topography, meteorology, soil type data, land use data and agriculture practices. However catchments models like MOHID LAND are prepared to use LAI and ETa as input and they can easily include algorithms for soil water assimilation. Successfully applications of data assimilation in hydrological models use sequential methods based on the Kalman filter, such as reduced-order Extended Kalman filters (Reichle *et al.,* 2002) and the Ensemble Kalman filter (Kumar *et al.,* 2008).

Model results can also be coupled with reservoir models like CEQUALW2 (Cole and Wells, 2006) or MOHID WATER (Braunschweig *et al.,* 2003). There are two advantages of this: i) reservoirs are of central interest to for many users; ii) validate if levels obtained with reservoir models are correct when catchment model flow results are used has input. This last point provides an indirect validation of catchment models. For facilitating model coupling (like for example catchment and reservoir models) HarmonIT EU project has developed the open modelling interface (OpenMI) that facilitates easy linking of existing and new models (Gregersen *et al.,* 2005).

For detailed 2D simulation of the urban flooding, the PRICE2D model will be utilised (Price *et al*., 2010). This is a two-dimensional non-inertia surface flow model for simulating the complex phenomenon of interaction of sewer-drainage system and surface runoff. The Storm Water Management Model (SWMM5) (Rossman et al, 2005) will be used to simulate flows in storm sewer systems. Coupling with the catchment model MOHID LAND will be ensured using the OpenMI interface.

Aquarius is a non-linear reservoir model used for simulating the Rijnland catchment hydrology and reservoir control (van Andel et al., 2008[b]). This model already takes in to consideration all this features but it is site specific. The use of this model will show that MyWater platform can be adaptable to other Catchment models needed for more complex watersheds like the one in Rijnland. For remaining study sites (where water flow is less dependent on human activity) SWAT and MOHID-LAND will be used.

In the innovative hydrological modelling approaches that will be developed, calibration and validation routines are changed to incorporate the uncertainty of EO analysis input data. The downstream hydrological data will be used as indicator for improvement of the EO data interpretation, and then the improved interpretation of EO data will be used as input to the catchment models before calibration to complete the feedback loop (see Figure 8). To represent the dynamic uncertainties in input data, model parameters, and model predictions, ensemble prediction methods will be used. These include the use of ensemble meteorological forecasts and ensemble hydrological predictions (Schaake et al., 2007). This will thus contribute to innovative ways of integrating catchment models with EO based input data.

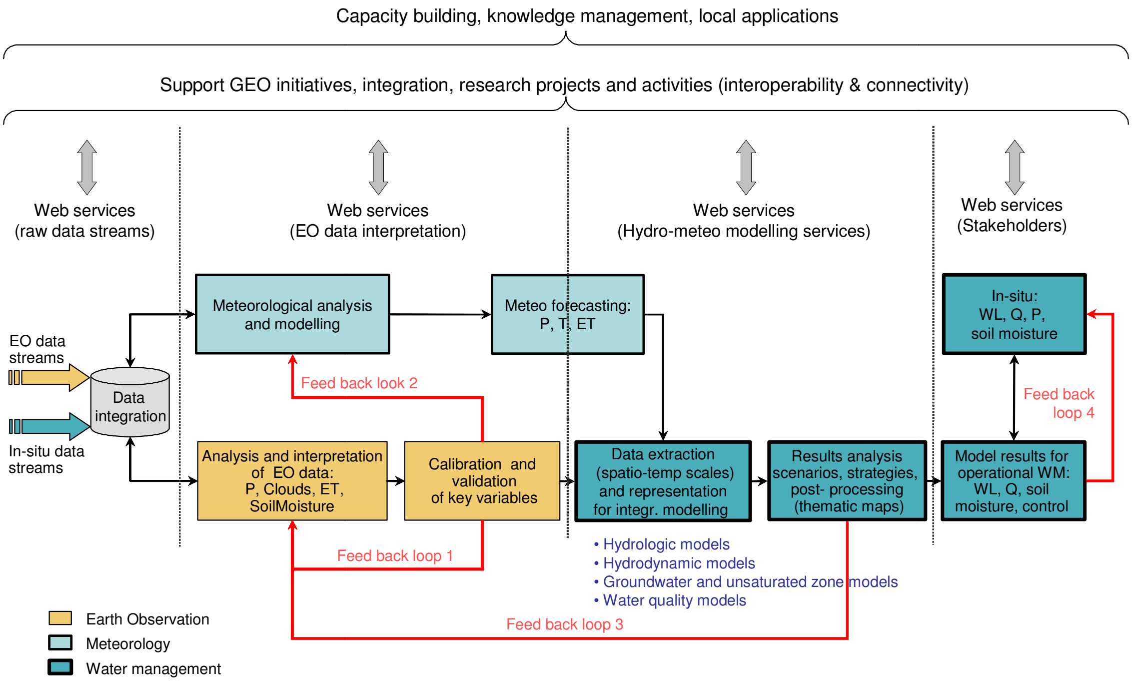

Figure 8 - Schematic presentation of feedback loops for the integration of the three disciplines: earth observations, catchment modelling and operational water management.

B1.2.7. Data analysis and publishing

The MyWater platform can be divided in three layers: import, processing/storing and exploitation/dissemination (see Figure 9).

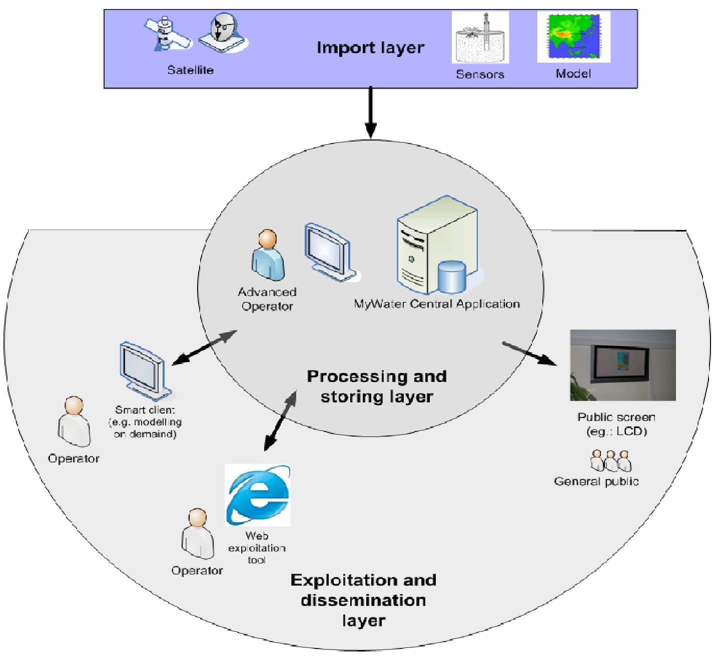

Figure 9 – MyWater platform general architecture.

In the import layer the external data sources (e.g. satellite, sensors network and model results) considered important for the MyWater goals are aggregated and periodically uploaded into the processing and storing layer. The system needs both near real time field data to validate the models, and also forecasts to force the models run in operational mode. The import layer must be able to periodically check the available data sources to determine if there are new data. If it is the case, it converts these data to standard formats for time series (e.g. ASCII) and spatial fields (e.g. HDF5 and NetCDF). After conversion, the data is uploaded to the processing and storing layer base. The data import layer workflow needs to be adapted to the reality of the user.

The processing and storing layer is responsible for managing all the data fluxes (measured and modelled) necessary to deliver to the end-users a real time/forecast “image” of the hydrologic cycle adapted to their needs. In this layer is stored all the external data already mentioned and also the model results generate inside this layer. At this level will be checked in a detailed way the consistency of the measured and modelled data to be delivered to the end-users. This is the main responsibility of the operator of this layer.

In the exploitation and dissemination layer will be provide several tools adapted to each end-user need. In this layer the following type of users are foreseen:

- General public who wants to have access to generic information. This type of information can be disseminated via LCD’s placed in public places or generic web sites (e.g. newspapers online or agricultures associations);
- Professional users (or operators) who want to have access to detailed information related to their activity. Usually they want to have access to a sub-set of parameters or a sub-region of the entire information managed by the MyWater Central Application. It is necessary in this case to develop Graphical Users Interface (GUI) that can be adapted to these users’ needs. These interfaces will be flexible. It will be possible to configure the exact type and number of views (e.g. alert signs, parameters map fields, parameters time series, schematic networks of hydraulic components, risk maps, etc.) necessary to their activity. The idea is to adapt the complexity of the GUI to the user needs and knowledge. These users can be also subdivided in two types:
    - Need to have access to detail data in real time. In this case a web GUI will be developed;
    - Need to do specific modelling runs. For these users a Smart Client will be develop that have the same graphical capabilities of the Web GUI and will allow the user to run models on his computer or in the server where the MyWater Central Application is installed.

The core of MyWater platform is the MyWater central application (Figure 10). The design can be divided in five main modules: i) Data Management, ii) Chart Engine, iii) Model Operationalisation, iv) Scheduler and v) System Administration.

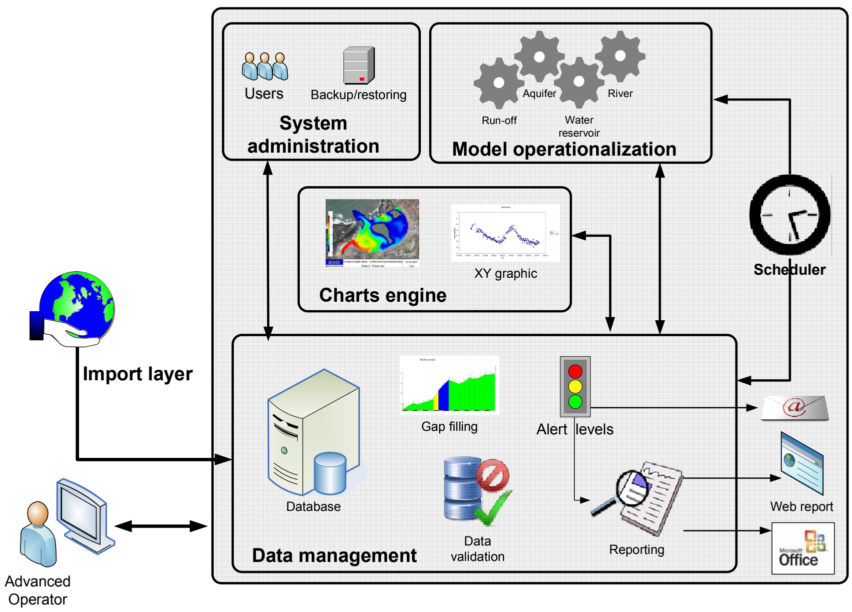

Figure 10 – MyWater central application general architecture.

The core of this module will be a SQL Server data base (or similar). All the data handled by the tool will be stored in this data base. In this module, will be developed several sub-modules responsible for the data quality (Data Validation and Gap Filling) and for the data analysis. Data Validation will be used throughout the System with the aim of checking if the data imported or generated inside the system have consistent values and evolution.

A system like this one generates complex outputs and large volumes of data. To improve the interaction between the operator and the system the concept of Alert Levels will be developed. The idea is to convert measured and modelled data of several parameters, highly continuum in time and space, into a discrete level of alert. Each alert level will be described by a name, a number and a colour.

The system will be able to create automatically MS Office or PDF reports. These reports can be produced periodically and the user can associate a set of time series and spatial field maps to each report. The system will also be able to create automatically XML reports to be published in the internet.

This system will be design to operate numerical models. Therefore, each numerical model must be implemented and validated first. The user must have at least a stable configuration of the numerical model. Only in this case the numerical models can be used in operational mode.

Numerical models still have some limitations, from the knowledge and algorithms point of view. However, the experience shows that usually the deficiencies identified in the numerical model's results are not associated with limitations of the model but rather with bad boundary conditions (e.g. precipitation, soil use) or deficient model implementation/configuration.

It is very important that each numerical model is implemented and validated by an expert. The validation process can be faced as a continuous task that can be supported partially by the MyWater platform. However, before importing a model, a preliminary validation must be done.

The numerical model expert has an important role not only in the implementation phase but also in the exploitation phase. An efficient link with numerical model experts is recommended in the latter phase in order to do a correct interpretation of the numerical model results.

All periodical procedures will be submitted in the Scheduler Module. The scheduler will be used to activate and manage the frequency of several actions:

- Data import;
- Run model;
- Reports;
- Backup;
- Check for alerts.

The Map View aims to present all spatial data (e.g. polygons, measurement points, scalar and vector fields) in a GIS environment. The user will be able to upload several layers The XY view will allow the user to create a new chart where to represent the time series.

At least three types of users are foreseen: administrator, advanced operator and operator. The first is responsible for the MyWater platform configuration. The second one is responsible for checking the evolution. The advanced operator can do periodically or on demand backups. The advanced operator can do on demand purge and restore actions. The operators are users focus in analyzing data for specific areas and/or sub-set of parameters.

B1.2.8. Test sites and Service Cases

The MyWater project has succeeded in attracting a very well geographical spread of the case studies and respective end-users (Case study locations presented in Figure 11).

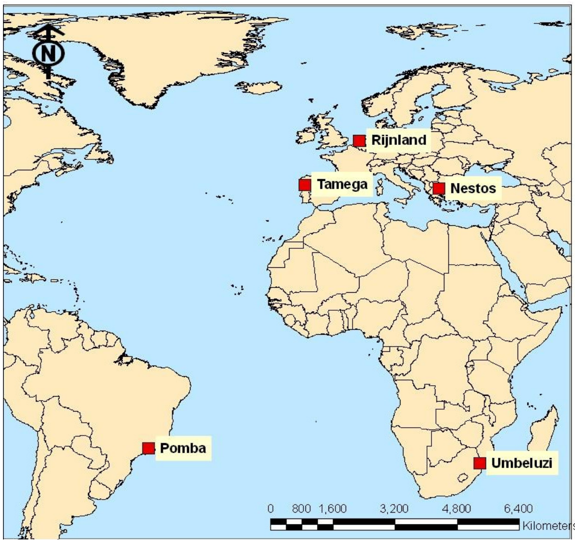

Figure 11 – Case study locations: Delft/Rijnland, Costa do Estoril, Thessaloniki, Umbeluzi, Pomba.

Rijnland, The Netherlands

Rijnland is a polder area in the western part of the Netherlands, bordering the North Sea (Figure 12). The total area is about 1000 km2 of which 72% is occupied by low-lying land-reclamation areas, 15% by free draining areas and 8% by dunes. A storage basin consisting of inner connected canals and lakes, occupies 45 km2. The storage basin serves to collect all the excess water of the Rijnland area, before it is discharged to the main water system of the Netherlands and finally to the North Sea. The low-lying areas would be subject to flooding if they were not protected by dikes and the excess water not pumped to the storage basin. The area consists of urban and rural parts. The rural parts can be sub-divided into areas committed to horticulture, agriculture, and grass lands. The dominant soil types are sandy in the free-draining and dune areas, clay in part of the land reclamation areas, and peat in the main part of the land reclamation areas.

During high rainfall events ground and surface water levels rice and 4 main pumping stations are operated to prevent flooding. During summer and dry spells, the channelled storage basin is flushed by combined operation of smaller inlets and sluices, mainly Gouda inlet and KvL sluice, and the four main pumping stations.

A simulation model of the water system is used in a decision support system (DSS) for operation of the four pumping stations to keep the storage basin water level within a 0.05 m target range. Through the use of EO information the Rijnland Water board would like to further improve its understanding of the system, and to improve the hydrological modelling for offline simulation and real-time prediction. This also includes the use of radar data and ensemble forecasting data of the Dutch meteorological institute.

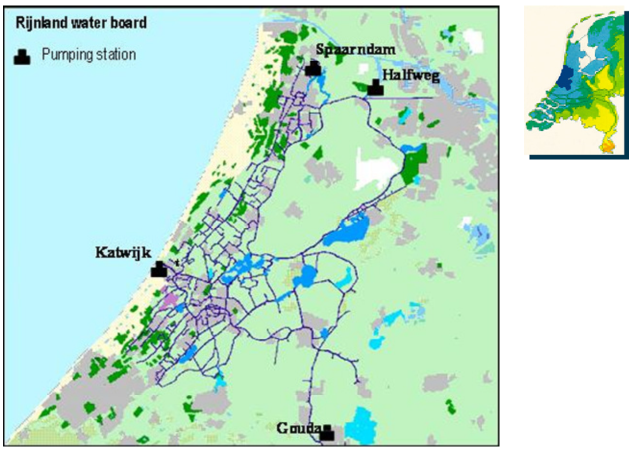

Figure 12 – Principal Water-board of Rijnland: controlling a low-lying regional water system in the western part of the Netherlands.

Tâmega, Portugal

This is a transboundary river between Portugal and Spain and is a tributary of Douro river. It has an area of about 3270km2 (Figure 13). This watershed drains to Torrão reservoir, which is of great importance for ARH-Norte user. The watershed is composed of around 65 % of forest area and 31% of agriculture area.

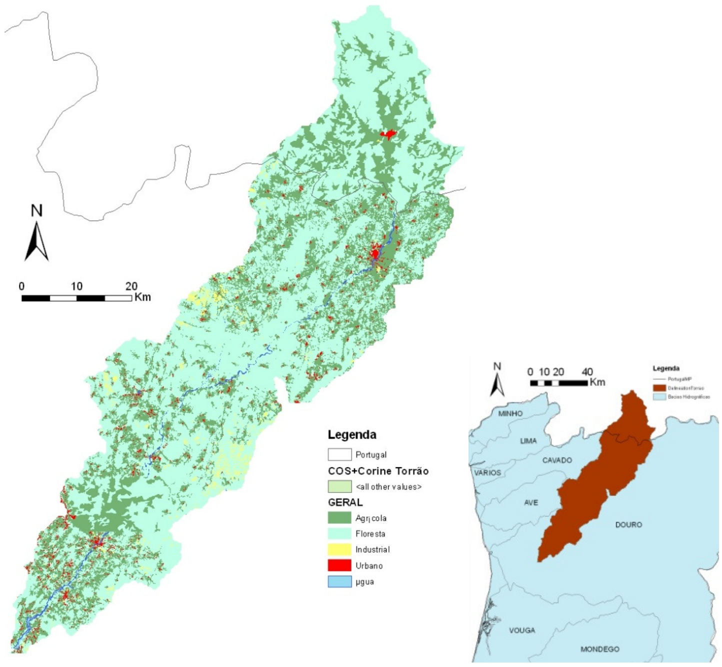

Figure 13 – Portugal case study area.

River Nestos, Greece

River Nestos is a transboundary river between Greece and Bulgaria (upstream Bulgarian name: Mesta). Its watershed covers an area of 6100 km2, of which 2300km2 are in Greek territory (Figure 14). The land cover is mainly natural vegetation (60%) and the rest is agricultural land. The number of inhabitants in the basin is 178,000 according to the last census. The average rainfall is 600-1200 mm and the annual water flow is estimated to 1830 Mm3.

Figure 14 – Greece case study area.

An extensive open canal irrigation system has been formed in the delta and flood plain of river Nestos. An area of 25,000 ha is irrigated, covered mainly by rice, alfalfa and maize. Water source is from a diversion dam of the river. Water scarcity has been reported after the construction of a hydroelectric power dam. Shallow groundwater level is relatively high. The river delta, downstream of the site, is a wetland of International Importance by the Ramsar Convention, and is included in the Natura 2000 network.

Pomba, Brazil

Pomba river is a tributary of Paraiba do Sul river and it has an area of about 9000 km2 (Figure 15). The highest part of the watershed is at 1100 meters height. Many data that are relevant for hydrological studies are already available namely: Detailed elevation maps, in situ precipitation and Soil Moisture stations (many of them with telemetry), Land Use/Land Cover maps, Soil type maps, radar for accessing real time precipitation, flow measurements.

Natural landscapes in this watershed have been degraded due to coffee plants plantations.

Figure 15 - Brazil case study area.

Umbeluzi, Mozambique

Water supply in Maputo relies on water quality and quality of Pequenos Limbombos Reservoir. This reservoir depends on contribution from Umbeluzi Watershed. This watershed is shared with Swaziland and has high density of agriculture. Location of the study area is presented in (Figure 16)

For a successful study site implementation tools have to be setup with local data and with input from the user. Models and EO dada will have to be calibrated with best local data available. This will make implementation easier and ensure the operationalisation of service.

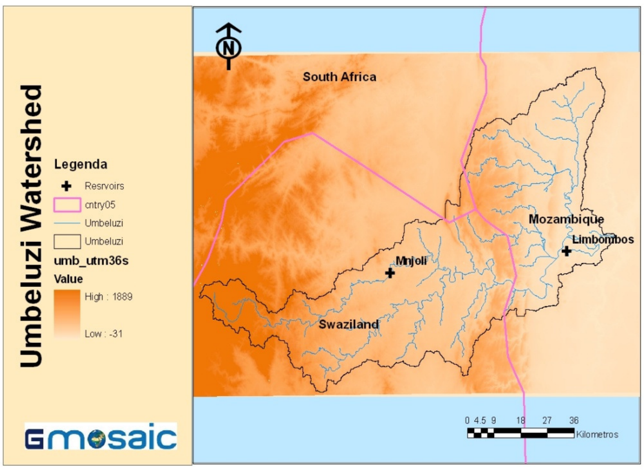

Figure 16 - Mozambique case study area.

B1.3. S/T METHODOLOGY AND ASSOCIATED WORK PLAN

B1.3.1. Overall Strategy and general description

The MyWater project is constituted by 4 main blocks (Figure 17 presents the MyWater work plan structure):

- Management (WP1);
- Base data and methods (WP2, WP3 and WP4);
- Services and tools development (WP5 and WP6); and
- Implementation (WP7, WP8, WP9 and WP10).

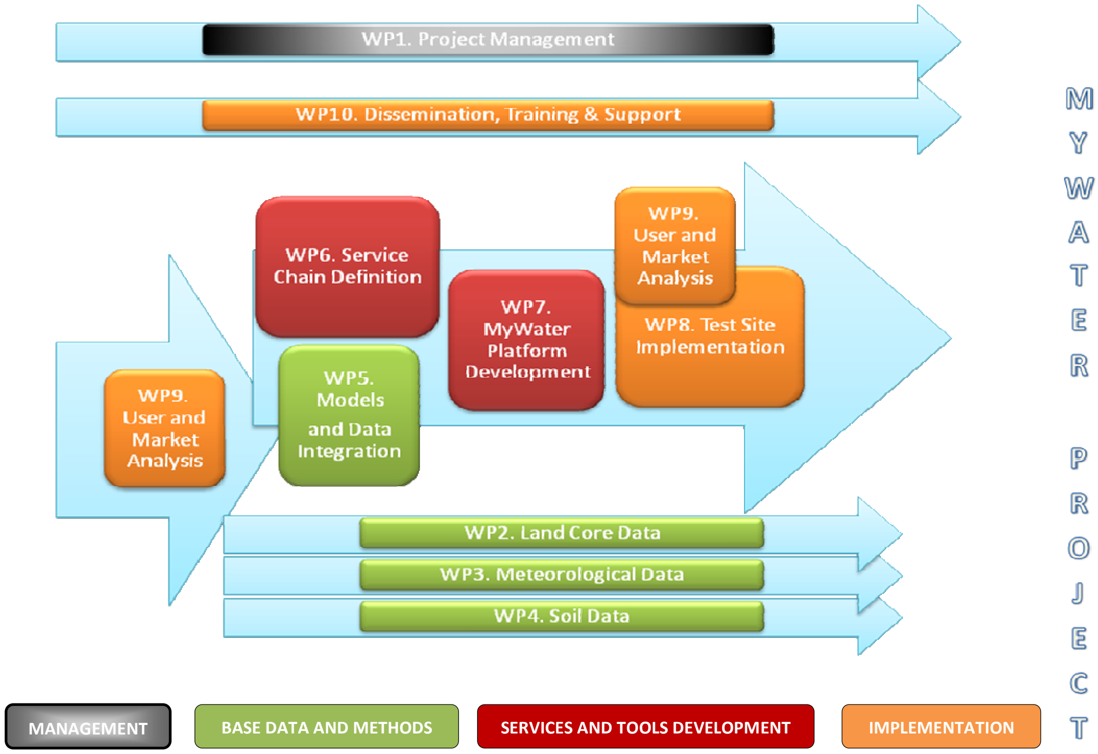

Figure 17 – MyWater work plan structure.

The Management block is constituted by:

- WP1 Project management which addresses, in general terms, all coordination and management issues and the interface to the Commission. This WP applies to the whole study spreading across the remaining WPs.

The Base data and Methods block respect to the base data gathering and processing, and data modelling procedures.

In this block:

- WP2 Land core data will be used for the derivation of the GMES land core services (i.e. LCLU, LAI, ETa, Soil Moisture) relevant to run the catchment models. This shall be performed through a detailed inventory of the already available GMES services, EO and ancillary data for the test sites, and through the development of methodologies based on EO data extraction for generating those services;
- WP3 Meteorological data will be used for the generation of the meteorological previsions needed to run the catchment models (e.g. Precipitation, Temperature). Methods will be developed for meteorological forecasting at different temporal and spatial scales;
- WP4 Soil data will be used for the provision of the information necessary to the catchment models on soil data, which will be derived by pedotransfer functions. Soil databases addressing soil depth, soil texture and Soil Organic Content (SOC) will be developed;

- WP5 Models and data integration will allow the integration of the catchment models with the land core data, the meteorological data and the soil data. Methodologies to check the models accuracy will be developed. Models calibration and validation towards enhanced implementation in the study sites will also be carried out. A PhD research will be dedicated to this task (IHE). Special attention will be given to methodologies that allow local users to take the most advantage of model results.

In the services and tools development block:

- WP6 Service chain will focus on the development of the building blocks and information flows for each of the Service Cases: Early flood warning system; Support to irrigation activities; Desertification risk assessment; Reservoir Management. The idea is to breakdown in unitary blocks the technical procedures needed to go from GMES data to processed information useful to MyWater end-users. Each service chain will follow the generic workflow presented below (Figure 18):

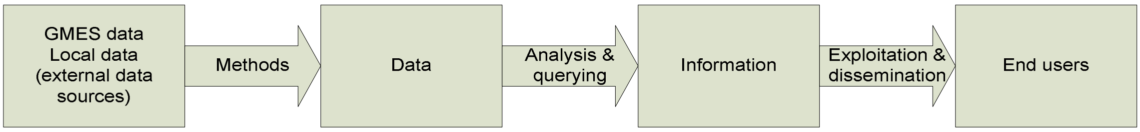

Figure 18 – Service Chains generic workflow.

- WP7 MyWater platform development address to the development of the MyWater information tool, in which the service chains will be implemented in order to be handled by all users.

In the final block Implementation, the following work packages will be carried out:

- WP8 Test site implementation, where the MyWater platform will be implemented in several locations and the business models will be tested;
- WP9 User and market analysis, where will be conducted: a) an analysis of the user needs; b) evaluation of competing solutions; c) preliminary business plan, taking into consideration the acceptability of the proposed solution to stakeholders, analysis of the competitive environment and segmentation of the market; d) development of a final exploitation plan;
- WP10 Dissemination, training and support, will contribute to the definition of the project dissemination strategy and the training methodology to support all local partners to take the most advantage of MyWater tools and services.

B1.3.2. Timing of work packages and their components

The following picture (Figure 19) depict the project plan, showing the project components, tasks and their interdependencies.

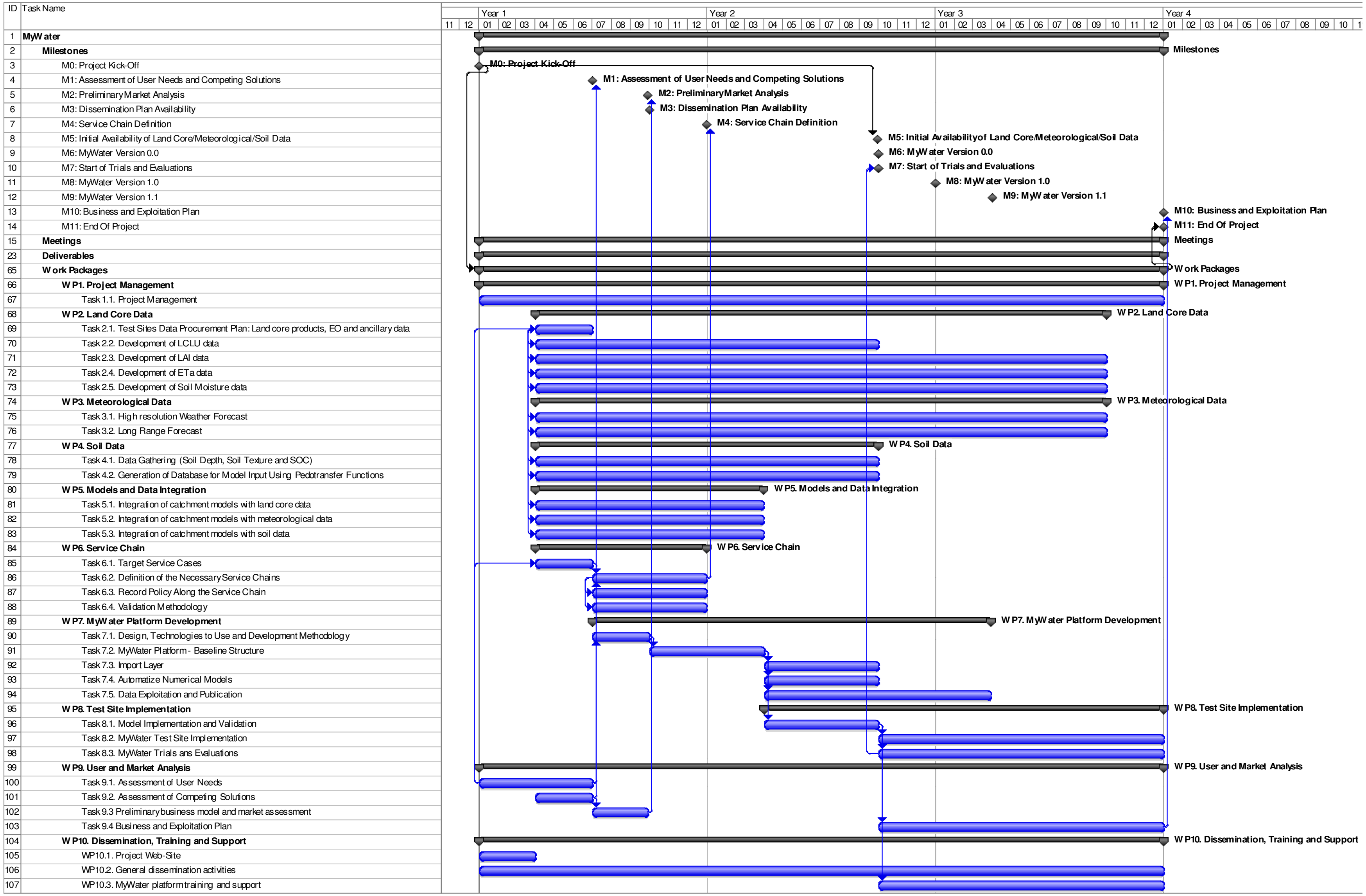

Figure 19 – MyWater GANT chart.

B1.3.3. Risk analysis and contingency plan

The major potential low, medium and high risks for the project identified in the following table (Table 1). These are mainly to project management issues. The table also provide a set of possible mitigation actions. The risk level is determined on the basis of the two components of risk, i.e. the magnitude of the potential loss and the probability that the loss occurs.

Table 1 - Potential project execution risks and proposed solutions.

Potential low risks	**Proposed solutions**
Partner(s) /end-user(s) will withdraw from the consortium.	Should any end-user withdraw from the consortium, the system implementation will be limited to the remaining end-users. Academic and private company partners are not expected to withdraw from the consortium.
The MyWater platform may be out of scope of solutions suitable for the user group.	End-users and commercial companies are expected to provide sufficient information to mitigate this risk. The project already considers the existence of a WP with focus on market analysis. Also, the presence of stakeholders in the Advisory Board will guarantee that the solutions will be as compliant as possible with “real-life” user requirements.
Potential medium risks	**Proposed solutions**
Key person will leave the company/university/institute.	To mitigate personal risks, the work will always be shared among more people to allow personnel replacement.
The MyWater platform may be expecting data of type or quality not provided by the local users.	End-users are expected to provide real data, where any research must be tested and verified against these selected reference datasets. In case of absence of local information in quantity and/or quality, the system will be implemented with the available information.
The necessary space-based observation data necessary to the development will not available	If sufficient EO data is not accessible some of the following mitigation actions may have to be carried out: Provision of a smaller number of services Implementation of services for fewer test sites Work has to be performed at smaller scales Work has to be performed using less detailed EO derived data EO data used will not be as up-to-date
Potential high risks	**Proposed solutions**
Testing data may raise privacy and data quality issues not allowing using such data for public presentation and demonstration.	Careful choice of the testing data and related privacy issue. Presence of relevant stakeholders with wide experience in dealing with privacy and data quality. Specific work package in the project dealing with privacy and data quality is limiting the probability of this risk.

B2. IMPLEMENTATION

B2.1. MANAGEMENT STRUCTURES AND PROCEDURES

Many times underestimated, project management is in our opinion one of the most important activities in a project and therefore in MyWater. Its purpose is to ensure a proper co-ordination across work activities, components, countries and partners, in order to achieve the overall project objectives within time and budget constraints.

GMV will be responsible for the overall management of the MyWater project including the interface to the Commission.

Planned technical and administrative activities will be coordinated under a management structure and organization designed specifically for the purpose, which accounts for the interests of all the actors involved.

The proposed project management procedures are identified and described in the present section, including the management structure and organization, the form to reach the internal consensus, the conflict resolution procedures, quality control procedures and IPR strategy. The project will start with the kick-off meeting to address the general terms in the consortium agreement:

- Assigned responsibilities;
- Meeting and reporting procedures;
- Conflict resolution;
- Communication strategy;
- Financial requirements for fund transfer;
- Quality assurance procedures complementing the contract and the existing and certified quality systems of the participants;
- Personal coordinates.

From a quality control perspective, this provides a mechanism whereby the partners can follow an agreed process for all major management activities, increasing efficiency and simplifying possible conflict resolution strategies.

The project management structures have been defined by taking into account the composition of the consortium, the experience of consortium members, as well as specific needs of the MyWater project (Figure 20). MyWater project is based on a sound management structure, able to cope with the inherent complexity of a collaborative research project in an international context.

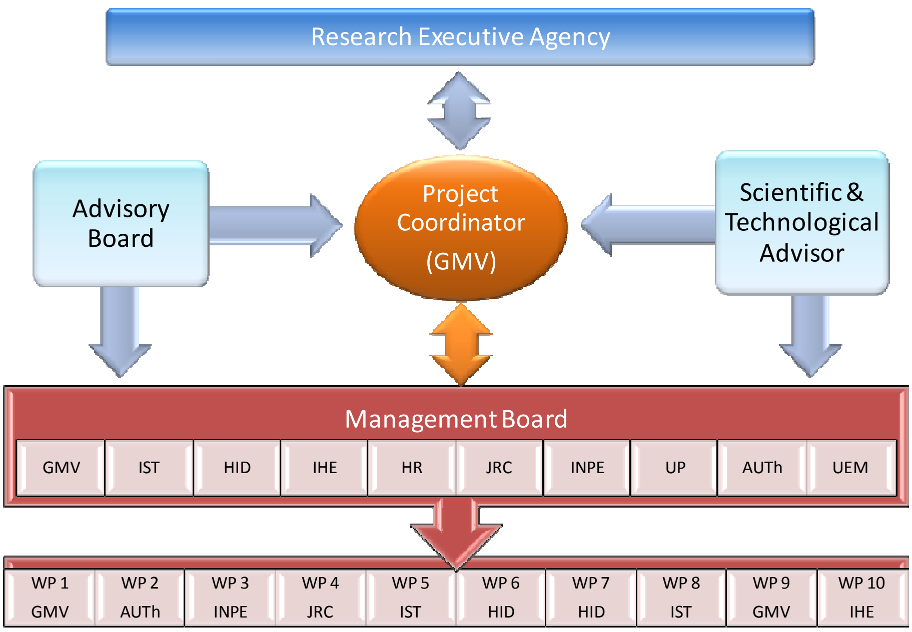

Figure 20 – Management structure.

The management structure is as simple as possible in order to ease the challenges resulting from having partners from different countries, with different cultures, that must work together and achieve successful results.

The Project Coordinator (PC) will take care of the day-to-day management, assuring that the work plan is being executed according to the schedule. In practice, it is intended that in the day-to-day activities, the role of the PC is similar to the one of a private company CEO, while the project management board will act as an Administration Board. Both will receive the support of the Advisory Board in what concerns the vision of the market needs, and of the Scientific and Technical Advisor in what concerns the scientific issues. For each Work Package, a Work Package leader is assigned with responsibilities in the technical co-ordination of each work package, keeping track of the activities to be developed within each. This will contribute to help the Project Coordinator.

Such an organization structure allows synchronization and optimization of the work of all consortium members, avoiding duplications and complex management mechanisms, allowing WP teams to work independently, both in parallel and jointly, assuring at the same time that the project developments keep in mind the “real-world” needs. Strong cooperation will be enforced by the PMB.

B2.1.1. Project Coordinator

Mr. Paulo Gomes, of GMV, will be responsible for the project coordination. The PC ensures the communication between the consortium and REA as well as he is in charge of day-by-day work supervision and project management. These tasks include monitoring progress of the project, dealing with any contractual, financial and administrative issues that arise from day-to-day practice.

The PC also interfaces with the PMB to collect all project-related information, to report the project status and to raise decisions to be made. Generally, the Project Coordinator will be in charge of all typical project management tasks.

B2.1.2. Project Management Board

The PMB includes the PC (in the chair position), the work package leaders and possibly also other senior representatives of each partner. This body is in charge of the definition and monitoring of the strategic direction of the project, so its duties include:

- Changes in the objectives;
- Budget adjustments;
- Changes in the Consortium Agreement;
- Making decisions which were not possible to solve at lower level;
- Developing exploitation strategy;
- Regularly verify the progress of work, the quality of results and their match with the overall project objectives and time scheduling;
- Discuss and validate the periodic progress reports of the project, checking the quality of the work and of the results;
- Discuss general decisions at project level;
- Take necessary actions to adjust, modify, fasten the activity of work packages;
- Organise the dissemination of results, the participation to special events and the presentation for project audits;
- Generally coordinate project activities, so as to meet the envisaged objectives;
- Solve possible conflicts, looking for the widest internal consensus and taking care that project internal rules are respected, including legal and ethical obligations.

The PMB will meet at least twice each year and if possible in conjunction with wider technical meetings of the consortium. In order to assure a continuous monitoring of the project activities, the PC will collect information from all partners about the status of the work and will produce tri-monthly reports on technological progress to identify any potential future problems. Video/tele-conferencing will be used where appropriate to minimize the cost of travel.

B2.1.3. Work Package Leaders

The project is organized as a set of closely related work packages (WP). WP leaders, preferably members of the PMB, are in charge of coordination, planning, monitoring and reporting the tasks within every WP, and for the detailed coordination of the progress of their WP with others. Quality assurance will be performed by back-up WP leaders of other organizations. Trimestral progress summary reports of WP leaders will be prepared in coordination with the back-up leaders before they are sent to the PC. These summaries, together with additional financial progress, will be used by the PC for the compilation of yearly project reports.

B2.1.4. Scientific and Technological Advisor

Prof. Ramiro Neves of IST will be the Scientific & Technological Advisor (SA) - he will be in charge of the technological research direction of the project. The SA will synchronize and coordinate research activities, in compliance with research and innovation objectives defined in this document.

The SA assists the PC and through him cooperates with the WP leaders in steering the project from a scientific and technological point of view. Therefore, his duties include:

- To technically coordinate the project, steering it toward its objectives;
- To prepare decisions about cross-WP technical issues, like development of tools and frameworks;
- To assure a smooth scientific progress of the work through the different phases and WPs;
- To closely cooperate with PC to early identify possible issues, problems and suggest solutions;
- To supervise definition of the details of the WP objectives and work plan;
- In coordination with PC, to review periodic progress reports.

B2.1.5. Advisory Board

The Advisory Board will be a body of high relevance to the project success, following closely the project activities and having the opportunity to express their opinion about the functionalities of the tools in development, to make them fit to “real world” needs.

The Advisory board advises the project consortium but does not have authority to vote on project matters, nor a legal responsibility. The idea is to define a group of experts who have agreed to give to MyWater meaningful help on a regular basis in different areas, including law, scientific, technology, policy, and market analysis.

The Advisory Board advises the consortium in its strategic decision-making process. Sometimes questions will be posed to the whole group; sometimes individual members will be consulted. All actions of the Board shall be transmitted in writing, on a regular basis, to the rest of the consortium.

The selection criteria for the appointed members shall be qualified by close connection with the goals and needs of MyWater. They shall be invited from nominees recommended by the Consortium. During the definition process special attention shall be paid to possible conflicts of interest.

Besides the nominees recommend by the Consortium (3 to 4 persons are foreseen), the REA will also propose one person to represent the EC DG Environment as a member of the Advisory Board.

The Advisory Board should meet at least once a year during the project lifetime, preferably during the annual project meetings, but the contact with the end-users and the project coordination will be permanent. Appointed Board members shall receive no compensation for their services but eligibility for reimbursement of Travel Expenses. The project coordinator shall, to the extent practical, schedule teleconferences and meetings to minimize travel and per diem costs.

For each meeting to be held the project coordinator will submit agenda items to the Advisory Board at least 5 working days prior to a scheduled meeting. The agenda will provide a description of each item to be discussed so that interested members of the board will be capable of understanding the nature of each agenda item.

A description of the generic profiles for the Advisory Board looks as follows:

- Business development. People whose primary responsibility is performing market analysis for proposed feasibility projects. The market analysis includes target market identification, estimating market potential, product positioning, developing marketing strategies and identifying marketing channels. It would be desirable to have experience in evaluating the effectiveness of marketing, promotional campaigns and knowledge of the Water management market and of the EO environment;
- Law and Policies. People with strong knowledge of international laws regarding intellectual property rights as an effective link between R&D and economic exploitation. Experience in the definition of international legal systems for the safeguarding of technological development. Provision of background in appropriate exploitation strategies (e.g. exploitation with partners/via licences). Typical issues to be discussed include procedures for ideas subject to property rights, the framework for right registration, as well as information regarding possible patent infringements and exploitation problems due to international exploitation of the MyWater results;
- Sensing scientists and water applications specialists. People with a strong background in Remote Sensing applications, geography, modelling, water management and considerable experience in all aspects of geo-spatial information and interpretation.

B2.1.6. End-users

My Water end-users include the owners of the catchments studied in the framework of MyWater and organizations potentially interested in the tools to be developed in the project. In Table 2 is presented the contacted end-users that showed interest in the project.

Table 2 - List of contacted end-users that showed interest in the project.

MyWater End-Users	Country
FenaReg	Portugal
ARH-Norte	Portugal
AdeM	Mozambique
ARA-Sul	Mozambique
Agriculture ministry	Greece
Rijnland water board	Netherlands
Cargill	Brazil

FenaReg is the Portuguese National federation of the irrigated farm owners, being an important institution for the dissemination of the project results among Portuguese farmers.

In Portugal mainland, the **Administração da Região Hidrográfica do Norte (ARH – Norte)** in one of the 5 regional water authorities existent. ARH-Norte is the water authority for the northern region, where the Douro catchment is the most important. ARH-Norte is the owner of the Tâmega catchment where the Torrão reservoir is located. This Authority is in charge of implementing the management services and tools required for complying with the national and European water legislation. Presently ARH-Norte is developing the basis for a management plan for the whole region, including the Tâmega sub-catchment. This plan aims at retrieving all the dispersed data relevant for managing water in the region and to set up basic tools for making decisions based on the existing data and knowledge. MyWater will develop new tools, building on partner's knowledge, on project developments and on existing data. The present activities being carried out by ARH-Norte in the catchment guarantee that the consortium will have access to the best existing data and knowledge.

Águas de Mozambique (AdeM) is the user organization for the Umbeluzi test case. AdeM is Águas de Portugal (AdP) subsidiary for water supply to Greater Maputo Area. AdeM mission is to provide drinking water to the population in Mozambique and the disposal of waste water. AdeM operates as an interface between population and the natural resource that is water. Consequently it is highly interested in understanding what can impact water quality and availability to insure public health protection and effectiveness of capital projects to expand the service.

ARA-Sul is the regional water authority for the South of Mozambique. ARA-Sul is structured in four River Basin Management Units, namely Umbeluzi River Basin Management Unit (UGBU) that includes the Maputo basin, Incomati River Basin Management Unit (UGBI), Limpopo River Basin Management Unit (UGBL) and Save River Basin Management Unit (UGBS). ARA-Sul is given full legal powers to manage and dispose of public property related to its responsibilities, namely the Pequenos Libombos dam, that will be addressed in the project.

The Directorate of Planning and Estimation of Soil - Water Resources of the **Greek Ministry of Agriculture** is responsible for the following: i) Sustainability, with the integrated management of soil and water systems' analysis in agriculture, and ii) Incorporation of environmental status and the reliability of agriculture and rural development with water reclamation and soil conservation programmes. In Nestos watershed this user is interested in maintaining sustainable irrigation areas. Water scarcity has been reported after the construction of a hydroelectric power dam. Shallow groundwater level is relatively high. The river delta, downstream of the site, is a wetland of International Importance by the Ramsar Convention, and is included in the Natura 2000 network.

The **Rijnland District Water Control Board** ensures that: i) dunes, dikes and embankments are in good condition so that the land is protected from high water levels (flood defences), ensuring a good quality of open water so that it can be used for recreation, watering cattle and as a habitat for a large variety of plants and animals (water quality); ii) there is sufficient (fresh) water (water management); iii) polluted river, channel and lake beds are cleaned, and that the water provides opportunities for natural development (water management plus). Rijnland is a polder area in the western part of the Netherlands. The area consists of urban and rural parts. The rural parts can be sub-divided into areas committed to horticulture, agriculture, and grass lands. During high rainfall events ground and surface water levels rise and four main pumping stations are operated to prevent flooding. During summer and dry spells, the channelled storage basin is flushed by combined operation of smaller inlets and sluices. Through the use of EO information the Rijnland Water board would like to further improve its understanding of the system, and to improve the hydrological modelling for offline simulation and real-time prediction.

Cargill is an international producer and marketer of food, agricultural, financial and industrial products and services. It is also the main exporter of soya from Brazil. Cargill helps customers succeed through collaboration and innovation, and are committed to sharing global knowledge and experience to help meet economic, environmental and social challenges. Water saving is an important issue for Cargill. For example it has launched a pilot project in the Henan Province of China designed to improve irrigation methods used by farmers in order to save water and increase crop production efficiency.

During the project, end-users will be asked to state their approval of MyWater by providing commitment letters demonstrating their wiliness in continuing using the products developed under MyWater even after the project end.

B2.1.7. Information flows

The information originated from the project may have a technical or administrative nature. Any information flow will be achieved through:

- Organization of internal workshops (including teleconferencing);
- Meetings of WP leaders which will be held as necessary for the technical performance of the MyWater Project;
- Distribution of three-monthly technical progress reports by the Project Coordinator, which are associated to deliverables;
- Use of specific groupware to support collaborative work, including appropriate source code subversion management and document repository;
- As far as administrative and financial issues are concerned, communication and information flow will be achieved through consortium meetings; they will aim to inform all project partners of project progress;
- Distribution of reports by the PC.

B2.1.8. Conflict resolution

A consortium agreement, together with the grant agreement with the EU, will rule relationships between partners. In case of conflicts arising within the consortium regarding the execution of the project or other matters related to the project itself, the following steps will be taken (draft proposal, to be completed with the consortium agreement):

- The parties will try to resolve the conflict issue amicably between them;

- If this attempt fails, the question will be brought to the PC, who can contact core partners (Management Board) of the consortium for consultation and advice. Possible solutions, if any, to resolve the conflict will be prepared by the PC;
- The conflict will be discussed at the first scheduled meeting of the PMB, or in case of urgency, an ad hoc meeting of the PMB will be called for by the PC, upon request of at least two partners;
- The question will be discussed within the PMB, and the PC will try to solve it by consensus;
- If consensus cannot be reached, a vote will take place, according to the rules of conflict resolution of the consortium agreement;
- All these rules, including the voting rules, will be agreed in the consortium agreement signed prior to the project.

B2.1.9. Methods for Monitoring and Reporting Progress

The foreseen procedures and tools for the MyWater Project are the following:

- All formal meetings will be notified at least two weeks in advance. Agenda, proposed resolutions, decisions and supporting documentation will be available to all attendees at least one week before the meeting. Issuing of all documents will be done solely via the chairman (PC) who is responsible for compiling all submissions from partners;
- For all meetings it will be ensured the collection of the relevant facts referred and the respective production of minutes which will be issued within five working days of the completion of the meeting;
- Due to the importance of documentation produced by the project (interim reports, cost statements, working papers and deliverables), the PC will be responsible for maintaining three kinds of libraries: Management Library, Technical Library and Exploitation Library;
- Standard techniques such as Critical Path Analysis and Cash Flow Planning Models will be adopted where appropriate;
- The WP leaders will report on technological progress to the PC every three months;
- The PC will include all relevant information in the three monthly reports, which will include summarized information on technical progress, results obtained and compliance with the work programme and resources;
- The status of the tasks will also be reported in terms of percentage completion and estimated time to complete. Performance in terms of person-months spent and estimated person-months to complete will follow a special reporting schedule;
- All information will be reviewed by the PMB and necessary steps will be suggested if required.

B2.1.10. Meeting Plan

The Table 3 presents the meeting plan for the complete duration of the MyWater project.

Table 3 – Meeting plan.

Meeting number	Meeting name	Expected date (project month)	Meeting Objective
MT0	Project Kick-Off Meeting	T0	Kick-off of project activities
MT1	Intermediate Meeting # 1	T0 + 6 months	Review project progress and approve pending deliverables. Verify completion of Milestone MS2
MT2	Progress Meeting # 1	T0 + 12 months	Review project progress and approve pending deliverables. Verify completion of Milestone MS3, MS4 and MS5
MT3	Intermediate Meeting # 2	T0 + 21 months	Review project progress and approve pending deliverables. Verify completion of Milestones MS6 and MS7 and, hence, approve the “Start of Trials and Evaluations” (Milestone MS8).
MT4	Progress Meeting # 2	T0 + 24 months	Review project progress and approve pending deliverables. Verify completion of Milestones MS9.
MT5	Intermediate Meeting # 3	T0 + 30 months	Review project progress and approve pending deliverables. Verify completion of Milestones MS10. Review Progress of Trials.
MT6	Final Review Meeting	T0 + 36 months	Verify completion of Milestones MS11 and MS12. Approval of project deliverables and close of project activities

B2.2. BENEFICIARIES

The proposed consortium consists of organizations working in the different addressed areas (Table 4): earth observation, meteorology, soil, catchment modelling, and water management information technologies. They are research institutes, universities and SME organizations.

Table 4 - List of MyWater partners and their main scope in the project.

MyWater partners and main scope in the project	Country
GMV (management, data provider, market analysis)	Portugal
IST (development and implementation)	Portugal
IHE (dissemination, training and support and implementation)	Netherlands
HID (development)	Portugal
HR (development)	Netherlands
JRC (data provider)	Italy
CPTEC (data provider)	Brazil
UP (data provider)	Hungary
AUTh (data provider)	Greece
UEM (implementation, data provider)	Mozambique

B2.2.1. GMV

GMVIS SKYSOFT SA (GMV) is an IT company specialized on the development and integration of critical software systems in the areas of Aeronautics, Space, Defence, Security, Transports, and Public Sector; was established as a private Portuguese company in 1998 focusing on advanced technological solutions for the aeronautics and ICT markets and then shortly initiating its first space related activities, even before the accession of Portugal to the European Space Agency. The company's activities have grown since that date, to the point where GMV is the Portuguese entity with highest business volume with ESA.

Integrated within GMV Innovating Solutions in 2005, today the group employs more than 1,000 staff, most of whom work in the Space business (about 550) and have outstanding experience and capabilities; GMV has a staff count of near 100 persons with a solid technological background.

Nowadays, GMV is well known for its successful participation in projects for leading European organizations including the European Space Agency (ESA) (e.g. projects PROMOTE, MARISS, MARCOAST, PYROS), European Commission (EC) (e.g. projects G-MOSAIC, SAFER, CITRINE, ASTRO+, LIMES), European Maritime Safety Agency (EMSA), Galileo Supervisory Authority, EUROCONTROL (e.g. DEMETER), Eumetsat (e.g. LandSAF), among others.

GMV has detailed experience in Earth Observation (EO) including as part of ESA's GMES initiative.

Key persons involved,

Paulo Gomes is currently working as Head of Department in GMV, where he is responsible for around thirty persons working in the Transport and Information and Communication Technology (ICT) domains. He has a long experience in participating and managing R&D projects. Examples are project Active Road Management Assisted by Satellite – ARMAS developed for ESA, where he was project manager, and project Solution Outline for the NIS System – SONIS developed for EMSA, where he was the coordinator from the contractor's (GMV) side.

Sérgio Barbedo is since 2001 Board director of GMV, former Skysoft Portugal. In his long curriculum he has a degree in Civil Engineering, a MSc in National Defence and a MBA. Among his several attributions, Sergio Barbedo is currently responsible for the Marketing Department of GMV.

António Araújo, Biophysics Engineer, MSc in Geographical Information Systems. He has a large experience in remote sensing and GIS on land management. He has worked for about 5 years in the Remote Sensing group of the Portuguese Geographic Institute where he worked in several EO based land characterization projects (e.g. CLC2006, LANDEO, Aquapath, COSMIC). He was responsible for the development of the accuracy assessment strategy for the Portuguese CLC2006 map and the CLC2006 High resolution soil sealing layer. Today he works in the Earth Observation domain in GMV.

B2.2.2. IST

Instituto Superior Técnico (IST), the Engineering School of Lisbon Technical University is Portugal's main Engineering School with about 7000 undergraduate students and 2000 graduate students. Research activities IST are organized into Research Centres and Institutes. MARETEC is IST's multidisciplinary research centre, coordinated by Prof. Ramiro Neves (www.maretec.mohid.com and www.mohid.com). Maretec's main activities are numerical modelling applied to aquatic environmental problems, monitoring and data management.

Maretec's financial resources are consulting services (private and institutional) and research projects. The strategy followed for the past few years led Maretec to consolidate MOHID, a numerical modelling platform (www.mohid.com) covering almost all phases of the water cycle from watershed to river, estuary and finally ocean. The efficiency increase in the applications using this tool made it possible to go one step further and allocate resources to other areas that are complementary to modelling: data acquisition systems and monitoring. Maretec has 16 permanent staff members.

Maretec's expertise in producing downstream services was recently recognised by ESA (European Space Agency). IST was selected to develop Aquapath in Portugal, an application under GMES Service Element (GSE-Land), lead by the German company InfoTerra. The primary objective of the project is to provide the end-users with services that enable a thorough assessment of water quality and quantity within watersheds.

Key persons involved,

Ramiro Neves, PhD, is a professor at IST, he is the Coordinator of a Master course on Modelling of the Marine Environment (integrated into an ERASMUS/SOCRATES European course) and he is a Fluid Mechanics and Modelling teacher. He has been responsible for research projects on estuarine and ocean circulation, wave propagation, sediment transport, water quality and ecological modelling, He is author or co-author of about 50 papers on modelling development and application and he has supervised 4 Ph.D and more than 10 MSc theses.

Gabriel Pita, PhD, is a professor at IST, is a Heat and Mass Transfer and Thermodynamics teacher. He has been responsible for research projects on Energy budgets on different ecosystems. He is the Principal Investigator of the Carbo Europe site of Espirra, where various National and Europeans projects have been developed to measured the Carbon and Water vapour fluxes above an Eucalyptus forest.

Pedro Chambel Leitão, agronomist, MSc, is an Assistant Researcher at IST, Portugal. He has participated in many research and engineering projects (www.ecomanage.info, www.tempqsim.net, www.icrew.info). He is an expert in modelling soil and watershed hydrodynamic and water quality. In soil modelling, he has developed and applied a soil model in the MOHID system and has applied other soil models. In catchment modelling, he focused on the application of SWAT models and he is the main manager of the WQ1.10, which is one of the GSE-Land downstream services.

B2.2.3. HID

Hidromod Modelação em Engenharia Lda (HID) is an SME, established in 1992 as a technologic company in the field of computational modelling of aquatic environments. So far, HID has worked on more than 300 projects, all strongly connected to Hydro-informatics. HID has been one of the greatest supporters of the MOHID system (www.mohid.com), regarding its development, application, tech. support and training. HID has a staff of high educated professionals. From 9 employees, 4 have a Ph.D. degree and 2 an MSc degree. HID is ISO 9001:2000 certified.

HID has already implemented operational systems for environmental risk management, based on its numeric modelling expertise and on the most recent advances in Information Technology (IT). Know-how on data management (from models or measurements) and real-time flows of information (numerical models entry data generation, model running, results validation, reports and publication) exist within HID's team. Recent advances are also coming from industrial projects such as the COWAMA project, financed by Suez Environment, or recent R&D projects (namely, INSEA, EcoManage, Aquastress, SCHEMA in FP6 and LENVIS in FP7). In the framework of the COWAMA project, HID was contracted, after an international bid, to develop a water quality forecast tool, based on a database, a sensor network and models for coastal circulation, waves and urban drainage, for Barcelona and Biarritz. In the framework of INSEA, a fundamental know how was acquired in the fields of downscaling, data assimilation, data management and data analysis that constitute an excellent start for the MyWater activities.

Key persons involved,

Adélio Silva Civil Engineer, PhD, has a large experience in administrative management and numerical modelling. Besides his 16-year experience of managing HID, he has a 20-year experience in developing and applying models to a wide range of problems, such as wave generation and propagation, hydrodynamics, sediment transport and water quality issues. He also has a long experience in participating in R&D projects.

José Chambel Leitão, Civil Engineer, PhD, has 20 years experience in modelling of aquatic systems and in project management. In FP6, he was the deputy coordinator of EcoManage.

Paulo Chambel Leitão, Civil Engineer, MsC, PhD, has large experience in numerical simulation of momentum and mass transport and also biogeochemical processes in marine environments in the framework of research and engineering projects.

Pedro Galvão, MSc, beyond experience regarding numerical modelling, he has advanced knowledge on several programming languages, open source Web GIS technologies and data bases. He was the lead architect of real-time operational systems already deployed by HID.

Henrique Coelho, Oceanographer, MsC, PhD, has 15 years experience in numerical modelling. He participated in numerous R&D projects and teaches under graduate courses of Environment and Oceanography.

B2.2.4. IHE

UNESCO-IHE Institute for Water Education (IHE) is dedicated to research, postgraduate education and training in the fields of water and environment, with over than 13,000 alumni in more than 160 countries. It has 70+ academic staff with a strong research record.

In this project IHE's first task is leading WP 9 Dissemination, training and support. IHE has strong experience in publishing in internation peer-reviewed journals. The dissemination and training will be further enhanced through IHE's international networks, expecially in the case study areas outside Europe. The hydroinformatics core has a wide experience in localised and online tailor-made courses worldwide. As such, IHE will lead the training and support tasks in the case study areas.

The second task of IHE is to develop an innovative integrated modelling and EO analysis approach for water management (WP 5). The Hydroinformatics core has wide experience in data integration as a result of its research in hydrological modelling with EO input data, data-driven modelling and real-time control. Many past and ongoing research projects relate to flood forecasting, early warning and Decision Support Systems (DSS). Past projects include TELEFLEUR, Floodrisk and FLOODsite, and ongoing research projects include Dutch-funded projects "Safety against Flooding" and "Ensemble Flood Forecasting".

Key persons involved,

Prof. **Dimitri Solomatine**, MSc, PhD of Russian Academy of Sciences. Prof. Solomatine is with IHE Institute for Water Education (Delft) from 1990, and from 2006 he is the head of the Hydroinformatics core (chair). His research interests include hydroinformatics, integration of models and remote sensing data, optimization, systems engineering, computational intelligence, decision support, analysis of uncertainty, and knowledge management. He participated in a number of large-scale research projects, including the EU-funded TELEFLEUR, ELTRAMOS, FLOODsite. He has published over 160 papers, chapters in books and conference proceedings. He co-edited several special issues of journals, a book, regularly organizes special sessions on hydroinformatics, and is an associate editor of two international journals. He is the member of International Association of Hydraulic Research (IAHR), IEEE Computational Intelligence Society, and the vice-chairman of the sub-division on Hydro-informatics of the European Geosciences Union.

Ann van Griensven's (MSc, PhD) main research area is hydrological modelling with applications for drought analysis and water-quality management. An important research topic is the relation of modelling and monitoring in which she explored and developed techniques for GIS processing of remote sensing data, model calibration in SWAT, uncertainty analysis and model-based experimental design. Dr van Griensven is also a visiting professor at Laval University, Canada.

Schalk Jan van Andel (MSc, PhD) is lecturer and researcher in hydroinformatics. He has a background in Hydrology, Computational Hydraulics and Water Management. He has been involved in national and international research projects, like the design of innovative flood reduction measures along the Dutch branches of the Rhine and the development of Earth System Models at the Potsdam-Institut für Klimafolgenforschung (PIK). He specialised in the development and application of hydrologic and hydro-dynamic models. His main research interests include Anticipatory Water Management and Flood Forecasting, Early Warning and Control.

PhD researcher will be assigned to the project. The research will have an MSc degree in hydroinformatics or in a related water engineering discipline. The candidate will have experience and affinity with GIS applications, hydrological modelling, and programming. Fluent writing and communication skills in English are a prerequisite.

B2.2.5. HR

HydroLogic Research | Delft (HR) is a research and consultancy hydroinformatics SME, specialised in providing innovative urban water management solutions and services in the European and Middle East markets. Our activities are focused on the major processes and components of the urbanised water environment, such as: water supply and distribution systems, wastewater and storm-water collection and conveyance systems, deltaic water management, and fluvial and pluvial flood simulation, forecasting, warning and real-time control. The applications and services we develop use advances in hydro-informatics such as simulation models, data modelling, remote sensing, GIS-based modelling, risk and uncertainty analysis, artificial intelligence, decision-support systems, web services and mobile information and communication technologies. HydroLogic Research | Delft works in close cooperation with HydroLogic Amersfoort, also an SME (www.hydrologic.com). At present we are involved various EC-funded projects, such as Interreg and FP7 framework-funded projects, among which the LENVIS project, for which HydroLogic is the Project Coordinator (www.lenvis.eu).

Our staff has participated and led several European projects in previous research frameworks (FP5 and FP6). Examples are: ELTRAMOS, HYDROPLAN-EU, TELEFLEUR, FLOWS, OSIRIS, FloodRisk, Flood*Site* and Marie Currie AI4IA project.

Key persons involved,

Slavco Velickov is a chartered Civil Engineer (MA, MSc, PhD) with more than 16 years of research and consultancy experience in the water industry, with specialisation in hydroinformatics: urban flood management, hydrodynamics (2D/3D) and hydrological modelling, water infrastructures and ICT. He managed and worked as a consultant on more than 100 projects internationally: clean water and wastewater projects, hydrodynamic and hydrological modelling studies, urban flood forecasting systems, industrial process plants and facilities, and renewable energy projects. He holds undergraduate and graduate degrees in Civil Hydraulic Engineering with post graduate specialisations in hydroinformatics and business development. He is member of International Association of Hydraulic Research (IAHR), International Water Association (IWA), and International Hydrological Programme (IHP) of UNESCO, and reviewer of several journals.

Arnold Lobbrecht (MSc, PhD) has 22 years of experience in the area of water management and ICT and is specialized in the areas of water-system control. His expertise is further in the area of hydroinformatics and decision support systems (DSS) in particular for flood forecasting and early warning, together with all the underlying subsystems. He got his PhD in the area of operational decision support and control. He has been involved in research, design and development of DSS for various water authorities in The Netherlands and in many other countries. He is also Associate Professor of Hydroinformatics at UNESCO-IHE, where he is leading the Real-Time Control research group and supervising PhD students working in the fields of: anticipatory water management, optimum monitoring networks and, integrated control of urban drainage systems.

Emer. prof. Roland K Price (PhD, MA) was awarded a first in Part II of the Mathematics Tripos at the University of Cambridge in 1963, and subsequently completed Part III of the Mathematics Tripos in 1964. He received a PhD in mathematics at the University of Essex in 1969. He has more than 40 years experience in hydroinformatics in the areas of urban water systems, data-driven modelling and knowledge management. During his career he worked as a consultant, established Wallingford Software in UK, chaired the Hydroinformatics section at IHE in Delft and is currently working as a part-time strategic advisor at HR. He is editor of the Journal of Hydroinformatics (since 1999), fellow of Institute of Mathematics and member of the British Hydrological Society. He has been involved in the life cycle of several EC projects, and becoming a leader in the Delft Cluster large-scale research project.

B2.2.6. JRC

The SOIL Action of the Land Management & Natural Hazards Unit, lead by Luca Montanarella, is a partner of the project. EU policy relevant soil information, from initial field data collection all the way to final reporting is managed by this Action. This can be achieved by using the European Soil Data Centre (ESDAC) as the single soil information focal point. It serves the Commission's needs in negotiating through the EU Institutions the new Thematic Strategy for Soil Protection (COM (2006)231) and the Soil Framework Directive (COM(2006)232) as well as their subsequent implementation in Member States. Advanced modelling techniques and scenario analyses are used to provide soil information to end-users in relation to the major threats to soil identified in the Thematic Strategy for Soil Protection (erosion, decline of organic matter, compaction, salinisation, landslides, sealing, contamination and loss of soil biodiversity). A strong scientific and technical support to the United Nations Convention to Combat Desertification (UNCCD) is provided by promoting the reform of the Committee of Science and Technology (CST) of the UNCCD and by the development of an operational Global Soil Information System (GLOSIS) for the regular assessment of global soil degradation processes. This Action provides a coherent approach to soil data collection and distribution for all different policy areas and initiatives relevant to the EU, while assuring high scientific quality, policy relevance and technical support as needed (see http://eusoil.jrc.it).

The key persons who will be involved in MyWater work in close relation with several hydrological modelling experts (e.g. working in the FLOODS Action) since all belong to the Land Management & Natural Hazards Unit. This link will give an added-value, since the expertise will be naturally transferred if necessary.

Key persons involved,

Gergely Tóth is a Research Scientist at the Joint Research Centre of the European Commission (JRC). His professional experiences include research and project coordination of land evaluation, soil conservation and land use planning, as well as teaching of soil science, land use planning, soil management and soil conservation. His educational background includes a BSc (1994) in Soil Science and Agrochemistry; an MSc (1996) in Environmental Sciences and Policy and post graduate diploma (1997) in Applied Statistics; a PhD (2000) on the field of land evaluation. His professional activities are focused on the formulation, description and assessment, of soil quality under different land use systems and environmental pressures

Kabindra Adhikari has been working at the Joint Research Centre of the European Commission (JRC) since October 2006 as a doctoral researcher. His activity mainly focuses on the monitoring and on the characterization of Soil Moisture status based on soil information, topography and Pedotransfer Functions. K. Adhikari holds a Master degree in soil science and a bachelor's degree in agriculture (soil science).

Iason Diafas is an environmental economist. He joined the Joint Research Centre as a post-doctoral researcher in October of 2008. Prior to this post, he was doing his PhD on economic valuation of forest ecological services. He also holds an MSc degree in Environmental and Resource and an MSc in Environmental Assessment and Evaluation. He obtained his bachelor's degree in Economics. He has also worked as a consultant on the socioeconomic aspects of adaptation to climate change at the secretariat of the United Nations Framework Convention for Climate Change (UNFCCC).

B2.2.7. CPTEC

The CPTEC is the Centre for Weather Forecast and Climatic Analysis, a division of the INPE, the Brazilian National Institute for Space Research. This organization is part of the Brazilian government, and his director is directly subordinated to the Science and Technology Minister. The INPE is a traditional provider of data, software and services for researchers, forecasters and decision makers in Brazil and South America. The institution is a reference for space science, satellite imagery and environmental studies. The CPTEC is an operational and research centre dedicated to meteorology and climatology. In the facilities located at Cachoeira Paulista city, Brazil, are some of the fastest supercomputers used for numerical weather forecast runs in south hemisphere. Indeed, the organization is a pioneer in global and regional numerical weather forecasting in South America and the responsible institution for numerical weather and climatic forecasts for Brazil. It is also one of the 9 institutions in the world that operationally runs a global numerical weather model and is a data-provider for multi-model ensemble for the World Meteorological Organization (WMO) TIGGE project. Several of the INPE´s departments and centers, like the CPTEC, have a variety of valuable datasets. The CPTEC distributes outputs from several numerical models, like the CPTEC global model, ETa and BRAMS regional models for South America, among others.

Key persons involved,

Waldenio Gambi de Almeida, MSc, has a degree in Physics and a MSc in Mechanical Engineering. He has a large experience in informatics and meteorological data processing and systems for data communication and visualization. Currently he is the responsible for the conventional meteorological data processing system in the CPTEC and a member in data representation codes technical commissions at WMO. He also has a key participation in the implantation of the new WMO's Information System (WIS) in South America and in the TIGGE project.

José Antônio Aravéquia, Dr., has a degree in Physics, a Master and a Phd in Meteorology. His main area of expertise is data assimilation for numerical weather forecast. He has experience with the CPTEC models, in special with the regional model, and data assimilation schemes based on kalman filter. At this moment he is the head of the operations division of CPTEC.

José Roberto Rozante, Dr., has a degree in Meteorology, Msc and Phd also in Meteorology. He has extensive experience with the CPTEC regional ETa model. He studied the quality of the weather forecasts from ETa's model over South America, as well the physical processes associated. Presently he is the responsible for the operational runs of the numerical models from CPTEC, where he is the leader of one operational team.

Caio Augusto dos Santos Coelho, Dr., has a degree in Meteorology, Msc and Phd in Meteorology. He has extensive experience in producing long-range (seasonal) forecasts as well as in performing climate prediction analysis and forecast quality assessment. He is the lead investigator of the EUROBRISA project and is currently the leader and responsible for the team in charge of producing numerical seasonal forecasts at CPTEC.

B2.2.8. UP

The University of Pannonia is the leading institution in teaching and research in Agricultural, Environmental Sciences and Information Technology in Hungary. The Georgikon Faculty of the University is the first regular agricultural higher education institution on the Continent of Europe (estabilished in 1797), and it performs extensive international research programs in soil and environmental sciences, land use, plant production as well as agro-informatics. The university has a wide range of graduate and postgraduate courses for international students, as well as established doctoral schools in the different disciplines. The Department of Plant Production and Soil Science has been running several long-term field experiments since the 1960-ies in which the effect of different rates and forms of fertilizers, soil tillage and crop rotation as well as different systems of organic matter and crop residue management can be studied. The department is also in charge of organizing and supervising the National Long-term Field Trial Network. Data base consisted of soil, plant and climatic data from the field experiments and pilote areas is available for research.

Key persons involved,

Dr. András Makó, PhD, is an associate professor in the University of Pannonia at the Department of Plant Production and Soil Science in Keszthely, Hungary. He currently teaches Pedology, Soil Physics and Environmental Soil Science. Current research activities include the measurement and prediction of fluid (water and NAPL) retention of different soils inclusive of the temperature dependence; fluid conductivity measurements inclusive of NAPL conductivity, water and air permeability; sorption and transport of organic vapors in porous media as a function of soil properties. Currently he is participating in the development of Hungarian land evaluation system.

Mrs. Brigitta Tóth is a PhD student at the Department of Plant Production and Soil Science of the University of Pannonia in Keszthely, Hungary. She received her MSc degree in Agri-Environmental Sciences in 2005 from the Szent István University in Gödöllő, Hungary. Her current research field is hydropedology with a focus on the usability of hydrophysical data to predict characteristics of soil water regime. Her employment is foreseen in the MyWater project to carry out research on the relationship between the soil map information and the soil hydrophysical data.

Tamás Hermann has graduated in 2002 as an agronomist at the Department of Land Management, Georgikon Faculty of Agriculture, University of Veszprém. He then studies geoinformatic sciences at the University of West Hungary, College of Geoinformatics since 2003 within the frame of UNIGIS course. He carries out his doctoral research on the field of land evaluation at the Department of Plant Production and Soil Science, Georgikon Faculty of Agriculture, University of Pannonia, Keszthely, Hungary. His professional experiences include research and project coordination of land evaluation, soil conservation and land use planning, as well as teaching.

B2.2.9. AUTh

Project partner AUTh consists of the research teams of two laboratories at the Aristotle University of Thessaloniki (AUTh), Greece: the Laboratory of Remote Sensing and Geographic Information Systems (established in 1991) and the Laboratory of Applied Soil Science (established in 1964). The research focuses on agricultural applications, and in the last decade, also on other fields related to the broader space of natural resources and the environment, since Remote Sensing and GIS are considered inter-scientific sectors. AUTh has been involved in numerous projects on different levels (local to international) in the fields of monitoring, evaluating, and managing natural resources (soil-water-vegetation), and in specific: Monitoring water use with remote sensing; Soil mapping; Evaluation of soil resources pollution and degradation; Site specific management of soil and water resources; Modelling and economic assessment of natural resources degradation; Functional evaluation of soil and terrestrial ecosystems; Management, restoration and rehabilitation of terrestrial ecosystems; Earth Observation techniques for monitoring pressures and environmental impacts; Rural development. AUTh has also developed innovative methods and technologies for soil and water resources mapping. Some of the basic applications are: physiographic analysis, erosion studies, LPIS systems, crop damage assessment, yield prediction, LCLU mapping.

Key persons involved,

Prof. Emeritus Dr. Nikolaos Silleos, is a professor of soil science and remote sensing. He is specialized in agricultural and natural resources monitoring and modelling.

Prof. Dr. Nikolaos Misopolinos, is a professor specialized in soil mapping, soil quality assessment, soil degradation and remediation, and soil-water resources management.

Prof. Dr. George Zalidis, is a professor specialized on soil and water pollution, soil quality and sustainability, soil-water resources management, bioremediation of degraded areas, restoration of wetland ecosystems.

Dr. Thomas Alexandridis, is an agronomist, specialized in water use estimation with remote sensing, monitoring natural and agricultural Land Cover Land Use, Soil Moisture.

Dr. George Bilas, is an agronomist, specialized in soil mapping, soil quality assessment, multi-factorial analysis of soil properties.

Dr. Nikolaos Karapetsas, is an agronomist, specialized in soil mapping, spatial interpolation, GIS, monitoring soil parameters, agricultural remote sensing.

Ms Ines Cherif, is a physics engineer, specialized in modelling natural resources, desertification assessment, and mapping evapotranspiration with remote sensing.

B2.2.10. UEM

The Universidade Eduardo Mondlane (English: Eduardo Mondlane University) is the oldest and largest university in Mozambique. The Universidade Eduardo Mondlane (UEM) is located in Maputo and has about 8,000 students. This University is divided in 14 faculties. Prof. Cugala is part of the Agronomy and Forest faculty. The group of Prof. Cugala has worked in research projects related with agronomy for more than 10 years which resulted in a build-up of local knowledge on soil, plant growth, agriculture practices and river dynamics. These works include ecological status analysis of Umbeluzi river and studies related with Soil, land use, and pasture biomass that were financed by FAO. This University has long collaborated with AdeM which is the user of MyWater in Mozambique.

Key persons involved,

Domingos Ranquene Cugala, PhD, is an assistant Lecturer on Agricultural and Sustainable Pest Management using economically and environmental friendly strategies at the Faculty of Agronomy and Forest Engineering of Eduardo Mondlane University, Maputo- Mozambique. He has been responsible for research projects on Biological control against cereal stem borers. He is author or co-author of about 15 papers on biological control of cereals in Mozambique and he has supervised more than 50 licentiate thesis.

Silvia de Fatima Langa, biologist, MSc in Applied Entomology and is an assistant lecturer on Vertebrate Zoology and Biological control of weeds at Eduardo Mondlane Universidade Maputo- Mozambique. She has participated in research and short courses about biological control of weeds. From 2008 up to data she is doing her PhD on Distribution and impact of aquatic weeds in the southern Mozambique Basin Rivers at Rhodes University (South Africa).

Tomás Fernando Chiconela, PhD, is an assistant Lecturer at the Faculty of Agronomy and Forest Engineering of Eduardo Mondlane University, Maputo- Mozambique. He has participated in a study on Soil, land use, and pasture biomass study, commissioned by FAO. He also has knowledge in Geographic Information Systems that will be useful to take up the technology developed in MyWater. He is author or co-author of about 10 papers and he has supervised more than 10 licentiate thesis.

B2.3. CONSORTIUM AS A WHOLE

A small consortium was chosen having each partner the dominance of an area of expertise important for the project. At the same time consortium has representatives from different regions of Europe, assuring a close proximity with local users and local knowledge. Brazil is also represented in the project due to its relevance in terms of marketing opportunity for water services. In fact Brazil has farming companies with dimension to be interested in water services that generate water savings. An African case study was included in the project has a showcase for users and organizations interested in services in the area. Moreover Africa in general deals with serious problems regarding water availability and therefore it's important to extend efforts to help such underdeveloped regions.

B2.3.1. Role of the Partners In The Project

The consortium is composed with experts from the different areas of expertise required for the service that MyWater intends to implement: satellite data in use for environmental characterization, water modelling, meteorology modelling, and information systems development. For EO data, AUTh will be the partner responsible for leading this task considering is strong experience in deriving data from EO satellite images. AUTh will be supported by GMV, a grater with size and expertise to develop the service chains required.

Also very important for the project outcome is expertise in operational modelling. The operational modelling is of interest to serve user daily needs. Soil is a major input to for estimating ETa with models and is one of the most difficult data to obtain. For operational water modelling IST has the most important curriculum, but HID, IHE and CPTEC also use operational modelling on water services.

Meteorology for the coarser level of the service can be provided by CPTEC to any part of the world. For higher detail a local model can be implemented.

For soil data, JRC has recognized expertise not only in Europe but in several other parts of the world. JRC has experience in collecting, organizing and distributing soil data. JRC also has experience in deriving soil properties using pedotransfer functions. In this task, UP will provide a major contribution

Finally, for dissemination of outcomes of the project IHE has experience in transporting water technology to both developing and developed parts of the world. IHE has strong experience in publishing in international peer-reviewed journals. The dissemination and training will be further enhanced through IHE's international networks, especially in the case study areas outside Europe.

B2.3.2. Sub-Contracting

Currently not applicable.

B2.3.3. Third Parties

The Advisory Board is treated as a third party making available resources to the coordinator (details on the Advisory Board are included in section 2.1.5). A budget of 13.800EUR is foreseen to support travelling costs of the Advisory Board members. This budget is allocated to GMV budget. This budget is intended to support the travelling costs for the meetings of the selected members of the Advisory Board and will include the support of the flight tickets and accommodation on the meeting place.

B2.3.4. Other countries

Currently not applicable.

B2.3.5. Additional Partners

Currently not applicable.

B2.4. RESOURCES TO BE COMMITTED

To make MyWater project a scientific / technological and economic success case, various resources will be mobilized and integrated in a coherent way by the consortium partners with the expected support of the European Commission.

MyWater consortium can rely preferentially on equipment and infrastructure already existent, which can be used within the project. However, in some cases, it may be necessary to purchase some equipment necessary for the work. Each organization will use its resources, including Information and Communications Technologies and domain experts, but mainly their research and development experts. The use of hardware and software laboratories for the testing of the algorithms, prototyping, skilled personnel and dedicated electronics equipment is planned, too.

End-users will make data about their specific problems available, covering specific geographical areas, equipped with monitoring infrastructures, such as urban areas, water basins, agricultural areas, environmental experts, and their experience in daily practices. All partners have the needed pre-existing scientific know-how, that will be made available in the project, including models, environmental and ICT packages.

The project resources will be allocated to human resources expenses, other costs related with travel expenses, the acquisition of equipment (hardware and software) and data, and indirect costs. These costs are distributed in accordance with the different types of activities in the project:

- Management (MGT) - project activities related with all coordination and management aspects, as well as contractual aspects. Scientific coordination is excluded;
- Research and Technological Development (RTD) - all activities directly aimed at creating new knowledge, new technology, and products, including scientific coordination;
- Other activities (OTH) – all other activities such as related with dissemination, training and exploitation studies.

In Figure 21 can be observed the split up of the budget according to the type of activity.

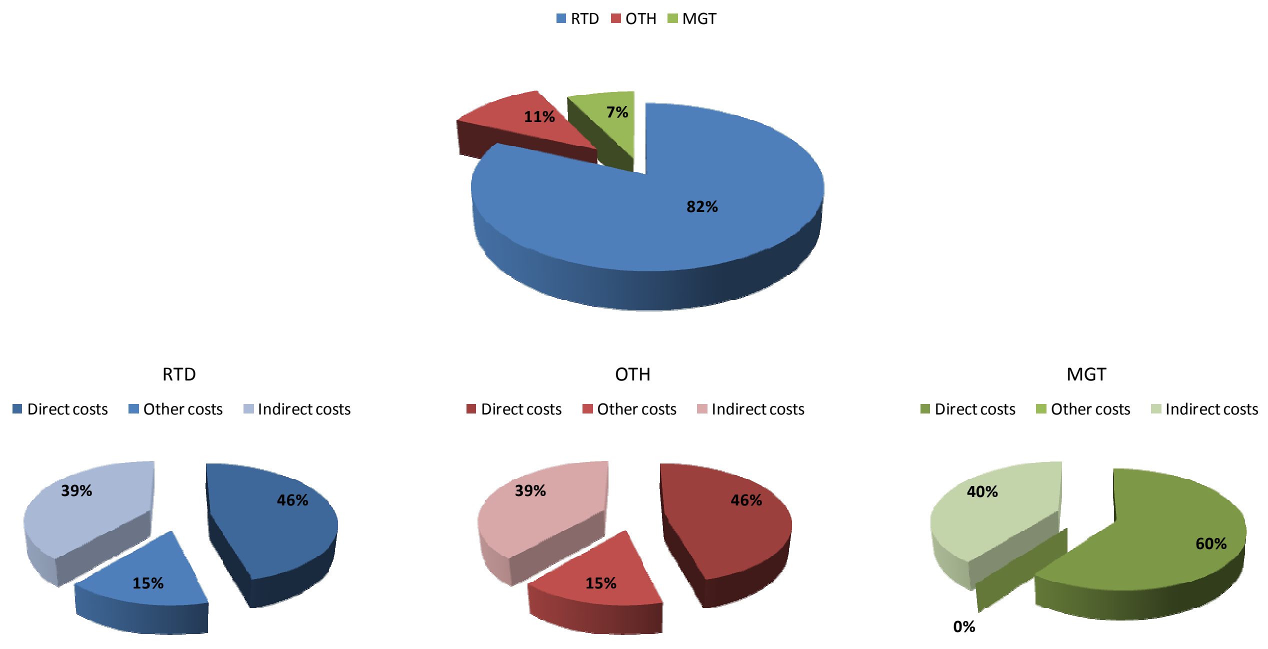

Figure 21 – Budget share per type of activity.

A summary of resources to be committed to the consortium partners is presented in Table 5. A budget breakdown, per type of activity (i.e. RTD and OTH), distinguishing amongst the Other direct costs (i.e. Consumables, Durable equipment, Computing, Travel and subsistence, and Others) and their respective justifications is presented in Table 6.

Table 5 – Resources to be committed (values in euros).

			RTD			OTH			MGT				
Part No	**Participant short name**	**Man Months**	**Direct Personnel Costs**	**Other direct costs**	**Indirect Costs**	**Direct Personnel Costs**	**Other direct costs**	**Indirect Costs**	**Direct Personnel Costs**	**Other direct costs**	**Indirect Costs**	**Total Costs**	**EC contribution**
1	GMV (coordinator)	44,5	105.290,29	9.998,61	67.528,66	26.997,51	13.800,00	17.315,04	107.990,04	0,00	69.260,16	**418.180,31**	**326.771,53**
2	IST	40,5	91.607,57	38.000,00	166.581,35	4.834,17	3.000,00	8.790,57	1.208,54	0,00	2.197,64	**316.219,86**	**242.172,63**
3	HID	53	160.000,00	19.500,00	107.700,00	10.375,00	3.000,00	8.025,00	2.450,00	0,00	1.470,00	**312.520,00**	**240.720,00**
4	IHE	43	32.536,00	83.630,43	30.955,00	65.839,11	24.870,00	63.467,27	4.620,00	0,00	4.444,00	**310.361,81**	**273.581,46**
5	HR	33	206.625,00	27.200,00	140.295,00	29.000,00	8.000,00	22.200,00	3.625,00	0,00	2.175,00	**439.120,00**	**345.590,00**
6	JRC	23	167.343,00	36.585,00	122.356,80	0,00	0,00	0,00	0,00	0,00	0,00	**326.284,80**	**244.713,60**
7	CPTEC	34,5	91.300,00	18.300,00	65.760,00	2.700,00	0,00	1.620,00	1.350,00	0,00	810,00	**181.840,00**	**138.000,00**
8	UP	45	44.750,00	19.125,46	38.325,27	0,00	0,00	0,00	2.100,00	0,00	1.260,00	**105.560,73**	**80.010,55**
9	AUTh	62	169.854,31	93.300,00	157.892,59	3.000,00	0,00	1.800,00	1.500,00	0,00	900,00	**428.246,90**	**322.985,17**
10	UEM	5,5	28.902,27	16.650,00	27.331,36	0,00	0,00	0,00	2.890,23	0,00	1.734,14	**77.508,00**	**59.287,09**
TOTAL		**384**	**1.098.208,44**	**362.289,50**	**924.726,03**	**142.745,79**	**52.670,00**	**123.217,88**	**127.733,81**	**0,00**	**84.250,94**	**2.915.842,40**	**2.273.832,00**

Table 6 – Budget breakdown, per type of activity (i.e. RTD and OTH), distinguishing amongst the Other direct costs (i.e. Consumables, Durable equipment, Computing, Data, Travel and subsistence, and Others) with respective justifications.

		RTD					OTH		
Part No	**Participant short name**	**Durable Equipment**	**Computing**	**Data**	**Travels and subsistence**	**Others**	**Consumables**	**Travels and subsistence**	**Others**
1	GMV				9.998,61 € About 6 travels for GMV to attend to project meetings (e.g. progress meetings).; about 5 travels for GMV to perform field work in the study areas.			13.800,00 € about 12 travels to Europe to bring the Advisory board to at least one meeting per-year.	
2	IST	6.000,00 € Field measurment equipment of LAI and water content.	4.000,00 € Computer and data storage hardware.	4.000,00 € Aquisition of data to run watershed models	24.000,00 € About 20 travels to attend project meetings (e.g. progress meetings). and perform local training actions.		3.000,00 € Training course material.		
3	HID				19.500,00 € 15-20 travels to attend project meetings and perform local training actions.		3.000,00 € Training course material.		
4	IHE		3.000,00 € Computer and data storage hardware.		11.500,00 € Flight tickets (about 5 x 1000 Euro to Africa/South America, about 7 x 500 within Europe) and DSA (about 40 x 75 Euro) for project meetings, case study visits and providing training courses.	69.130,43 € Phd research costs	4.000,00 € Training course material. Flyers.		20.870,00 € Phd research costs
5	HR		15.300,00 € Data centers and servers for hosting MyWater application and model. Purchase of one professional developers license of Microsoft Visual Studio (.NET) package.		11.900,00 € About 10 travels in Europe and to Africa / S. America, average costs 1000 euro, including subsistence costs.			8.000,00 € Travels to present work in conferences.	

Table 6 – Budget breakdown, per type of activity (i.e. RTD and OTH), distinguishing amongst the Other direct costs (i.e. Consumables, Durable equipment, Computing, Data, Travel and subsistence, and Others) with respective justifications. (Continuation)

		RTD					OTH		
Part No	**Participant short name**	**Durable Equipment**	**Computing**	**Data**	**Travels and subsistence**	**Others**	**Consumables**	**Travels and subsistence**	**Others**
6	JRC			20.000,00 € Soil data.	16.585,00 € Mission expenses to study sites for the collection of the needed soil data and information. Travels to attend project meetings (e.g. progress meetings).				
7	CPTEC				18.300,00 € about 10 travels to participate in project meetings (e.g. progress meetings).				
8	UP		5.000,00 € Computer and data storage hardware.	3.000,00 € Costs of field and laboratory study (sample collecting, measuring).	11.125,46 € about 10 travels to participate in project meetings (e.g. progress meetings); local travel (field work).				
9	AUTh	2.400,00 € Field measurment equipment of LAI and soil moisture content.		48.000,00 € Satellite data.	42.900,00 € 15-20 travels to bring at least one member of AUTh to each project meeting (e.g. progress meetings). 15 - 20 travels to perform field work and data collection in the 5 study areas.				
10	UEM	5.000,00 € Field measurment equipment of LAI and water content.	2.000,00 € Computer and data storage hardware.		9.650,00 € About 6 travels to attend project meetings (e.g. progress meetings).				

An important share of the budget is appointed to cover the acquisition of EO satellite data (see preliminary procurement plan in Table 7). Note that the possibility of using data from future satellite missions shall also be evaluated and taken into account to assure the sustainability of the service in the future – it will be analysed the adequacy of the future satellites and sensors, i.e. their technical characteristics, regarding to the development of MyWater Land core data. Examples of such missions are the Sentinels and the Earth Explorers. If the acquisition of EO satellite data will be, in the end, covered by the Data Warehouse or another mechanism, the budget allocated for it will be reallocated to partners. Partners will be able to increase their effort in some WPs to, consequently, be allowed to execute more tasks or to execute the same tasks but with higher accuracies, higher repetition rates, detailed scales, etc. These tasks are identified in Table 8.

Table 7 – Preliminary EO satellite data procurement plan.

Study sites	LCLU	LAI	ETa	Soil moisture
Tamega	Landsat images	12 AVNIR-2 images (6 bi-monthly acquisitions during 12 months)	1 MODIS image each 8 days during 12 months	4 PALSAR images (4 acquisitions during 12 months)
Rijnland	Landsat images	12 AVNIR-2 images (6 bi-monthly acquisitions during 12 months)	1 MODIS image each 8 days during 12 months	4 PALSAR images (4 acquisitions during 12 months)
Nestos	Landsat images	12 AVNIR-2 images (6 bi-monthly acquisitions during 12 months)	1 MODIS image each 8 days during 12 months	4 PALSAR images (4 acquisitions during 12 months)
Pomba	Landsat images	12 AVNIR-2 images (6 bi-monthly acquisitions during 12 months)	1 MODIS image each 8 days during 12 months	4 PALSAR images (4 acquisitions during 12 months)
Umbeluzi	Landsat images	12 AVNIR-2 images (6 bi-monthly acquisitions during 12 months)	1 MODIS image each 8 days during 12 months	4 PALSAR images (4 acquisitions during 12 months)

Table 8 – Budget reallocated to partners, allowing for the execution of the tasks identified.

Part No	Participant short name	Re-allocation value (euros)	Tasks
1	GMV (Coordinator)	8.832,86	1 m/m to WP2 will allow to produce LCLU maps with greater confidence (e.g. more samples will be collected for maps accuracy assessment, more samples will be collected for training classifiers) Remaining reallocation budget will be appointed to travels in order to allow more persons or more travels in field work, etc.
2	IST	5.608,97	1 m/m to WP5 will allow for finer Integration of catchment models with EO based input data (e.g. will be possible to perform more tests)
3	HID	5.550,92	2 m/m in WP7 will allow for the development of a better product (e.g. lesser number of bugs per code line; enhanced customisations and features)
4	IHE	6.749,27	1 m/m to WP5 will allow for finer Integration of catchment models with EO based input data (e.g. will be possible to perform more tests). Also will be possible to prepare attractive course material for WP10, such as instruction (YouTube-like) movies.
5	HR	9.628,34	1 m/m in WP7 will allow for the development of a better product (e.g. lesser number of bugs per code line; enhanced customisations and features)
6	JRC	5.698,12	0,5 m/m in WP1
7	CPTEC	2.392,22	1 m/m in WP3 will allow to produce meteorological forecasts with greater confidence
8	UP	1.049,45	Remaining reallocation budget will be appointed to travels in order to allow more persons or more travels in field work, etc.
9	AUTh	1.822,43	Remaining reallocation budget will be appointed to travels in order to allow more persons or more travels in field work, etc.
10	UEM	667,42	Remaining reallocation budget will be appointed to travels in order to allow more persons or more travels in field work, etc.
	TOTAL	48000,00	

B3. IMPACT

B3.1. STRATEGIC IMPACT

The increasing of water pressures with direct impacts on environment and public health is an important issue at a global level. Being this concern pushed by an increased educated population, by the legal system or by the economical activities (e.g. agriculture, tourism), or even by environmental factors such as droughts and floods, the result is the same: an increased necessity to be able to foreseen in due time and with the most possible accuracy the state of the water (e.g. availability, quality) for the uses to which they are submitted. In case of possible non-conformity, it is of prime importance that the necessary actions may be taken in time to avoid major consequences. This is the case, for instance, of possible pressures over water availability caused by extensive farming and irrigation, that may lead to water shortage for public use. If managed properly, being able to access the necessary information, may give the opportunity to take adequate risk minimization actions.

Moreover, the attention of the public is strongly focused on the environmental quality, and specifically, on the water availability which is today seen as the world future economic driver (instead of the current which is oil). MyWater addresses these needs through the implementation of fitted to user-needs functionalities in terms of operational water information services. The practical result may be a comprehensive alert system, a water availability information service, etc.

In line with these needs MyWater aims at supporting the use of the GMES Core Services to the establishment of local operational systems, capable of sharing the knowledge embedded in heterogeneous data (Core services, local) to provide advanced forecast capabilities (improving the managing capabilities by contributing to reduce the risks, both to the environment and the public health and increasing the degree of preparedness of the end-users in respect to possible natural or man-made risks) and making results available to professional and non-professional users.

As a result MyWater will bring added competitiveness to the companies to whom the MyWater services will be made available by providing them the means to propose services to their clients and a competitive cost which otherwise would not be possible. But MyWater will also bring an increased competitiveness to the Core Services Providers by means of the enlargement of the local companies that will require the use their products and services.

MyWater is though in line with the Call expected impact of to boost the stimulation of the development of GMES services in specific areas in, close collaboration with representative user communities in Europe. MyWater is in line with this goal by involving different partners from Europe that will be effective users and/or suppliers of core data for the services and it is even going further by extending this collaboration to other Non-European countries contributing to the creation of a global market. MyWater is also in line with the work programme expected impacts of being complementary to the Fast Track Services (land core services) and to make the best use of the products they will provide.

B3.2. PLAN FOR THE USE AND DISSEMINATION OF FOREGROUND

MyWater project aims to produce catchments management services and complementary software tools that may help local users to take advantage of the GMES Core Service Products. These tools and services will simplify the operations necessary to get access to the data and the exploitation of local models. Once these two operations are considered major constrains to a wider use of GMES data and models, it is expected that the contributions proposed by MyWater in these fields will significantly contribute to increase the number of users. The service will allow the tools to communicate between them exchanging input and output data.

The target market for these tools is formed by water regulators, water users and farmers' associations. The results that are intended to be provided by MyWater as an added value, in relation to the present situation, are related with improved forecast and/or management capabilities (ex. manage drought effects, irrigation needs forecast, flooding risk forecasting, etc). In this sense MyWater project will create (or increase) the market for 3 different products:

- The web-based data services;
- The MyWater Platform;

- Model implementation support services.

The Web data Service will act as a central access point to the GMES Core Services Data (e.g. MyWater will give access ready to be use to the Landsaf products) and/or to any data that the users of the system wish to make available. Any user connected to this platform can use the Core Services Data and make its own results available for other users, thereby acting as a data provider. The access to each data source may be free of charge or subject to a fee according to the policies of the data providers.

It is expected that the web data service becomes important for a wider community of users (not necessarily only those interested in MyWater platform) and the promotion of the use of this service by the larger possible number of users will be an objective of the project.

The **MyWater Platform** is the main software product of the project and the market action will address it directly. The platform will be supported on the basis of:

- A software licence fee over MyWater platform (issued according the terms of the MyWater Comercial Agreement). This platform will gather a customized interface for access, analysis and extraction of data in proper formats and grids from the web data service and an interface to control the model implementation environment (scheduler, automatic reporting tools, results analysis tools, alert procedures definitions, etc.);
- An annual maintenance fee that will include the tools updates and a support. The cost of the fee will include a block of a number of hours of support. Extra support blocks may be purchased whenever necessary;
- The customized access to the web service data. This service cost will depend of the data providers' policy.

The implementation of local models it is not included in MyWater objectives. The use of the MyWater Platform for model exploitation presumes the previous existence of validated models. Nevertheless, taking in consideration that most of the MyWater target users may not have the necessary skills to implement and validate a model, the MyWater consortium will be available to help the local users in these tasks providing the necessary implementation **supporting services**.

Also, taking in consideration that MyWater products are addressed to a wide community of users, some of them still in a low technological stage, the MyWater **supporting services** will also include knowledge transfer (best practices for instance) and alternative access to know how and data making use of different supports such as the production of printed material that may resume the exploitation of the available data under different local scenarios.

The supporting services may by this way be seen as a subsidiary source of financing. From the point of view of the user, these services assures that they will not be limited by some minor implementation issues and/or they will get specialized support in some specific area to which they don't have trained staff.

In this respect, within the MyWater consortium there are a number of specialists, covering a wide range of knowledge (e.g. hydrodynamic, data assimilation, EO data use and interpretation, water quality, hydrology, risk management, etc) that are ready to provide support in specific issues to any user that is willing to implement an operational system locally. In this context MyWater consortium will assure access to high level information to a large community of potential users, presently not prepared to do all the complex tasks that are necessary to implement and exploit a model and find and retrieve appropriate data in formats that they can easily use.

The next sub-sections will explain in more detail the rationale behind this preliminary approach to the Industrial/Commercial model that will ensure future exploitation of results and how it will be addressed during and after the project.

B3.2.1. Exploitation Strategy

MyWater exploitation strategy is based on the development and implementation of a sustainable business plan that will include the identification of the market to which is intended to provide products and services fitted to the real needs. The evaluated plan is based on the implementation of four logical steps:

- Market identification, definite data and revealing existent and certain needs by segments;
- Target and satisfy segments needs in face of the diversified "products and services" emerging by the project;
- Implement coordinated and specific actions according to each partner business;
- Promote market penetration actions.

The exploitation plan will be carried out in light of a twofold perspective. Globally MyWater consortium, according the terms of the Commercial Agreement, will create a structure to exploit the project results promoting the MyWater solution and services on the global market through a series of agreement with local partners. The plan foresees the covering of different countries potential market by using local competences and preferential relations with the end-users involved. Focus will be given to the countries of residence of the consortium partners, where they have best access to market, and on African and South American countries.

Locally marketing analysis and local reality fitted business plans will define the key elements of the business case for introducing MyWater in different sites. Market sizing work approach and data gathering will be provided to assess the market potential. Moreover, the identification of the investment already available to develop MyWater will allow to assess the attitude of the actual players to be involved in the scheme and possibly to analyse their benefits/drawbacks coming when introducing MyWater's solutions.

In this context the initial step will be to sign the Commercial Agreement between consortium partners that will cover:

- Forms of co-operation among the partners;
- Exploitation royalties between the companies;
- Tools maintenance and evolution;
- Configuration management.

The second step that will be implemented during the project lifetime it is to conduct market analysis in different markets already addressed by the project in order to identify the proper approaches to provide to the local users the products that they need. These markets include both the European high technological prepared companies and institutions and the African low technological level of some companies and institutions (but still needing support for the water management activities).

Analysis

Starting from the review of previous market studies related with water management, the study will provide a realistic and accurate evaluation of earth observation, meteorology and catchment modelling services and a vision of how they could be widespread over time.

Market opportunities and barriers with respect to the developed water management application and its likely development in time will be analysed. The work will take into account fundamental aspects, such as relations with citizens, local authorities, water management authorities, European and national legislation etc. Comments and reactions will be gathered and processed.

The study will also consider specific features of the proposed solution that could have adverse effects on the exploitation of the scheme. Finally marketing strategies targeted to the user groups identified in the scope of the market analysis will be set up and will raise the awareness on the advantages and effects of the proposed concept.

At the end of the project, each partner will provide a clear definition of their possibilities to exploit the results of its, according to the specific activity of each of them (with an special emphasis on those partners acting as potential providers of services and technology in the value chain and those playing the role of adopters of these solutions).

Implementation

The MyWater addressed market will be a universe of data users (trough the implementation of the data management services), a universe of operational models exploitation companies and institutions (trough the MyWater platform) and a universe of support and knowledge transfer to companies and institutions (through the support and training actions).

The costs of the access to the web data service will depend of the data providers' policy but all the efforts will be made to create conditions to provide this service preferentially at no cost especially in regions where this cost may be seen as a major constraint to the use of the MyWater Services and tools.

Although the maintenance of such a service following a no charging policy as a general rule may represent an important effort from the project consortium, from the point of view of the GMES Core Services this will promote its use and enlarge the number of potential users of the available data products. In medium to long term, in face of the level of acceptability of the service and in face of the user needs, other policies may be proposed such as the definition of a fee for extended data services.

This concept of the distribution of an idea or a product at no cost is today accepted itself as a sustainable business strategy (freeconomics). In fact, if the cost of the products and its distribution it is low, it is possible to disseminate them on a gratuity basis, and a good strategy it is first to try to reach the maximum number of users and create a universe of people that know about the product or service. The revenues for the authors may then arrive from selling derived products, such as an improved support service, implementation of the models, or even other products that become visible by the fact they are associated to the same people.

In medium to long term, in face of the level of acceptability of the service and in face of the user needs, it is possible to imagine the emerging of number of possible business around the provision of advanced data services. In our opinion the estimation of a sustainable value for the revenues of such kind of services it is not possible at this moment.

Guess of the order of magnitude of the initial business

Although only a proper market evaluation study, that is being proposed to be developed during the project lifetime, will be able to make more clear how much the potential users are willing to pay for the proposed services and tools and, from these services and tools, which ones are more fitted to the different markets, most of the MyWater consortium partners already have some experience gathered in the framework of other business in the same markets.

According this experience it would be realistic to expect that by the end of the project 30 to 50 users could be interested in acquiring the MyWater platform and during subsequent years at least 15 to 20 licenses per year could be sold.

Assuming € 10,000 as the cost of a license and € 2,000 as the annual maintenance, the MyWater platform can thus generate a cash flow of about € 500.000 by the end of the project (cost of 50 licenses) and around € 200.000 per year in the subsequent years (Table 9).

Based on the present experience the supporting services are estimated to be between 3 and 5 times those values. This would represent a market of the order of € 1.000.000 per year.

As referred the revenues from the Data Services will be considered as having no expression in the first years but it is expectable that in medium to long term, in face of the level of acceptability of the service and in face of the user needs, it is possible to imagine the emerging of number of possible business around the provision of advanced data services. In our opinion the estimation of a sustainable value for the revenues of such kind of services is not possible at this moment.

It is important to refer that this guess is being made taking in consideration only the direct business that it is realistic to be supported by MyWater Consortium. But it is also realistic to guess that in case MyWater approach has success, this will create an enlarged market both for the Core Services Products (by proposing easy ways to retrieve information from the available data that it is a hard operation today) and for the operational models exploitation that will open doors to other consortiums around the world.

Table 9 - Evaluation of the addressed market.

Market Segment	**Direct beneficiaries/ direct end-users**	**Guess maximum size of the expected market to be reached**		**Guess market growth potential over the service life**
		Volume	Value	
Software licenses	Consultancy companies / wastewater utilities, water agencies, water safety agencies, Basin District Managers	50 (in the first year)	500.000 €	20 % / year
Maintenance		50 (in the first year)	100.000 €	20 % / year
Supporting services		30-40	1.000.000 €	10 % / year

B3.2.2. Validation Methodology

This section defines the general methodological framework supporting the validation activities for MyWater. Activities to be carried out are detailed, also providing the logical connection between work packages and deliverables.

According to the work programme expected impact it will be envisaged to establish validated scenarios for services meeting the specific user needs and further insights into the uptake of products.

In line with these goals the validation of the MyWater services and tools will be mainly based on the end-users evaluation. This will allow evaluating the system on the users' satisfaction point of view (considering the system capability in answering the users' requirements), but also on the reliability side, asking the users to provide reports on operative reliability of the system.

Also, in order to guarantee that the market evaluation and that the validation of the acceptance products and services by the end-users follows objective rules a specific Work Package (WP8) was defined where will be included a market and users feedback analysis.

The validation methodology also includes the monitoring procedure, defining the guidelines ruling the communication procedures from the local partners to the WP leader and from the monitoring task co-ordinator to the local partners. More specifically, the process that will be followed and that will be better detailed in following paragraphs can be described in the following phases:

- **Design the test cases:** The local partners will define, in compliance with the project objectives, the acceptability targets of MyWater system and the operational profile of the test cases. The local partners will design the tests cases, based on the MyWater platform;
- **Prepare the test cases:** This step includes the selection of the operational activities. Test cases will be prepared according to real scenarios, involving the specific needs of the local end-users;
- **Run test cases:** Test cases will be run by each local partner after the implementation of MyWater platform;
- **User's feedback:** The users will be called to give its opinion about the products and tools under development. This continuous monitoring from the end-users will allow identifying the global level of satisfaction, but also of understanding the critical points that may affect user acceptance and satisfaction;
- **Assessment:** The opinions expressed by the end-users along the development process will be assessed, in order to be incorporated in the system development if considered relevant. The validation activities will concentrate on the collection of user satisfaction as well as service validation.

B3.2.3. Dissemination Strategy

The dissemination strategy focuses on five types of dissemination activities:

- Publications in international peer-reviewed journals and conferences;
- Flyers;
- Policy briefs;
- Dedicated session in an international conference;
- Specialised courses in the regions of the cases study areas;
- Attractive instruction material (suitable for inclusion in e-learning);
- Website.

Because of the innovations within this project on the enhancement of water management services through novel combinations of EO data and hydrological modelling approaches, it is expected that a number of scientific articles will be published in international peer-reviewed journals.

After two years (two-third) of the project a special session in a prestigious international conference will be organised by the project. For now it is aimed to have a special session in the General Assembly of the European Geophysical Union (EGU 2013, Vienna). The session will attract many speakers from outside the project consortium. This will provide input for the finalising stage (last year) of the project. At the same time the audience with researchers from all over the world in EO and water resources management fields, including those researchers involved in related EU projects and programmes, provides a very good ground for disseminating the MyWater results.

A specialised course for setting up and operating the MyWater services will be developed by IHE with input from all the consortium members. The course will be customised and given (during the project duration) for the three regions of the case studies: Southern Africa, South America and Europe – in Europe we foresee to have the course in Portugal. A special attention shall be given to the lecturing language to be used in the courses. Therefore, lecturers with proficiency in the case studies local languages will be present. For Portuguese speaking countries this can be easily guaranteed by the Portuguese project partners. IHE will draw on its international networks, such as the WaterNet to invite attendees well representing operational water management organisations in the region countries. This aims at the "Mushroom" effect of spreading the results from the local to the regional level.

The course will have a theory introduction part, a large hands-on training section, and inter-active discussion sessions in which regional participants work out potential of the use of MyWater products in their specific case studies. The course expected audience will be of about 20 persons.

Specific components of the course will consist of hands-on computer exercises in the use of the MyWater tools, how to do data analysis and reporting, catchment operational modelling and the ways to use the MyWater products in daily water management.

For these courses and for strengthening the MyWater website, attractive e-learning course material will be developed. This will include animations using state-of-the-art hydrological modelling software.

All the four activities mentioned before, together with the real-time project progress and deliverables will be reported up-to-date at the MyWater website. In this way the website will both provide in a professional reporting of the project results, as well as in the need of providing an attractive portal to potential end-users and the EU citizens.

Given the fact that dissemination is a transversal activity, it will run throughout the project lifetime and mobilise all the consortium partners. However, an increased dissemination process will start right at the end of the project, once the pilot services conclusions are available. Their wide diffusion aims to ease the entrance of earth observation, meteorology and catchment modelling technologies into the mass-market.

Dissemination is also foreseen to the technical community. Other organisations will be approached (e.g. GMES community, etc.) to ensure early notification of expected and intermediate results and validation of specific user requirements.

B3.2.4. Management of Knowledge and Intellectual Property

The rules concerning "knowledge" address its ownership, protection, use and dissemination, as well as the so-called "access rights" to it, while the rules concerning "pre-existing know-how" only cover the "access rights" to it.

According to EC Regulation concerning the participation in FP7 and the dissemination of research results, a participant who carries out work that generates knowledge will own this knowledge. The knowledge capable of industrial or commercial application produced within the MyWater project will be adequately protected by the IPR.

Besides, the dissemination of knowledge, by any appropriate means other than publication resulting from the formalities of protecting it, will be granted if this does not adversely affect its protection or use. The R&D costs for products/components specifically developed inside MyWater will not be charged by one partner to the other partners. A Consortium Agreement will be signed by all partners detailing the rules to be observed in what respects this issue.

Non Disclosure Agreement

Additionally to the Consortium Agreement, specific non discloser agreements are foreseen in the MyWater project for the protection of partner particular knowledge and tools. The need for this type of agreements is justified because partners have to work together, using often tools and knowledge belonging to the background of a specific partner.

Patents

Each new patent developed under the project will be disseminated to the partners. The access to intellectual property rights will be discussed during the Project Management Board meetings. Patents resulting from common foreground of the project will conduct to common patents.

Knowledge sharing

The MyWater web site will be used for internal and external dissemination of document and knowledge. Every project's document from meeting agenda to deliverable will be posted on the server of the project. This server will be organised by subjects, work packages, management of the project, presentations, publications and patents.

B4. ETHICAL ISSUES

MyWater project will make use essentially of environmental monitoring data and there are no expected ethical issues associated with the project activities.

B5. CONSIDERATION OF GENDER ASPECTS

MyWater will take the promotion of gender equality seriously, in particular since female researchers are usually underrepresented in the field of Earth Observation, Information Technologies, modelling and water management.

The different partners composing the MyWater project consortium will ensure that women are informed about the goals and opportunities in the project and are involved at all levels and activities in the project. In this way the MyWater project aims to help women with progressing in their scientific careers and gaining recognition and leading roles in the research communities in their areas.

The participant institutions of MyWater project observe equal opportunity. MyWater consortium aims to guarantee that its present and future staff is selected and treated according to their merit, talent and capacity, without regard to sex, gender, sexual orientation, family or marital status and other circumstances related to family, race, ethnic group, national origin, colour, creed, disability, ideology, trade union membership, economic class or any other non-relevant aspect for adequately carrying out the job required in every case. Participant organizations want to banish all unfair and discriminatory practices, regardless of how and when they occur.

MyWater will take into account the best and most appropriate measurements that ensure the equality of opportunities for both men and women.

The project therefore presents an excellent opportunity to promote gender equality and to encourage young women scientists to embark on research careers.

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