FP7-ENV-2008-1
14-Oct-08

SEVENTH FRAMEWORK PROGRAMME
THEME 6
Environment (including climate change)

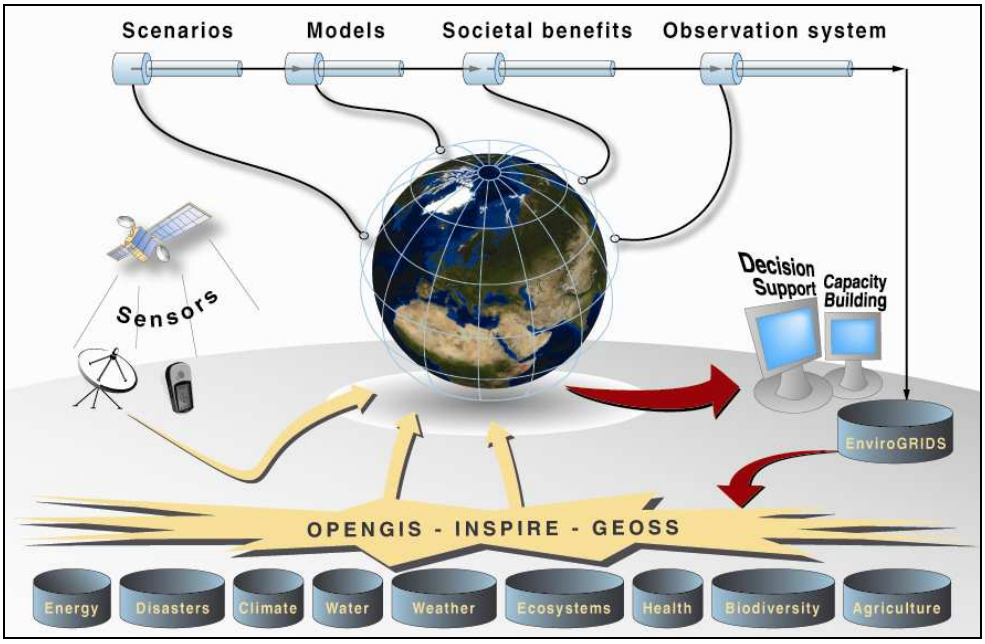
FP7-ENV-2008-1

Annex 1 – Description of Work

EnviroGRIDS

Building Capacity for a Black Sea Catchment Observation and Assessment System supporting Sustainable Development

Grant agreement number: 226740



Date of preparation of Annex 1:
Date of approval of Annex 1 by Commission:

Project coordinator:
Dr. Anthony Lehmann, Anthony.Lehmann@unige.ch, +41 79 815 46 17, fax: +41 22 917 80 29
www.unige.ch/climate

List of beneficiaries:

Nb	Beneficiary name	Short name	Country	Enter	Exit
1	Université de Genève	UNIGE	Switzerland	1	48
2	ArxIT consulting	ARXIT	Switzerland	1	48
3	Melitopol State Pedagogical University and Azov-Black Sea Ornithological Station	AZBOS	Ukraine	1	48
4	Black Sea Commission Against Poluution	BSC PS	Turkey	1	48
5	Black Sea Regional Energy Centre	BSREC	Bulgaria	1	48
6	Czech Centre for Science and Society, partner of United Nations Spatial Data Infrastructure	CCSS	Czech Republic	1	48
7	European Organization for Nuclear Research (CERN)	CERN	Switzerland (Int.)	1	48
8	Advanced Studies, Research and Development in Sardinia	CRS4	Italy	1	48
9	Danube Delta' National Institute for Research and Development	DDNI	Romania	1	48
10	Danube Hydrometeorological Observatory	DHMO	Ukraine	1	48
11	Swiss Federal Institute of Aquatic Science and Technology	EAWAG	Switzerland	1	48
12	Geographic GIS&RS Consulting Center	Geographic	Georgia	1	48
13	Institute of Biology of the Southern Seas	IBSS	Ukraine	1	48
14	Geographical Institute, Romania Academy of Sciences	IGAR	Romania	1	48
15	UNESCO: Institute for Water Education	IHE	The Netherlands (UN)	1	48
16	International Commission for the Protection of the Danube River	ICPDR	Austria	1	48
17	Istanbul Technical University	ITU	Turkey	1	48
18	National Institute of Hydrology and Waters Management	INHGA	Romania	1	48
19	Odessa National I.I. Mechnikov University	ONU	Ukraine	1	48
20	St. Petersburg State University	SPSU	Russian Federation	1	48
21	Soresma n.v.	SORESMA	Belgium	1	48
22	Tavrida National University	TNU	Ukraine	1	48
23	University of Barcelona, European Topic Centre Land Use and Spatial Information supported by the European Environment Agency (EEA)	UAB	Spain	1	48
24	Ukrainian Scientific and Research Institute of Ecological Problems	USRIEP	Ukraine	1	48
25	Technical University of Cluj-Napoca	UTC	Romania	1	48
26	Environmental Protection and Water Management Research Institute	VITUKI	Hungary	1	48

Table of Contents

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

Summary Box

The Black Sea Catchment is internationally known as one of ecologically unsustainable development and inadequate resource management, which has led to severe environmental, social and economic problems. The EnviroGRIDS @ Black Sea Catchment project addresses these issues by bringing several emerging information technologies that are revolutionizing the way we are able to observe our planet. The Group on Earth Observation Systems of Systems (GEOSS) is building a data-driven view of our planet that feeds into models and scenarios to explore our past, present and future. EnviroGRIDS aims at building the capacity of scientist to assemble such a system in the Black Sea Catchment, the capacity of decision-makers to use it, and the capacity of the general public to understand the important environmental, social and economic issues at stake. EnviroGRIDS will particularly target the needs of the Black Sea Commission (BSC) and the International Commission for the Protection of the Danube River (ICPDR) in order to help bridging the gap between science and policy.

EnviroGRIDS @ Black Sea Catchment aims at building capacities in the Black Sea region to use new international standards to gather, store, distribute, analyze, visualize and disseminate crucial information on past, present and future states of this region, in order to assess its sustainability and vulnerability. To achieve its objectives, EnviroGRIDS will build an ultra-modern Grid enabled Spatial Data Infrastructure (GSDI) that will become one of the systems within in the Global Earth Observation System of Systems (GEOSS), compatible with the new EU directive on Infrastructure for Spatial Information in the European Union (INSPIRE) (Fig.1).

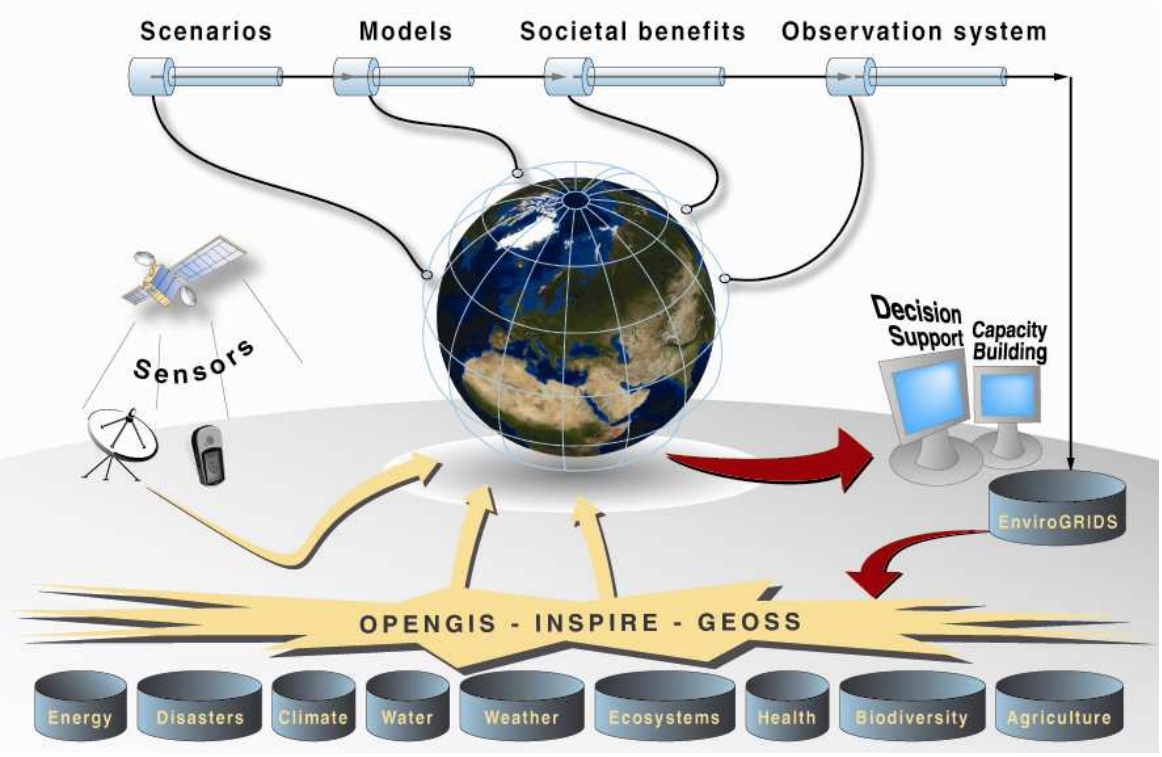


Fig. 1 EnviroGRIDS concept

First, a gap analysis will allow identifying areas where most efforts are needed to reinforce existing observation systems in this region. Then, spatially explicit scenarios of key drivers of changes such as climate, demography and land cover will be created. These scenarios will feed into hydrological models calibrated and validated for the entire Black Sea Catchment. EnviroGRIDS will rely on the largest GRID computing infrastructure in the world (EGEE) that will transform elements of software underpinning scenarios and models onto a grid enabled system. The combined impacts of expected climatic, demographic, land cover and hydrological changes will be measured against GEO Societal Benefit Areas. Specific outcomes will be analyzed and made accessible to both the expert and non-expert public through a state-of-the-art web interface providing advance warning to target audiences about risks. The know-how and results of the project will be made available to countries within the Black Sea Catchment, and to the rest of the world, by providing a free and open source "do-it-yourself toolkit" downloadable from the Internet or provided on DVDs.

Based on the generated outputs, a Uniform Resource Management concept introduced by NaturNet-Redime[1] project will be set up to support sharing of relevant knowledge and regional networking. Targeted workshops and course (both in-person and virtual) will be prepared on key domains. Through the combination of these activities, the consortium will greatly improve data access, use and utility in the Black Sea catchment. It will significantly build local, national and regional capacity on Observation Systems in order to better exchange knowledge and information and guide the region towards more sustainable development.

With its ambitious objectives, EnviroGRIDS will be able to become a contributor to the Global Earth Observation System of Systems (GEO 2005) to help addressing societal benefits such as reducing human exposure to disasters, understanding key environmental factors, improving management of energy resources, understanding, assessing, predicting, mitigating, and adapting to climatic change, improving water resource management and weather information, managing terrestrial, coastal, and marine ecosystems, supporting sustainable agriculture and combating desertification, and conserving biodiversity.

Regional organisations (such as the Black Sea International Commission, or Danube International Commission) and countries will be able to take advantage of EnviroGRIDS to analyse large environmental datasets in a harmonised way in order to support the conceptualization and implementation of environmental and relevant sustainable development policies.

Several of the environmental topics mentioned are clearly related and interdependent. As climatic change is becoming a worldwide concern that will affect many areas of human activities, the last report of the Intergovernmental Panel on Climate Change (IPCC 2007c, a, b) predicts important changes in the coming decades that will not only modify climate patterns in terms of temperature and rainfall, but will also drastically change freshwater resources qualitatively and quantitatively, leading to more floods or droughts in different regions, lower drinking water quality, increased risk of water-borne diseases, or irrigation problems. These changes may trigger socio-economic crises across the globe that need to be addressed well in advance of the events in order to reduce the associated risks.

Indeed, as documented by several assessments, humans are exerting significant impacts on the global water system (GWSP 2005) through activities such as the modification of the hydrological cycle, the accelerated melting of snow and ice in alpine zones, the removal of trees that lead to increased runoff, reduced transpiration, impacts on the water table and landscape salinity, the draining of wetlands, irrigation for agriculture, the alteration of flow through dams, the transfer of water between catchments, and pollution from industrial, agricultural and domestic sources.

The European Community is addressing the crucial problem of water quality and quantity by adopting the Water Framework Directive (CEC 2000) that promotes water management based on watersheds rather than administrative or political boundaries. The aim is to build river catchment management plans that define objectives based on ecological, hydrological and chemical values, as well as protected areas status. River catchment analysis will integrate the analysis of the economic value of water use for stakeholders in order to

[1] http://www.naturnet.org/

understand the cost effectiveness of alternative policy and technical measures. However, despite efforts to date, the vulnerability of different areas of Europe and beyond to climate change remains poorly addressed.

The project will also provide crucial inputs for the development of an integrated European policy of territorial cohesion, linking economic competitiveness (according to the Lisbon strategy, 2000), social cohesion and environmental sustainability (Gothenburg strategy, 2001) in the global perspective described by the Territorial Agenda of the EU (Leipzig summit, 2007). The division of EU policies in separate fields (e.g., transport, environment, trade) introduce the risk of contradictions between separate decision-making at the European, national, regional or local levels. EnviroGRIDS therefore has an exceptional opportunity to demonstrate how major driving forces of change (in particular climatic change) can be analysed in a fully integrated way by means of relevant integrated tools, producing added value for citizens and decision-makers at various territorial levels.

The United Nations has followed a similar pathway and launched the UN Water Program[2] aimed at bringing a greater focus on water-related issues at all levels and on the implementation of water-related programmes in order to achieve the water-related targets in Agenda 21, the Millennium Development Goals (MDGs) and the Johannesburg Plan of Implementation (JPOI).

Given the predominant international concern on water issues related to climate change and the vulnerability of the Black Sea catchment, the EnviroGRIDS project will contribute to build capacity on Observation Systems in this specific region by looking at the impacts of these changes on selected GEO societal benefit areas. It will also provide direct scientific and technological support to the European Water Framework and INSPIRE directives. The methodology that will be developed though EnviroGRIDS will be fully transferable to other regions of the World in the future. The expected outcome is largely ensured by the participating organisations that are experts in different fields and that will bring together the best available data, modelling and communication techniques. The resulting tools and data will allow for the analysis of river catchment pressures and their impacts on human and ecosystem well-being by local stakeholders and decision-makers. These efforts will also help to identify and provide early warning to vulnerable populations and identify the efforts needed to adapt and to limit negative social, economic and environmental impacts in the future. Through several validation projects on different societal benefit areas, our international consortium is expected to promote a wider use and acceptance of new data standards such as those contained in OGC, INSPIRE and GEOSS.

B1.1.2 Justification

The core environmental problem of the Danube River Catchment can be described as “ecologically unsustainable development and inadequate water resources management” (PCU 1999b). The problems are caused by different factors, such as: inadequate management of wastewater/solid waste, ecological unsustainable industrial activities, and inadequate land management and improper agricultural practices. They generate several direct consequences: pollution of surface/groundwater, eutrophication, and accelerated runoff /erosion. These consequences have, on the other hand, the following main effects: decline in quality of life, human health risks, degradation of biodiversity, economic decline, and reduced availability of water.

The Black Sea itself is also affected by severe environmental degradation. In 1995, it was rated with the highest concerns in five out of seven environmental categories, making it the worst of any of the European seas (Stanners and Boudreau 1995). Some signs of recovery have been observed in the last years, but eutrophication remains a severe problem.

The Black Sea Hydrological Catchment (Fig. 2) represents a very interesting case study to test the capacity of integrating large data sets to assess vulnerability and sustainability issues related to freshwater resources as various scales. The project is therefore essentially concentrating on the terrestrial part of the Black Sea Hydrological Catchment, not to be confused with the marine part often considered when using the Black Sea Basin terminology.

[2] http://www.unwater.org

Fig 2. Black Sea Catchment considered in EnviroGRIDS (Map GIWA 2004)

B1.1.3 Scientific and Technical objectives

The scientific aim of the EnviroGRIDS @ Black Sea Catchment project is to start building an observation system that will address several GEO Societal Benefit Areas within a changing climate framework. This system will incorporate a shared information system that operates on the boundary of scientific/technical partners, stakeholders and the public. It will contain an early warning system able to inform in advance decision-makers and the public about risks to human health, biodiversity and ecosystems integrity, agriculture production or energy supply caused by climatic, demographic and land cover changes on a 50-year time horizon.

The generic technical objectives of the EnviroGRIDS project are to:

- run a gap analysis of existing regional observation systems to prepare recommendations for improvement of networks of data acquisition in each region/country,
- build capacity on observation systems in the Black Sea catchment,
- improve regional network to coordinate the efforts of partners active in observation systems
- link, gather, store, manage and distribute key environmental data,
- develop the access to real time data from sensors and satellites,
- create spatially explicit scenarios of key changes in land cover, climate and demography,
- distribute large calculations and datasets on large computer clusters,
- streamline the production of indicators on sustainability and vulnerability of societal benefits,
- provide a standard for integrating data, models and information and communication tools,
- provide policy-makers and citizens with early warning and decision support tools at regional, national and local levels.
- produce innovative tools to visualize and interpret data and results of integrated models,
- alert citizens concerning exposure to environmental risks,
- build capacities in the implementation of many new standards and frameworks (INSPIRE, GEOSS, OGC,..).

B1.2 Progress beyond the state-of-the-art

Summary Box

EnviroGRIDS is clearly going beyond the state of the art in the Black Sea region by adopting a catchment approach and by tackling several societal benefits areas together. By using the most powerful computer network of the world it is clearly showing the direction on how to analyse the increasing amount of global data made available throughout the planet. It is bringing crucial information in a relatively data-poor region on future scenarios of expected climate, demographic and land cover changes. Based on the outputs of these scenarios it is building geoprocessing services in key societal benefits areas that will be connected back to the GEOSS.

Main innovations

- Contribute to free publicly-funded data through interoperable databases and services
- Streamline data process from data warehouses, to scenarios, hydrological models, impacts assessments and finally to disseminations tools.
- Use grid enabled computer technology to store and analyse environment data
- Gridify the code of hydrological model calibration and validation
- Create regional scenarios of development in function of expected climate, land cover and demographic changes
- Build efficient virtual and life trainings on EnviroGRIDS main topics
- Make available useful open source software and data on DVD and on Internet
- Raise public and decision-makers awareness through innovative collaborative systems
- Provide an early warning system to inform the citizens and decision-makers on environmental vulnerability and risks associated to selected Societal Benefit Areas

B1.2.1 International state-of-the-art

Earth Observation Systems:

As we mentioned already, the Group on Earth Observations (GEO) is coordinating the construction of a vast Global Earth Observation System of Systems (GEOSS). GEO was launch in 2002 in order to respond to the increasing demand to bring valuable data from the observation of the earth into the hands of decision-makers that are facing more and more complex environmental, social and economical issues. GEO function like a voluntary partnership, to which the European Commission belongs. It works along a 10-year implementation plan from 2005 to 2015, in which we find the following tasks concerning capacity building; strengthen education, training, research and communication; establish baseline sites for global in situ and remote-sensing networks; develop a capacity building network; facilitate access to data and models, particularly for developing countries. GEOSS is also advocating for an increased sharing of methods for modelling to transform data into useful information, which is exactly what EnviroGRIDS will create with the different projects in all societal benefit areas, and with the help of the largest parallel computing tool in the world. Two years down the track, GEOSS has produced a first report on its first hundred steps where are listed several ongoing initiatives in all nine societal benefits areas (GEO 2007).

Another recent initiative supported by the European Commission is the Global Monitoring for Environment Security (GMES) that aims at bringing data, providers and end users together to improve earth observation largely from remote sensing imagery and networks of sensors. GMES develops for instance projects early warning systems for floods, fire, and pollution. GMES acts also as European contribution to the GEOSS system.

The United Nations Environment Programme (UNEP), in its Global Environment Outlook reports (a different GEO acronym from the one used above; UNEP 2002, 2007) proposed an assessment of the state of

the global environment that would greatly benefit from improved Earth Observation Systems. In this report four different scenarios are proposed. The "Markets First" scenario assumes further globalization and liberalization. In "Policy First", policy measures, regulatory frameworks and planning processes with public institutions are strengthened. "Security First" involves the rise of powerful and wealthy elites with a focus on self-protection against increasing waves of protest. Finally, the "Sustainability First" scenario envisages a new environment and development paradigm that emerges in response to the challenge of sustainability. The IPCC and the GEO scenarios represent excellent platforms to explore alternative futures that our societies are preparing for in the 21st century. The data behind the GEO report can be freely accessed on a web portal[3] that was developed in the coordinating institution of the EnviroGRIDS project. Another relevant initiative by the UNEP/GRID is the PREVIEW[4] project that is monitoring natural disasters to identify risk and human vulnerability to natural hazards in relation with socio-economic and physical factors.

Black Sea Observation Systems

The Black Sea has also a long history of observation systems with for instance the regional Black Sea Global Ocean Observing System (BS-GOOS[5]) funded by UNESCO. Another early project was the Black Sea Ecosystem Processes and Forecasting / Operational Database Management System. The Project was started in 1998 between major marine research institutions in 6 Black Sea countries, with the support of NATO Science for Peace Sub-Programme.

The European Commission funded in the fifth framework a project called Regional Capacity Building and Networking Programme to Upgrade Monitoring and Forecasting Activity in the Black Sea Basin (ARENA)[6]. Another recent European project is the Black Sea Scene[7] that aims at establishing a network of organisations around the Black Sea to improve data exchange and use. Let us cite also here the SESAME[8] project that is studying the impact of expected changes such as climate on both the Mediterranean and Black Sea.

The UNDP, GEF and UNOPS co-funded the Black Sea Ecosystem Recovery Project (BSERP) that aimed at reinforcing the Black Sea Commission and the cooperation between the countries, as well as assessing the environmental status and trend of the Black Sea.

Very recently a new Memorandum of Understanding has been signed on the assessment of the state of the Black Sea marine environment between JRC-IES and the Black Sea Commission.

Even though the EnviroGRIDS @ Black Sea Catchment project will notably extend the geographical extent of these previous projects, it will strive to reuse the development of tools and concepts made earlier as several partners were active in these different projects.

Spatial Data Infrastructure: The European Commission has recently launched a new directive on Infrastructure for Spatial Information (INSPIRE). Spatial data is indeed very heterogeneous in format and quality across the European community and urgent efforts are needed to organize and standardize spatial data to improve its interoperability. Several global initiatives have emerged in recent years, such as the 'Global Monitoring for Environment and Security' (GMES) that aims at bringing data and information providers and users together, to improve environmental and security-related information and make it available to decision-makers. The Global Earth Observation System of Systems (GEOSS) is coordinating existing systems by supporting interoperability, information sharing, improving the understanding of user requirements, and data delivery.

The United Nations are also developing their own system of access to key environment information through a spatial data infrastructure (UNSDI). The concept of SDIs reside in "working smarter, not harder" by re-using data, technical capabilities, skills, intellectual effort and capital, through the sharing the costs of people, technology and infrastructure. SDIs rely on the development of policies, technologies, data, common standards, standard practices, protocols and specifications such as those of the Open GIS Consortium (OGC).

[3] http://geodata.grid.unep.ch
[4] http://www.grid.unep.ch/preview
[5] http://www.ims.metu.edu.tr/Black_Sea_GOOS
[6] http://www.arena-blacksea.net
[7] http://www.blackseascene.net
[8] http://www.sesame-ip.eu

Spatial Data Infrastructure (SDI) is the base collection of technologies, data, human resources, policies, institutional arrangements, and partnerships that enable the availability, exchange of and access to geographically-related information using common practices, protocols, and specifications. SDI consists of a framework that enables users with different mandates and disciplines to operate in a cooperative and cohesive manner to acquire access, retrieve, analyze and disseminate geospatial data and information in an easy and secure way. It particularly helps to improve the efficiency of development, management, use and maintenance of geospatial databases. The governing principles of SDI include:

- Data access and sharing through a decentralized coordination framework
- Interoperability and standardization of tools
- Place-based management
- Portability
- Build once, use many times
- Continuity and sustainability

Large Grid infrastructures like the EGEE Grid are investigating the large scale storage of spatial data in their Grid catalogues and the distribution of sensor data via the storage architecture of the Grid. The collaborative tools of the Grid offer a vast potential for the creation of a common access to data offered by the various data centres and its distributed catalogue technologies can be used to create a federated view of the existing data to allow the users an easy access and overview of the available data. The use of this infrastructure will be largely explored in the enviroGRIDS project.

Sensors: For the integration of between sensors (heterogeneous sensors observation like Earth Observation, digital cameras, meteorological sensors, smart dust technologies) and web environments, web interfaces are being used that are defined by the Open Geospatial Consortium, Inc. (OGC) initiative and called Sensor Web Enablement (SWE). The standards can be divided on encoding and services:

Encoding:

- Observations & Measurements (O&M) - Standard models and XML Schema for encoding observations and measurements from a sensor, both archived and real-time.
- Sensor Model Language (SensorML) - Standard models and XML Schema for describing sensors systems and processes; provides information needed for discovery of sensors, location of sensor observations, processing of low-level sensor observations, and listing of taskable properties.
- Transducer Model Language (TransducerML or TML) - The conceptual model and XML Schema for describing transducers and supporting real-time streaming of data to and from sensor systems.

Services:

- Sensor Observations Service (SOS) - Standard web service interface for requesting, filtering, and retrieving observations and sensor system information. This is the intermediary between a client and an observation repository or near real-time sensor channel
- Sensor Planning Service (SPS) - Standard web service interface for requesting user-driven acquisitions and observations. This is the intermediary between a client and a sensor collection management environment.
- Sensor Alert Service (SAS) - Standard web service interface for publishing and subscribing to alerts from sensors
- Web Notification Services (WNS) - Standard web service interface for asynchronous delivery of messages or alerts from SAS and SPS web services and other elements of service workflows.

European and global water programs: The European Water Directive Framework signed in 2000 is built around the concept of river catchments and has thus stimulated the development of watershed analyses throughout the continent. However, little is known for the moment on the vulnerability of the different

regions from climatic change. The report on Climate Change and the European Water Dimension (Eisenreich 2005) states that the expected changes in climate during the 21st century will have severe impacts on water resources and their use, especially if extreme events such as flood and droughts increase in frequency and severity. This recent European authority recognizes the need to develop regional models of climate change at the river catchment scale to assess the potential impacts on water quality and quantity, and develop adaptation strategies and quantify their associated costs.

The United Nations Water programme is currently collecting global data on water resources and reporting on the state of this resource at the global and regional levels every 3 years (UN 2006). UN-Water is responsible for assessing the status and trends in freshwater at the global and regional levels through the World Water Development Report, which is a comprehensive and authoritative review of the state of the world's freshwater resources. UN-water has also published papers on the risks associated with changes in water resources (UN-Water 2005). The United Nations Environment Programme is active in several projects linking water and environment. First, the UNEP GEMS/Water Programme provides data and information on the state and trends of global inland water quality (GEMS/Water 2007). Another initiative that has been supported by UNEP is the River Basin Information System (RBIS) that provides valuable hydrological statistics per watershed and is now expanding worldwide (Global-RIMS). The Global International Water Assessment (GIWA) is another initiative that was supported by UNEP/GEF and produced regional reports on the state of water resources in several regions of the world comprising the Black Sea (GIWA 2005a,b).

The International Hydrological Programme (IHP) of UNESCO is a scientific programme in water research, water resources management, education and capacity-building. Its first aim is on the impact of climate and human-induced changes on water resources. It is asking questions such as how, when and where human-induced changes, together with weather and climatic extremes, are influencing water resources and its sustainability. As these questions are very complex they require improved analytical techniques.

Finally, the United Nations are also active in the hydrological fields through the World Meteorological Organisation (WMO) and the Global Runoff Database Centre (GRDC) that is a world-wide depository of discharge data and metadata. GRDC is a facilitator between data providers and data users. GRDC is also developing the Global Terrestrial Network for River Discharge (GTN-R) that is a near real-time river discharge data base comprising 400 gauging stations around the world, which accounts for a massive proportion of freshwater fluxes into the oceans.

These European and United Nations initiatives are fully compatible with national and sub-national projects that are needed to address locally the important issues of water resource sustainability and vulnerability. It is clear, however, that water catchments represent a much more useful spatial framework for dealing with these complex transboundary issues.

Trainings, awareness raising and capacity building

Trainings, awareness raising and capacity building will be structured around results from the FP6 project NaturNet-Redime, namely on technologies for sharing of heterogeneous knowledge's through a so called Uniform Resource Management (URM). URM provides a framework in which communities can share information and knowledge trough a uniform description of information and knowledge including common scheme and vocabularies. A schema defines the meaning, characteristics, and relationships of a set of properties, and this may include constraints on potential values and the inheritance of properties from other schemas. The schema specification language is a declarative representation language influenced by ideas from knowledge representation (e.g. semantic nets, frames, predicate logic) as well as database schema specification languages and graph data models.

Multimedia tools will support online lectures given by instructors using video streaming. It is a new set of tools supporting online training without specific technological requirements from students. The integration of these two tools within EnviroGRIDS will open new ways for training and capacity building.

B1.2.2 Technical limitations of existing products, processes and/or services

Gaps in Earth Observation Systems:

As we mentioned in the previous chapter there has been already a lot of efforts to build different Observation Systems around the Black Sea. One of the main limitations of these systems is that they were mainly centred on the countries directly around the Black Sea. It is clear however that the water quality and quantity issues encountered in this region can only be tackled from hydrological catchment perspective. Moreover, the previous global framework did not allow such a global and European integration has is now planned within the GEO and INSPIRE framework. Very little integration of climate, land cover and demographic changes was made and most projects were centred on water quality issues whereas EnviroGRIDS will expand into all the Societal benefit Areas of GEO. Nevertheless, the previous experiences will be used to build the EnviroGRIDS project as much as possible.

Spatial Data Infrastructure: Even though we observe important progress in SDI with for instance the approval of the INSPIRE directive that opens new possibilities for SDI building. Existing SDIs still remain very limited and are usually only based on:

- Portal services (Web Mapping Services (WMS) with limited possibilities of Web Map Context)
- Registry and Discovery Services – metadata and at limited scales (Germany, Czech, Dutch, Spain, Slovakia) catalogue services.

Real data sharing, using for example, Web Feature Services (WFS), Web Coverage Services (WCS) is still not currently implemented for regional or national SDI. This is also a strong limitation for other more advanced services, based on processing of data in Web environments. The current activities leading to the building of Open Web Architecture (OWS 4 and OWS50) test beds has to be extended.

Although, or because, the INSPIRE directive was this year approved and published on 15th May, there exists a strong need for further developments in the area of standardisation. Drafting teams have already prepared draft documents for metadata and data modelling (other drafts are expected very soon). These drafts define basic frameworks for European SDI building, but they now need to be extended to address concrete themes in specific countries. INSPIRE drafting teams are working mainly on a voluntary basis and there is the need for support of these teams trough research projects.

Sensors: The Sensor Web Enablement (SWE) is a unique and revolutionary framework of open standards for exploiting Web-connected sensors and sensor systems of all types: flood gauges, air pollution monitors, stress gauges on bridges, mobile heart monitors, Webcams, satellite-borne earth imaging devices and countless other sensors and sensor systems. SWE presents many opportunities for adding a real-time sensor dimension to the Internet and the Web. This has extraordinary significance for science, environmental monitoring, transportation management, public safety, facility security, disaster management, agricultural and phyto-monitoring, industrial controls, facilities management, and many other domains of activity. The definition and implementation of SWE standards is in its initial phases. Currently only one partial implementation of SWE standards Open Source 52North Feeder Framework is available, which until now does not cover all aspects of SWE specification. There are missing instruments for effective sensor data fusion.

Big gaps also exist between the hardware sensor development community and specialists working in the sectors of SDI building. There exist two independent way of standardisation, where it becomes necessary focus on a combination of both standards to support real “plug and play” techniques for sensor integration.

Enabling GRIDS for E-SciencE (EGEE) is a mature infrastructure hosting a number of different applications. Recently, both the size of the infrastructure and the variety of users is attracting the interest of the environmentalist community.

The first challenge for the EGEE project is to expand in an area where the community is inherently interdisciplinary looking at integrating the power of the EGEE infrastructure with applications ranging from batch processing to quasi real-time data acquisition and correlation. We believe that the deployment

EnviroGRIDS on EGEE will be an innovative stimulus that will demonstrate the potential of GRID technology for observation and decision systems on the environment.

The second challenge is our aim to build around the EGEE GRID a full and sustainable working environment. EnviroGRIDS represents for instance an opportunity to further develop services that EGEE already proposed such as training or user support on an even broader scale. At the end of this project, we expect to have demonstrated a successful integration with EGEE services (and its foreseeable evolution in terms of sustainable infrastructure for Europe).

Sustainability and vulnerability indicators: The development of integrated indicator systems was energized around the world by the introduction of sustainable development as a societal goal in the early nineties. Since then a large and still growing number of countries, municipalities, communities and other entities have started developing indicator systems reflecting their key policy priorities and helping to communicate progress to a wide range of policy audiences and the public (Pintér, Bartelmus and Hardi 2005). While indicator development and use has progressed, the field continues to face critical challenges some of which EnviroGRIDS will directly address. While the development of indicators on multiple scales is by itself a sign of success, it also led to a large and growing diversity of often incompatible indicator approaches. This of course not only constrains comparability of indicators developed in different contexts, but also limits the effectiveness of policy coordination, particularly with regard to policies that cut across multiple jurisdictions, such as EU policies. While core indicator sets have been developed also by many organizations), making these accepted in various local jurisdictions that always face some unique issues is not straightforward.

Another key area of weakness associated with indicator systems is the availability and quality of suitable data. Regardless of jurisdiction, data sets in support of indicators almost without exception have serious data gaps both in the temporal and spatial sense and in terms of data quality. Also, in many cases indicators are still just plain statistical measures without spatial texture. This is helpful when it is enough to communicate trends through simple charts, but it also hides spatial realities that are often critical for understanding the nature of vulnerability and sustainability problems or to identify solutions and policy responses. Although it is a growing area, geospatial information is still rarely used to support indicators. EnviroGRIDS will enable European organizations to add, on a systematic basis, the spatial dimension to indicators, therefore providing far more accurate information on watershed and associated processes. In addition, the system would also provide geospatial information in time series which is critical for understanding the dynamics of most landscape processes. Thirdly, related to the last point, in present practice indicators are typically presented in a retrospective context that is based on historical data. This is helpful when trying to evaluate changes in the past and understanding policy effects and effectiveness in the ex post sense, but does not make use of the potential of indicators to help plan and evaluate policies ex ante. By explicitly connecting historic trends with business as usual and alternative projections using the same indicators, EnviroGRIDS will not only help learning from the past, but also serve as a directly useful tool when developing and evaluating policy options for the future.

Web interfaces: In recent years the progresses in computer simulation and high performance computing have highly extended the possibilities in this field, and have changed the way in which land management systems can operate (CyberSar, 2006). Recent advances in distributed heterogeneous knowledge networks and the experience gained during many European projects, such as the EUMEDGRID project, lead us to conclude that water and environmental management disciplines, largely based on GIS applications and hydrological modelling, might draw a huge benefit from the use of web-based collaborative technologies. In this framework, research can also improve the exchange of good practices with regard to dissemination, training and transfer of knowledge, in agreement with the Environment Action programs. Public and private environmental agencies often interoperate and communicate little, even when solutions require an integrated interdisciplinary approach; this situation leads to higher costs and inefficiencies in the environmental management. The diversity of environmental problems imposes the adoption of a cross-disciplinary approach, only possible through the development of problem solving models based on advanced information technologies, to set up virtual organizations sharing common interests and objectives providing high value-added complex services, accessible from anywhere (Mulino project, 2004). A web-based environment constitutes the ideal terrain for sharing knowledge (data, models, procedures, storage and computing infrastructure) by means of new tools. Client/server applications for data and compute resource virtualization

are the paradigm introduced in the Internet cyberspace by means of Web services to extract meaningful information and render a service to the community. The fact that a tool can be used by decision-maker without particular knowledge in cartography or GIS make possible a wide diffusion of innovative results and offer possibilities of better governance in the decision process.

Capacity building: In the European context E-learning is increasingly adopted as an approach to reach larger audiences against lower costs. At the global level, there are at the moment only a handful of international e-learning programmes in the field of earth observation systems, spatial data infrastructure, climate change and their impact on different societal benefit areas, water resources and river catchment management. There is an immense potential in using e-learning and blending learning that combines e-learning with face-to-face learning (class-room or video-conferences) to extend the EnviroGRIDS expertise within Europe and beyond. This project intends to help filling this gap.

B1.3 S/T methodology and associated work plan

Summary Box

The EnviroGRIDS project is built with careful planning of its timeframe along a data analysis pipeline starting with a gap analysis, the organisation of data collection and storage according to interoperability standards, the creation of scenarios of changes, the calibration of hydrological models, through to the assessment of impacts on selected societal benefit areas. The results of this entire pipeline will feed into the Black Sea Catchment Observation System to provide new regional geo-services to GEOSS.

B1.3.1 Overall strategy and general description

The general organisation of the EnviroGRIDS project is presented below with one management work package, five RTD packages and a dissemination one with clearly identified task and work package leaders and partners.

1. Management (UNIGE)

1. Organisation: Meetings, accounting, project calendar [UNIGE]
2. Publications: Reports to the Commission, organisation of project scientific publications [UNIGE]
3. Communication: Internet website, groupware, and newsletters, institutional and public relations [UNIGE]
4. Financial management [UNIGE]
5. Quality control [UNIGE]
6. Knowledge and intellectual property [UNIGE]
7. Conflict management and ethical issues[UNIGE]

2. Spatial Data Infrastructure (UNIGE)

1. Gap analysis [BSC, ICPDR + Black Sea Catchment partners]
2. Interoperability and data storage [UNIGE, CCSS, CERN, UTC, ArxIT]
3. Sensor data integration [CCSS]
4. Remote sensing data integration [ITU, UNIGE, Geographic]
5. Gridification of data and models [CERN, UTC]
6. Spatial direct servers: Data distribution system between patterns and toward end users. [ArxIT, UNIGE, BSC, ICPDR]

3. Scenarios of change (UAB)

1. Demography: Spatially distributed model of human population and scenarios of expected changes until 2050 [UNIGE]
2. Climate: Regional climatic models and scenarios of expected changes until 2050 [UNIGE, DHMO]
3. Land cover: change models and scenarios of expected changes until 2050 [UAB, ONU, DDNI]
4. Scenarios integration [UAB, UNIGE]

4. Hydrological catchment models (EAWAG)

1. Data collection [NIVHM, DHMO, IHE, USRIEP, ONU, VITUKI, DDNI]
2. Model calibration and validation, sensitivity and uncertainty analyses [EAWAG, IHE, USRIEP, NIVHM, VITUKI]
3. Application of hydrological models under scenarios defined within the project [UTC, EAWAG]

5. Impacts on selected Societal Benefits Areas (ITU)

1. Biodiversity [SPSU, AZBOS, ITU, ONU, TNU, DDNI]
2. Ecosystems [IBSS, AZBOS, ONU, TNU, DDNI]
3. Agriculture [EAWAG, IGAR, ONU]
4. Energy [BSREC, USRIEP, ITU]
5. Health [ITU, TNU]
6. Disasters [SPSU, IGAR, VITUKI, SORESMA]
7. Assessing sustainability and vulnerability (UNIGE, EAWAG)

6. Black Sea Catchment Observation System development (UTC)

1. BSC network of GEO partners [USRIEP, CCSS, UTC + BSC partners]
2. BSC observation system for decision-makers [CRS4, UTC, SORESMA]
3. BSC observation system for citizens [UTC, IHE, INHGA]

7. Dissemination and training (SORESMA)

1. End-user communication and conference (SORESMA)
2. Organisation of workshops and training (IHE , SORESMA, Geographic + all partners)
3. Virtual training center (IHE, UTC)
4. Scientific dissemination (IHE+ all partners)
5. Decision- and policy- makers involvement (ICPDR, BSC PS)

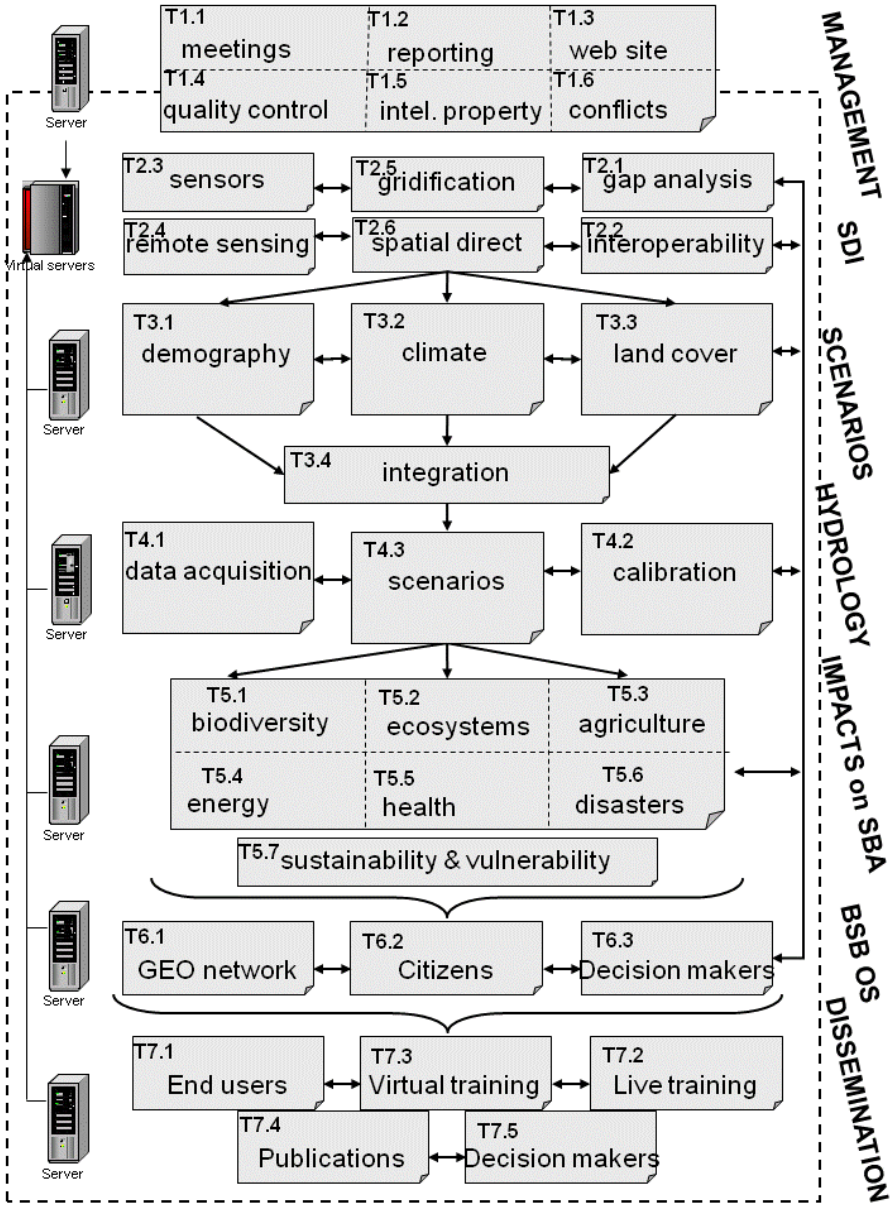
B1.3.2 Timing of work packages and their components

Work packages and tasks	Year1	Year 2	Year 3	Year 4
WP1 Management				
Task 1.1 Meetings				
Task 1.2 Reporting				
Task 1.3 Communication				
Task 1.4 Financial management				
Task 1.5 Quality control				
Task 1.6 Knowledge and intellectual property				
Task 1.7 Conflict management and ethical issues				
WP2 Spatial Data Infrastructure				
Task 2.1 Gap analysis				
Task 2.2 Interoperability and storage				
Task 2.3 Real time sensors				
Task 2.4 Remote sensing data integration				
Task 2.5 Gridification of data and models				
Task 2.6 Spatial direct server				
WP3 Scenarios of change				
Task 3.1 Demography				
Task 3.2 Climate				
Task 3.3 Land cover				
Task 3.4 Scenarios integration				
WP4 Hydrological catchment models				
Task 4.1 Data collection				
Task 4.2 Model calibration and validation, sensitivity and uncertainty analyses				
Task 4.3 Running hydrological models from scenarios				
WP5 Impacts on selected Societal Benefit Areas				
Task 5.1 Biodiversity				
Task 5.2 Ecosystems				
Task 5.3 Agriculture				
Task 5.4 Energy				
Task 5.5 Health				
Task 5.6 Disasters				
Task 5.7 Assessing Sustainability and Vulnerability				
WP6 BSC observation system development				
Task 6.1 BSC network of GEO partners				
Task 6.2 BSC observation system for decision-makers				
Task 6.3 BSC observation system for citizens				
WP7 Dissemination and training				
Task 7.1 End-user communication and conference				
Task 7.2 Organisation of workshops & training				
Task 7.3 Virtual training centre				
Task 7.4 Scientific dissemination				
Task 7.5 Decision- and policy- makers involvement				

B1.3.3 Project flow

EnviroGRIDS is clearly organized in 6 work packages and several specific tasks:

- WP1 is dedicated to the project management and is therefore interacting with all other WPs.
- The scientific work starts with WP2 that is concentrating on organizing the Spatial Data Infrastructure.
- The data prepared and standardized in WP2 flows then into WP3 where several spatially-explicit and dynamic scenarios of land cover, climate and demography changes are processed.
- The outputs of WP3 enter then the next WP where hydrological models are calibrated and validated, and then run according to the newly created scenarios, and gridified onto the EGEE network.
- Outputs from WP 2,3,4 feed then into WP5 on impacts on the sustainability and vulnerability of several GEO societal benefit areas.
- Then, all the results produced by the project are exploited in many different ways in WP6 that aims at developing a Black Sea Catchment Observation Systems.
- Finally, the knowledge and expertise gained during the entire project will be shared during several workshops and training sessions with targeted groups of experts and stakeholders in WP7.



B1.3.4 *EnviroGRIDS work flow and organisation with 7 work packages and several more specific tasks.* Work package list /overview

Work package list

Work package no.	Work package title	Type of activity	Lead beneficiary no	Lead beneficiary short name	Person-months	Start month	End month
1	Project management	MGT	1	UNIGE	24	1	48
2	Spatial data infrastructure	RTD	1	UNIGE	216	1	48
3	Scenarios of changes	RTD	23	UAB	106	1	48
4	Hydrological catchment model	RTD	11	EAWAG	160	1	48
5	Impacts on SBA	RTD	17	ITU	429	1	48
6	BSC Observation System	RTD	25	UTC	272	1	48
7	Dissemination and training	Other	21	SORESMA	107	1	48
	Total				1314		

B1.3.5 Deliverable lists

Del. no.	Deliverable name	WP no.	Indicative person-months	Nature	Diss. level	Delivery date (proj. month)
D.1.1	General assembly meeting reports	1	2	R-Report	PP	1,12,24,36,48
D.1.2	Face to face Project Management Board meeting reports	1	2	R-Report	PP	1,6,12,18,24,30,36,42,48
D.1.3	Internet Project Management Board meeting minutes	1	1	R-Report	PP	3,9,15,21,27,33,39,45
D.1.4	Project web site and forum	1	4	O-Web	PU	1, ongoing
D.1.5	Financial reports	1	2	R-Report	RE	ongoing
D.1.6	Report on conflict management, cultural and gender issues, intellectual property issues	1	2	R-Report	RE	12,36
D.1.7	Quality control reports	1	2+ subcontract	R-Report	RE	20,38
D.1.8	Reports to the Commission	1	9	R-Report	PP	18,36,48
D2.1	Interoperability guideline	2	6	R-Report	PU	3
D2.2	Data storage guideline	2	6	R-Report	PU	3
D2.3	Sensor data use and integration guideline	2	6 + subcontract	R-Report	PU	6
D2.4	Remote sensing data use and integration guideline	2	6	R-Report	PU	6
D2.5	Gap analysis reports	2	12	R-Report	PP	12
D2.6	Technical report and software package of grid services supporting massive data management	2	18	R-Report &Software	PP	18
D2.7	Gridified code and report	2	48	R-Report	PU	24
D2.8	Software package of grid services supporting CWE Portal	2	48	O-Software	PP	24
D2.9	Spatial Data Infrastructure report	2	48	R-Report	PU	24

D3.1	Demographic model inputs	3	6	R-Report	PP	18
D3.2	Climate model inputs	3	6	R-Report	PP	18
D3.3	Land cover model inputs	3	6	R-Report	PP	18
D3.4	Existing scenarios and data compilation	3	18	R-Report	PP	18
D3.5	Proposed demographic scenario	3	20	R-Report	PU	36
D3.6	Proposed climatic scenario	3	20	R-Report	PU	36
D3.7	Proposed land cover scenario	3	20	R-Report	PU	36
D3.8	Outputs from Spatially explicit combined scenarios	3	10	R-Data	PU	36
D4.1	SWAT database and report and data availability and quality	4	32	R-Report & O-Data	PP	18
D4.2	Calibrated high-resolution water quantity and water quality models	4	32	R-Report	PP	24
D4.3	Hydrological model running over the grid and performance optimization	4	32	R-Report	PP	36
D4.4	Package of calibration procedures linked to SWAT	4	32	O-software	PP	36
D4.5	Effect of land use change and climate change	4	32	R-Report	PU	48
D5.1	Analysis of retrospective data AZBOS, IBSS	5	48	O-Data	PP	24
D5.2	Agri-environmental trends, impacts and vulnerabilities	5	24	R-Report	PU	24
D5.3	Priority vulnerability and sustainability issues	5	24	R-Report	PU	24
D5.4	Risk Assessment Toolkit and DSS	5	48	O-Web	PP	36
D5.5	GEPIC specific model runs for whole Black Sea Catchment and for Romania and Ukraine	5	48	R-Report	PP	36
D5.6	Assessment of solar and wind energy, and improved policy for their promotion	5	48	R-Report	PU	36
D5.7	Impacts of water quality and quantity change on public health	5	36	R-Report	PU	36
D5.8	Synthesis of vulnerability and adaptation issues	5	24	R-Report	PU	42
D5.9	Monitoring, final preparation of databases IBSS & AZBOS	5	48	O-Data	PP	48
D5.10	Black Sea Catchment Disaster Early Warning System	5	57 + subcontract	O-Web	PU	48
D5.11	Report on the Biodiversity societal benefit area	5	24	R-Report	PU	48
D6.1	Requirements and specifications for the development of BSCOS Portal	6	24	R-Report	PP	12
D6.2	Report and URM for regional involvement of GEO	6	36	R-Report	PP	24
D6.3	First implementation of the BSCOS portal	6	32	O-Web	PP	24
D6.4	Generic conceptual design of the BSCOS for citizens & Prototype applications of the BSCOS for citizens	6	24	R-Report	PP	24
D6.5	BSCOS EnviroGRIDS SDI supporting description, discovery, and validation	6	36	O-Software	PP	24

D6.6	Guidelines on integration of EnviroGRIDS services	6	12	R-Report	PP	30
D6.7	Inclusion of CWE framework into BSCOS Portal & Tools and applications for citizens through BSCOS Portal	6	24	O-Web	PP	36
D6.8	CWE framework available to the partners to design their own applications & Scenarios of interest run through Web Portal	6	36 + subcontract	O-Web	PP	36
D6.9	Functional prototypes available on the web of BSCOS for citizens	6	66	O-Web	PU	48
D7.1	Flyers on main topics + general flyer on project	7	3 + subcontract	R-Report	PU	9
D7.2	First newsletter and policy briefing	7	3	R-Report	PU	12
D7.3	workshops series 1 (change scenarios, hydrological models, sustainability and vulnerability in SBA, risk assessment and early warning)	7	6	R-Report	RE	18
D7.4	citizens meetings 1 region a,b,c	7	3	R-Report	PU	21
D7.5	Second newsletter and policy briefing	7	6	R-Report	PU	24
D7.6	Workshops series 2 (grid computing, data visualisation, sensors integration)	7	6	R-Report	RE	24
D7.7	The Virtual Training centre off-line operational	7	12	O-Web	PU	24
D7.8	Workshops series 3 (change scenarios, hydrological models, sustainability and vulnerability in SBA, risk assessment and early warning)	7	6	R-Report	RE	30
D7.9	Citizens meeting 2 regions a,b,c	7	6	R-Report	PU	33
D7.10	Policy makers involvement report	7	20	R-Report	PU	36
D7.11	Third newsletter and policy briefing	7	3	R-Report	PU	36
D7.12	The Virtual Training centre on-line	7	12	O-Web	PU	36
D7.13	Workshop series 4 (grid computing, data visualisation, sensors integration)	7	6	R-Report	RE	40
D7.14	Citizens meeting 3 region a,b,c	7	6	R-Report	PU	45
D7.15	Fourth newsletter and policy briefing	7	3	R-Report	PU	48
D7.16	Report on End-conference	7	3	R-Report	PU	48
D7.17	Project “After-Life Plan”	7	3	R-Report	PP	48

PU = Public
PP = Restricted to other programme beneficiaries (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).

B1.3.6 Work package description

Work package no.	1		Starting month	1
Work package title	**Project management**			
Activity type	MGT			
Partic. No.	1			Total
Partic. Short name	UNIGE			
Person-months per beneficiaries	24			24

Summary Box

WP1 Objectives:

- Management and coordination of EnviroGRIDS project.
- Reporting to the Commission.
- Setting internal and external communication tools (Fig 1.1).
- Performing quality control check on project outputs
- Manage project budget
- Manage intellectual property issues
- Moderate potential conflicts and address cultural and gender issues

Figure 1.1 EnviroGRIDS Internet/Intranet site used so far to prepare the project and share info among partners (www.envirogrids.net)

Description of work:

The scientific coordination of the project will be carried out by Dr. Anthony Lehmann (UNIGE-GRID) with the help of a project manager to be hired, and the support of the University of Geneva administration. The teams of the two groups, namely the Climate Change and Climatic Impacts group and the Global Resource Information Database, will also support the management of the project. Together, they will form the management team that will conform to the rules and obligations imposed by the European Commission for all FP7 Large-Scale Integrated Projects. They will help in their mission by the work package leaders. Top decisions will be made in the Project

management Board in which is present a representative of each beneficiary. Further details about the project coordination and management are found in section 2.1.

WP1 is divided in seven tasks under the responsibility of UNIGE beneficiary:

Task 1.1 Meetings (UNIGE) D1.1, D1.2, D1.3

Several scoping meetings took place with Work package leaders in Geneva in June and July 2008, together with face to face meetings between the project coordinator and several partners since June 2008. A kick off meeting will be organized at the start of the project with all partners and the scientists who will work on the project. General assembly meetings will be held once a year and will be aimed at an overview of progress. The EnviroGRIDS Management Board will meet twice a year. One of the meetings will coincide with the annual General Assemblies. All meetings will be broadcasted on the web.

In addition to face-to-face meetings, video or phone conferences via the Internet will be organized every three months to discuss the project advancement within the Project Management Board (PMB) composed of Work Package Leaders, the project coordinator and the project manager. Decisions will be made according to the majority of the votes.

Meetings are expected to take place at the following places:

- Kick off meeting, UNIGE, CERN, Geneva, Switzerland (MONTH 1)
- WP leader meetings, CCSS, Prague, Czech Republic (MONTH 6)
- Full project meeting, DDNI, Tulcea, Romania (MONTH 12)
- WP leader meetings, SORESMA, Ghent, Belgium (MONTH 18)
- Full project meeting, IHE-UNESCO, Delft, Netherlands (MONTH 24)
- WP leader meetings, UAB, Barcelona, Spain (MONTH 30)
- Full project meeting, BSREC, Sofia, Bulgaria (MONTH 36)
- WP leader meetings, IBSS, Sevastopol, Ukraine (MONTH 42)
- Closure meeting, ITU, BSC PS, Istanbul, Turkey (MONTH 48)

The costs of the meetings will be partially covered by registration fees paid by each participant.

Task 1.2: Reporting (UNIGE) D.1.8

Reporting will take place according to the guidelines as stipulated by the Commission. A short, summary-type report will be provided each 6 months, and the full annual report will intervene at the end of each year of activity. Minutes of PMB meetings will be prepared.

Task 1.3: Web site (UNIGE) D1.4

Internal and external communication about the project will be based on web services. A collaborative groupware system was already started to guarantee internal exchange of data, documents and information (Fig. 1.1). An interactive web site will then be develop to present the project to a larger public and possible end-users such as international organisations, national governments and local authorities in collaboration. This task is also about coordinating the different initiatives to communicate about the project via the Internet, especially in WP6 and WP7. This task will also set up a discussion forum.

Task 1.4: Financial management (UNIGE) D1.5

The management team will supervise the project budget in close collaboration with the University of Geneva administration and its Euresearch contact point that has a long experience of dealing with European projects.

Task 1.5: Quality control (UNIGE) D1.7

The quality control of the system will consist on a regular update and revision of the work plan to ensure that each task and outcome targeted in the initial plan will be achieved in the deadlines indicated. The Project Coordinator and the management team will take in charge this task.

Quality procedures for each project deliverable, each beneficiary has to provide a specific contribution according to the project Work Plan and the list of deliverables. Each beneficiary should apply his individual Quality Procedures in order to self-assess his own contribution.

For the major Deliverables of public dissemination type, a review procedure with the following steps will be adopted: release by the WP leader to the project partners, two-week review period for comments, two-week amendment period to incorporate recommendations, one-week balloting period for approval by the PMB.

To realise all the outcomes described in this work package and to ensure a high quality level of results and products, the Project Management Board will hire an external consultant that will organize a Quality Assurance Scientific Committee (QASC) that will manage the evaluation of the project activities. The project evaluation will be taken in charge by an external organisation that will have to produce two interim reports to assess the project activities and deliverables, the quality of the management, and the final products.

Task 1.6: Knowledge and intellectual property issues (UNIGE) D1.6

The issue of Intellectual Property Rights (IPR) will be governed by the appropriate EU, United Nations and national regulations pertaining to intellectual property in the individual partner countries. Furthermore, all partners are members of larger research organizations and universities that have built considerable experience with protecting IPR and the exploitation of knowledge. Potential issues will be managed mainly by the partners themselves and if some conflicts appear between partners or outside of the consortium they will be addressed by the Project Management Board (PMB) during regular meetings.

In order to smoothly implement the knowledge and IPR EU directives, a special session covering IPR issues will be organized in the kick-off meeting and all partners will be requested to file within three months the register of background pre-existing know-how. Any particular pieces of pre-existing know-how that will be excluded from access rights to other beneficiaries should be explicitly stated at this stage.

Concerning a potential misuse of web-based services offered by the project to the public, all actions to secure the service will be taken.

This task is therefore mainly about coordinating the publications prepared by the different partners by keeping a list on the Internet that the partners can edit. The same system will allow the partners to announce the participation to conferences in which they will present EnviroGRIDS results. These lists will be reviewed during WP meetings and propositions for improvements will be made.

A crucial issue a project like this one is the data access. Here, EnviroGRIDS will distinguish several types of data: a) publicly available connected to GEO, b) available to project partners only, c) privately owned by partners, d) privately owned by third party and used with specific agreement. However, outputs from EnviroGRIDS models should be made publicly available even if some of the source data is not.

Furthermore, the consortium will apply the special clause 29 applicable to the FP7 model grant agreement on access rights to foregrounds for policy purposes and transfer of ownership of foregrounds, which is specific to environment research:

1. The Project should ensure that protocols and plans for data collection and storage are in line with Community Data Policy.
2. The Community Institutions and Bodies shall enjoy access rights to foreground for the purpose of developing, implementing and monitoring environmental policies. Such access rights shall be granted by the beneficiary concerned on a royalty-free basis.

3. Where foreground will no longer be used by the beneficiary nor transferred, the beneficiary concerned will inform the Commission. In such case, the Commission may request the transfer of ownership of such foreground to the Community. Such transfer shall be made free of charge and without restrictions on use and dissemination.

Task 1.7: Conflict management, cultural and gender issues (UNIGE) D1.6

Cases of conflicts, cultural or gender issues will be discussed during Project Management Board (PMB) meetings where Work Package Leaders will have one vote each. Decisions will be made according to the majority of votes.

WP 1 Deliverables (Month due) [responsible beneficiary]
D.1.1 General assembly meeting reports (Months 1,12,24,36,44) [UNIGE]
D.1.2 Face to face Management Board meeting reports (Months 1,6,12,18,24,30,36,44) [UNIGE]
D.1.3 Internet Project Management Board meeting minutes (Every two months) [UNIGE]
D.1.4 Project web site and discussion forum (Months 1, ongoing) [UNIGE]
D.1.5 Financial reports (ongoing) [UNIGE]
D.1.6 Report on conflict management, cultural and gender issues (Months 12,36) [UNIGE]
D.1.7 Quality control reports (Months 20,38) [subcontract]
D.1.8 Reports to the Commission (Months 18,38,48) [UNIGE]

Work package no.	**2**					**Starting month**					**1**
Work package title	**Spatial Data Infrastructure**										
Activity type	**RTD**										
Partic. No.	**1**	**6**	**7**	**17**	**2**	**12**	**25**	**4**	**16**	**8**	**15**	**Tot**
Partic. Short name	**UNIGE**	**CCSS**	**CERN**	**ITU**	**ArxIT**	**Geographic**	**UTC**	**BSC PS**	**ICPDR**	**CRS4**	**IHE**	
Person-months per beneficiaries	**30**	**30**	**36**	**24**	**24**	**18**	**16**	**18**	**12**	**4**	**4**	**216**

Summary Box

WP2 Objectives:

- Perform a gap analysis on Observations Systems in the Black Sea Catchment
- Specify interoperability standards to be used in the project
- Gather, format and organize environmental data necessary to run models
- Integrate remote sensing and sensor data
- Gridify code of hydrological data and models
- Build a Grid enabled Spatial Data Infrastructure compatible with GEOSS, INSPIRE and UNSDI (Fig. 2.1)

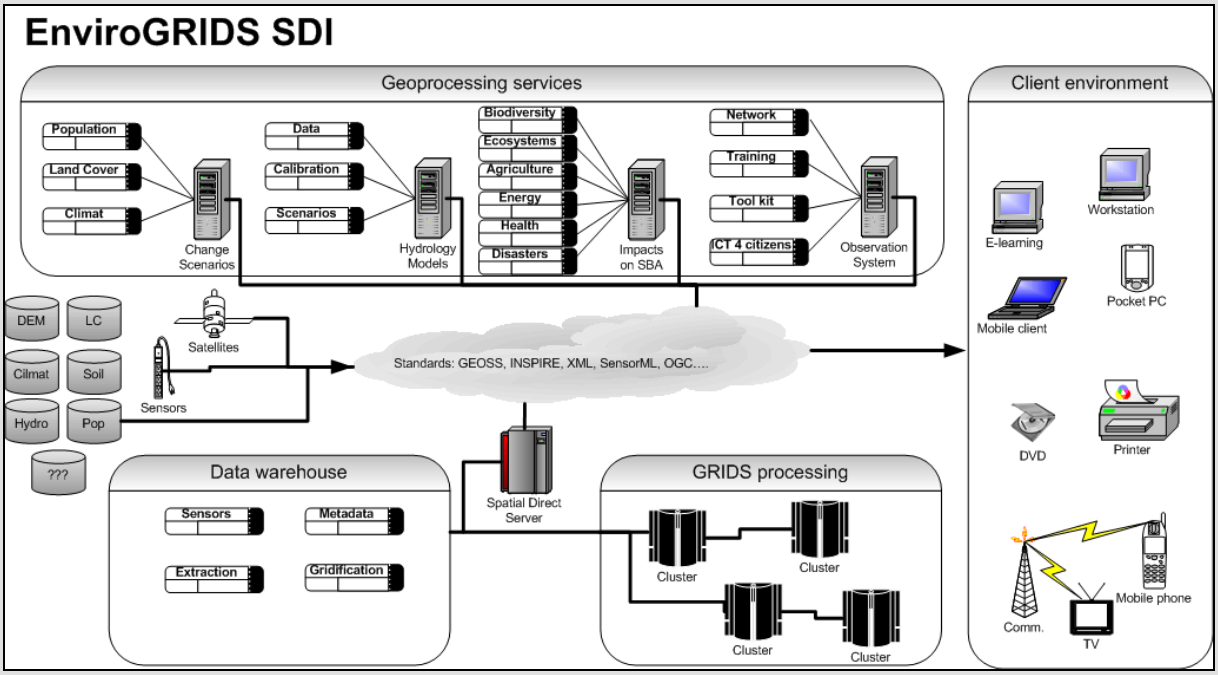


Figure 2.1. EnviroGRIDS Grid enabled Spatial Data Infrastructure (GSDI).

WP2 Description of work:

The aim of this WP is to create a Grid enabled Spatial Data Infrastructure (GSDI) so that the data necessary for the assessment of GEO Societal Benefit Areas, as well as the data produced within the project can be gathered and stored in an organized form on the Grid infrastructure and distributed across the Grid in order to provide a high performance and reliable access through standardized interfaces. Using the standardized technologies of the Grid we can provide a Single Information Space for environmental data in the Black Sea Catchment.

First a gap analysis will be made by all partners to analyse the state of development of SDI in the different countries within the Black Sea Catchment under the supervision of BSC PS and ICPDR partners.

The proposed grid enabled system will require the creation of a Spatial Direct interface to load and download spatial data in different format and projections. Partners will therefore be able to make available existing sources of data more or less publicly available (e.g. historical climate data or geographic information), or newly collected data from sensors and satellites. This system will be fully compatible will development made on interoperability standards such as INSPIRE, GEOSS, UNSDI, OGC, SensorML or TML. The existing mechanisms of the Grid can then be used to replicate and distribute the data from source sites to other data centres to improve the availability but also the access performance.

We intend to base our work firmly on the experience that the EGEE project (and in particular its beneficiary CERN) has acquired in similar projects, but with non-geographic data (e.g. biomedical data). CERN also collaborated with UNOSAT to store satellite images and geographic metadata on the Grid. In particular, CERN has been providing the AMGA metadata catalogue as part of the gLite middleware of the EGEE project that allows access on the Grid to databases storing GIS information. We intend to adapt this catalogue and its extensive replication and federation features to provide a unified view of all available metadata.

EnviroGRIDS GSDI will allow also distributing intensive calculations such as those needed for hydrological modelling and calibrations on the largest computer network of the world.

WP2 is divided in six tasks under the supervision of UNIGE beneficiary:

Task 2.1 GAP analysis (BSC, ICPDR + Black Sea Catchment partners) D2.5

The aim of the gap analysis is to establish the list of existing observation systems within the Black Sea Catchment and to assess their level of compatibility with the INSPIRE and GEO standards of interoperability. Here all partners will be asked to contribute to gather within their area of activity from local, national to regional scales. The task leader will organize this information on an internet web page linked to the EnviroGRIDS project and working interactively with all partners. The aim is also to identify projects and new partners that could contribute to address priority gaps in the activity of the BSC PS and ICPDR. In addition to a budget set apart within the project, co-financing will be searched to allow the integration of new partners according to the results of this gap analysis.

Task 2.2: Interoperability and data storage (UNIGE, CERN, CCSS, UTC, ArxIT) D2.1, D2.2

Interoperability

The societal benefits of Earth observations cannot be achieved without data sharing. EnviroGRIDS will therefore apply the following GEOSS data sharing principles:

- There will be full and open exchange of data, metadata, and products shared within GEOSS, recognizing relevant international instruments and national policies and legislation.
- All shared data, metadata, and products will be made available with minimum time delay and at minimum cost.
- All shared data, metadata, and products free of charge or no more than cost of reproduction will be encouraged for research and education.

In order to develop observation systems it is crucial to agree on relevant standards to describe, merge as well as disseminate distributed information. This is what it is proposed here through the exploitation of geospatial standards like OGC and ISO.

EnviroGRIDS metadata and data standards will also be coordinated and aligned with GEOSS standards, which are currently under development.

As outlined in the GEO 2007-2009 Work Plan, the relevant GEOSS Tasks for EnviroGRIDS are:

- DA-06-02: GEOSS Quality Assurance Strategy. This Task pertains to developing a data quality assurance strategy, beginning with space-based observations, then expanding to encompass in-situ observations, taking account of existing work in this area.
- DA-06-05: Guidance Document for Basic Geographic Data. This Task will develop a guidance document for basic geographic data (including format, precision, accuracy, etc.), taking into account relevant national, regional, and global initiatives.
- DA-07-01; DEM Interoperability. This Task has the purpose to facilitate interoperability among Digital Elevation Model (DEM) data sets with the goal of producing a global, coordinated, and integrated DEM. This DEM database should be embedded into a consistent, high accuracy, and long term stable geodetic reference frame for Earth observation.
- DA-07-06: Data Integration and Analysis System. It is expected that there will be a large increase in the volume of Earth Observation data. In addition to distributed data archives and integration system, data management facilities will be used for diverse and large-volume Earth Observation data from inhomogeneous information sources in cooperation with existing data centres. This Task is to coordinate data management approaches that encompass a broad perspective of the observation data life cycle, from input through processing, archiving, and dissemination, including reprocessing, analysis and visualization of large volumes and diverse type of data.

The European directive on “Infrastructure for Spatial Information in the European Community” (INSPIRE) is a major milestone for the use of Geographical Information in Europe as a central contribution to environmental policy and sustainable development. The directive is a legal agreement that encourages European countries to have: up-to-date metadata using identified themes lists and numbers of attributes, interoperability for dataset and services, facilitation of network access and sharing of data. EnviroGRIDS will therefore be built around the INSPIRE directive to guarantee full compatibility among European and International Cooperation Partner Countries (ICPC).

The main standards that will be used are OGC and ISO 19115/19139. The Open Geospatial Consortium (OGC) is a non-profit, international, voluntary consensus standards organization that is leading the development of standards for geospatial and location based services. The consortium is constituted by 350 companies, government agencies and universities participating in a consensus process to develop publicly available interface specifications. OpenGIS® Specifications support interoperable solutions that "geo-enable" the Web, wireless and location-based services, and mainstream IT. The specifications empower technology developers to make complex spatial information and services accessible and useful with all kinds of applications.[9]

Published in May 2003, ISO 19115 is the most widely used international standard for describing geographic information and services. It provides information about the identification, the extent, the quality, the spatial and temporal schema, spatial reference, and distribution of digital geographic data. It is applicable to cataloguing of datasets and clearinghouse activities. As well as geographic datasets, dataset series, individual

[9] http://www.opengeospatial.org/ogc

geographic features and feature properties, the standard can be extended to fit specialized needs (description of statistics, documents e.g.). ISO 19139 is the standard that aims to define an XML encoding (XML schema implementation) for the metadata elements defined in ISO 19115. [10]

In the context of INSPIRE, a survey done in 2006 showed that a majority of the European countries were using ISO standards (19139, 19115). The use of this standard is growing year after year. For instance, the current world leader of GIS software ESRI proposes in its ArcGIS package a module called ArcCatalog which allows since 2006 the management of ISO 19115 compliant metadata. Tailored Visual basic metadata editor using ArcCatalog dll can be also used or developed.

The INSPIRE survey analysis showed that OGC specifications were applied to 39% of all metadata holdings. Like ISO19115, OGC specifications are widely and internationally used. They facilitate the interaction, sharing and visualisation of geospatial dataset. The use of these specifications allow direct use of number of existing resources using OGC webservices WMS (Web Map Service) or WMF (Web Map Features) and a better dissemination and use inside the EnviroGRIDS SDI infrastructure as well as for external partners. The Web Feature Service (WFS) is certainly one of the most valuable specifications of the OGC. It provides a generic way for accessing raw geographic data over the web. To the general user, this can potentially provide a wealth of information embedded in the map being viewed. Parts of the WMS specification tried to implement this functionality, but using WFS gives much more control over how to actually access that data. A WFS leads to greater transparency and openness in mapping applications. Instead of merely being able to look at a picture of the map, as the provider wants the user to see, the power is in the hands of the user to determine how to visualize the raw geographic and associated data. The data can be downloaded, analysed and combined with other data, or it can be chained with other web services to do even more interesting things on the web.

Several partners of the proposal already work with OGC and ISO19115 standards such as UNIGE, EAWAG, UTC, CCSS, CERN, UAB and ArxIT.

The standards will be implemented through the metadata guidelines production and integration, as well as through data geoservices and data geoprocessing services which will be designed around OGC specifications.

Data storage

A data warehouse model for the storage of the bulk data - that are the source data (elevation, land use/cover, soil, climate and hydrological data), the data acquired by the sensors as well as the data created within EnviroGRIDS - will be developed and deployed using the EGEE middleware and its Grid infrastructure. In addition, Grid gateways to relational data - that are sensor source - will be provided. The model for the data warehouse shall be based on the experience of the CERN partner within the EGEE project: on one side, high-performance and high-capacity data-management systems for the High-Energy Physics activities and on the other collaboration across several disciplines (as Life Sciences, Meteorology etc...) in delivering solutions to enable Grid data access keeping into account new requirements (as security, data base distribution and federation, replication, etc...).

The bulk data shall be stored in Grid storage elements (SE) that provide a convenient and standardized access also from other data centres to a variety of tape and disk storage solutions. The generated relational data shall be stored within the AMGA Grid metadata catalogue. Existing relational metadata (or partial subsets) can be made accessible via AMGA so that this data can be federated to provide a uniform access and new possibilities of correlating existing sets of data stored in different administrative domains.

This task will necessitate first to design the data warehouse model and then to deploy SEs in the participating data centres and the necessary metadata catalogues to organize this data. The existing Grid middleware will provide a means to transfer data between data centres and allow Wide Area Network (WAN) access from one data centres to the data hosted on other data centres in order to provide reliability as well as increased performance through data replication. The gLite middleware provides powerful tools based on the Storage Resource Manager (SRM) and File Transfer Service (FTS) technologies to allow extended Grid access and to steer data distribution (replication) across sites.

[10] http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=26020

Task 2.3: Sensor data integration (CCSS) D2.3

This task consists mainly of providing interfaces so that any kinds of sensors can publish their data on the Grid, as well as providing Grid tools to access sensors, and finally store the gathered data on the Grid. Integration of the data generated by active sensors with the Grid environment is a prerequisite for the handling of this data on the Grid and for the integration with the Grid middleware.

Again, bulk data as well as relational metadata needs to be distinguished. Bulk data consists out of data files that can be either made available on the Grid by providing a storage element interface to the data provided by the sensor that is available on existing disk or tape storage. Alternatively tools need to be created that access sensors from within the Grid context and which then store the bulk data on the Grid, creating also the necessary metadata.

For the integration of Sensor environment in the Web Environment we will use Web Interface as defined by the Open Geospatial Consortium (OGC) initiative, which is called Sensor Web Enablement (SWE). The SWE:

- Describe sensors in a standardized way
- Standardize the access to observed data
- Standardize the process of what is commonly known as sensor planning, but in fact is consisting of the different stages planning, scheduling, tasking, collection, and processing
- Building a framework and encoding for measurements and observations
- Some sensors are already on the Web and able to return their location information as well as observations and measurements.

Task 2.4: Remote Sensing data (UNIGE, ITU, Geographic) D2.4

The integration of remote sensing data from airplane and satellite into the Grid architecture will be organized in collections of freely available scenes that will be accessible though the different partners. This data will be gathered, informed with its metadata, stored on the SDI, and finally redistributed to all partners. This task is responsible about executing remote sensing analyses for the different partners of the project if needed. Earth observations by remote sensing refers to the use of imaging sensors technologies for gathering information, at different scale, on a given object or area. There are two types of remote sensing:

- passive RS uses the radiation emitted or reflected by an object,. This type of RS include CCD imagery, radiometers, etc..
- active RS, such as radar or lidar, measures the time delay between the emission and its return to the sensor. It gives access to physical properties (namely height, speed, direction, …) of am object or area observed.

Remote sensing gives the opportunity to have access to continuous data collection and in the context of this project will be useful to monitor changes and trends in the Black Sea region/watershed (land use, deforestation, water quality etc..)

We propose to use medium to high resolution images, freely or at low cost, available on the internet:

- MODIS (Moderate Resolution Imaging Spectroradiometer, NASA): http://modis.gsfc.nasa.gov/
- MERIS (Medium Resolution Imaging Spectrometer, ESA): http://envisat.esa.int/instruments/meris/
- ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer, NASA): http://asterweb.jpl.nasa.gov

Monitoring of land cover / land use is for instance an important element for quantifying land surface characteristics for environmental management. Moderate spatial resolution spaceborn remotely sensed data such as MODIS (The Moderate Resolution Imaging Spectroradiometer), SPOT Vegetation data or /and AVHRR will be used. Available public domain data featuring better spatial resolution (up to 250m) and superior standards of calibration, georeferencing and atmospheric correction, as well as detailed per-pixel data quality information might be utilized.

Before classification process the images will be atmospherically corrected and the images will be register at the UTM coordinate system. If it is necessary a mosaick process can be applicable to produce just one image scene. To generate land cover maps, ISODATA unsupervised classification methodology will be applied with ancillary data.

Task 2.5: Gridification of applications (CERN, UTC, CRS4, IHE) D2.7

CERN has specific experience in porting applications for the Grid ("gridification"). The experience developed in supporting the demanding High-Energy Physics applications has led to build a unique know-how in this field. Just as an example, in the last year CERN specialists have ported several non-physics applications to run on the Grid. Examples are: collaboration with the International Telecommunication Union in 2006 (support for large scale running of specific telecommunication programs); use of Grid catalogues to search and correlate satellite images (supporting the UNOSAT agency); biomedical applications e.g. simulation of an advanced radiotherapy system (together with MedAustron – Austria) to mention a few.

Although some of the applications we are currently supporting need a "quasi real-time" behaviour, we are open to integrate the EnviroGRIDS system with information coming from real-time sensors. This will be built on our experience in monitor application on the Grid and on the experience of other projects (close to EGEE) notably GridCC (which has developed the necessary abstraction to connect generic devices to the Grid for simulation and control purposes).

UTC has developed MedioGrid as satellite imagery based processing platform over the grid. The MedioGrid project has achieved the massive data management and processing in order to support the development of geographical and environmental applications. The data model is distributed over the grid and the processing performance depends on the data consistency, replication, transfer and load balancing. UTC will develop and map over the grid the Service Oriented Architecture, which makes possible the using of distributed massive data model to Collaborative Working Environment (CWE) Portal and user oriented applications.

The support of a Grid team to the project is fundamental during the initial porting and the evolution of the different applications. Based on previous experiences gained for example with other United Nations agencies (ITU and UNOSAT), the Grid support team will ensure the new users a full Grid infrastructure in terms of certificates (security), privileges and services and also the necessary support to adapt the applications to the Grid. In order to achieve a stable production level infrastructure, this support strategy will be crucial during the ramp up period of the project and also during the development phase. The Grid support team will also be responsible of the training of the pilot users in order to ensure an expertise level, which allows and independent operation of the system. At the end of the project, the support of the Grid team should have been turned on an infrastructure level support only based on EGEE services (like the training and the operation support).

Grid users are grouped in Virtual Organizations (VO), which are entities typically corresponding to particular organisations, experiments or set of persons. At this moment the Grid team at CERN has established a VO infrastructure for generic applications, which allows a fast introduction of any community into the Grid environment. Based on previous "gridification" projects, this VO has been created fulfilling the basic requirements of any community or application trying to gain familiarity with the system. The support to this VO is ensured by a support team at CERN.

In this project we propose the use of the generic VO initially, but to then to establish our own VO. The creation of the independent VO for the project will be a part of the gridification, foreseen to be fully recognized within the EGEE infrastructure and which will allow therefore its expansion to different countries in the future. The Grid support team will be also responsible of the setup of this new VO and the follow up of the official procedure to merge it within the EGEE infrastructure. Note that this approach allows to start working immediately with the users and gaining experience and understanding on both sides before setting up formal agreements with the EGEE project in possible contribution of computing and storage resources.

Within the EnviroGRIDS project we envisage that (after the ramp-up phase) different beneficiary can join the Grid with their resources (notably storage of data to be shared within the project). We expect major

players in the project to join EGEE at least to share their data repository using Grid techniques of cataloguing and data access. This goes in the direction to enlarge the access to the data without forcing the creation of combined data repositories but enabling the scientific (or technical) application to combine the existing data in the optimal way. The CERN team will foster this project using the existing EGEE services for supporting new computing centres joining the Grid.

Task 2.6: Spatial Data Infrastructure and GRID integration (ArxIT, UNIGE, UTC, BSC, ICPDR) D2.6, D2.8, D2.9

The idea of the Spatial Direct Server is to provide a server application architecture that enables end users to download spatial data in the format and projection of their choice and in a web environment.

In order to set up and provide these functionalities, we have planned to use "FME Spatial Direct" software (www.safe.com) and to customize it with software development. Here are the features we will develop to rich up the needs:

- Visualize the data to extract/download (like a Self-service portal to the spatial data)
- View vector and raster data directly from the spatial databases
- Perform simple mapping operations such as pan and zoom
- Select themes and the format of the delivered data
- Select the projection for the delivered data
- Specify the geographic extent of the delivered data

In term of architecture, we plan to set up a scalable and a services-oriented architecture (SOA). The architecture solution will support high volume data processing demands, no matter how much the user community grows.

WP 2 Deliverables (Month due) [responsible beneficiary]
D2.1 EnviroGRIDS interoperability guideline (3) [UNIGE]
D2.2 EnviroGRIDS data storage guideline (3) [UTC]
D2.3 EnviroGRIDS sensor data use and integration guideline (6) [CCSS]
D2.4 EnviroGRIDS remote sensing data use and integration guideline (6) [ITU]
D2.5 Report on Gap Analysis (12,24) [BSC]
D2.6 Report and Software package of grid services supporting massive data management (18) [UTC]
D2.7 Gridified code and report (24) [CERN]
D2.8 Software package of grid services supporting CWE Portal (24) [UTC]
D2.9 Spatial Data Infrastructure report (24) [ARXIT]

Work package no.	**3**		**Starting month**			**1**
Work package title	**Scenarios of Change**					
Activity type	**RTD**					
Partic. No.	**23**	**1**	**19**	**10**	**9**	**Total**
Partic. Short name	**UAB**	**UNIGE**	**ONU**	**DHMO**	**DDNI**	
Person-months per beneficiaries	**38**	**30**	**10**	**12**	**10**	**106**

Summary Box

WP 3 Objectives

- To create spatially explicit scenarios on demographic changes
- To create spatially explicit scenarios on climate change
- To create spatially explicit scenarios on land cover changes
- To integrate the outputs of the three scenarios

WP 3 Description of work

WP3 is going to implement a set of models and tools for the production of demographic, climatic and land cover change scenarios at the Black Sea Catchment scale (Fig.3.1). These individual scenarios will be integrated with a descriptive storyline in concordance with global scenarios such as those proposed in the UNEP Global Environment Outlook or the IPCC reports.

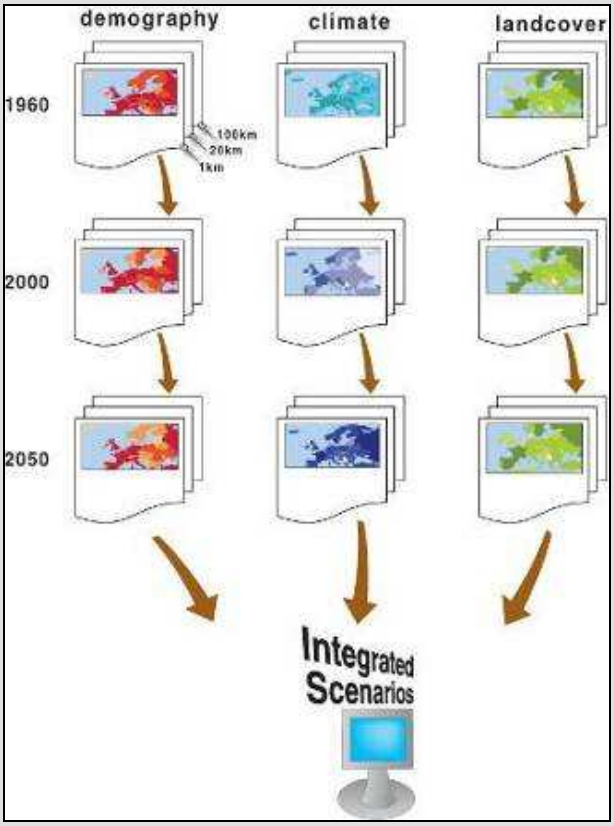


Figure 3.1 Outputs from climate, demographic and land cover change scenarios are made available for different years.

WP3 is divided in four tasks under the supervision of UAB beneficiary:

Task 3.1 Demographic change module (UNIGE) D3.1, D3.5

The main objective of task 3.1 is to set up an infrastructure and to implement analytical modules that will enable the production time series of prospective demographic data to be used as input for the hydrological catchment models (WP 4) as well as for the impact assessments of impacts on societal benefit areas (WP5). The demographic data and models should also be of use for any other users interested in harmonised, disaggregated and projected information on population distribution.

On the basis of widely accepted demographic scenarios, the system will allow the simulation of future populations at regional (2000-2030), national and subnational levels (2000-2050) with estimation of confidence intervals (i.e. high, low and medium variants as proposed in UN and Eurostat scenarios). Finally, generic mechanisms for transferring and analysing data from/to various spatial units (e.g. between politico-administrative units, pixels and watersheds entities) will be implemented.

Task 3.1 is composed of 4 sub-tasks which will result in generic and clearly identified modules organised in a logical order.

1) Structuration of existing data (vector and raster) on settlements and past/present/future population figures

The objective of task 3.1.1 is to integrate the most relevant existing datasets and scenarios produced by institutions specialised in this area:

- Eurogeographics and European Environment Agency for data on settlements;
- Eurostat and ESPON projects "Demography" (1.1.4) and "Scenarios" (3.2) for demographic scenarios at regional level and population figures at national and subnational levels;
- the Gridded Population of the World (GPW[11] v3) and Landscan[12] for gridded population data at regional level;
- United Nations Population Prospects (UNPP) and IIASA population projections for scenarios at national level.

The available data will be integrated in a central database managed by the project. The use of webservices for accessing updated population figures from data providers will be explored and strongly recommended. The feasibility of the webservices will specially depend on the agreements reached with the data holders, rather than on technical issues that are well known at UNIGE/GRID[13].

2) Projection of population figures

Based on the various models developed by the UN, Eurostat and IIASA, this module will allow the projection of demographic data for the harmonisation of figures to several reference years (e.g. 1970, 1980, 1990, 2000) as well as for the simulation of future states of population for the period 2000-2050.

The estimated projected demographic figures will be delivered with an evaluation of the uncertainty associated with the data.

3) Spatial disaggregation of data

This module will provide generic mechanisms for the disaggregation of demographic data into regular grids at various spatial resolutions (1km, 5km, 10km) that are generally finer that the original census/statistical data. Several methods are available for the refinement of demographic data, with or without the use of ancillary data: pycnophylactic (Tobler 1979), dasymetric (Mennis & Hultgren 2006), "smart interpolation" (Deichmann 1996a). The most relevant methods will be selected and implemented in the system.

[11] http://sedac.ciesin.columbia.edu/gpw
[12] http://www.ornl.gov/sci/landscan
[13] see e.g. http://geodata.grid.unep.ch/webservices/

The users of the system will be informed about the consequences on the estimated grid when choosing one or the other methods. The uncertainty of the estimations will be assessed according to reference data as well as to the type of disaggregation procedure used.

4) Spatial aggregation and areal interpolation

Conversely, in some cases, data may need to be aggregated to a lower resolution, e.g. for regional statistics or for comparison with a climatic dataset available at 50km. The module will provide explicit aggregation algorithms and functions, with a special attention given to the cases of non-overlapping spatial units (e.g. raster cells overlapping two politico-administrative units).

This module will also allow for the transfer of population figures from politico-administrative units (e.g. population by department) to non coinciding natural units (e.g. land cover types) : an usual assumption is that population is homogeneously distributed over the political unit, hence each land cover type is given a population share in proportion of its area. But other more valid assumptions (e.g. homogeneous population distribution in each land cover type) may lead to different results in terms of number of people per land cover units. Through the implementation of areal interpolation algorithms (Kyriakidis et al. 1996, Deichmann 1996a), the system will allow the sound transfer of demographic data to watershed units and conversely from hydrological units to politico-administrative units.

Used technologies

The structuration of and the access to the data will be carried out by a customisation of the GEO Data Portal[14] developed by UNIGE/GRID using open source technologies and geo-spatial standards from ISO and the Open Geospatial Consortium (such as WFS, WCS, GML, ISO 19139). Various spatial interpolation algorithms used during previous UNIGE/GRID projects (Deichmann 1996b, Dao & Eckert 2003) will be redeveloped using web-deployable languages (java, php,...).

Task 3.2: Climate change module (UNIGE, DHMO) D3.2, D3.6

This task will provide the best available data on climate change scenarios within the Black Sea Catchment and different methods to regional global scenarios. Two sub-tasks are defined in this WP:

1) Physically-based simulation models

The movement of water through the hydrological system is one of the vital processes operating around the globe. The whole system of water movement referred to as the global hydrological cycle. Although the world oceans include almost 97% of all water, the focus of this project is directed towards the land freshwater hydrology through modelling techniques. Physically-based simulation models of the hydrologic budget of watersheds will be used. As is typically the case with such models, they represent only a small part of the overall physical processes occurring in nature. In order to run properly such models a number of raster inputs are needed. First, boundary conditions represent distributed geographical characteristics of the watersheds under study, their topography, their surface, as well as soil underground hydrological and soil characteristics. Secondly, time series of atmospheric inputs drive the hydrological cycle over these drainage basins; these include essentially air temperature and precipitation. The former come from known comprehensive geological, topographical, and other physiographic datasets (e.g., USGS) while the latter may either come from station observation records or from simulated outputs generated by numerical models. Driving hydrological models with observations is an important step to validate the approach while driving these by simulated outputs allows undertaking sensitivity experiments and producing projections for a future climate warming scenario.

One source of coherent raster driving inputs for hydrological models may be provided by Global Coupled Models (GCM) outputs for which a number of runs for current and for future climate are available (e.g., IPCC, 2001). However, the horizontal resolution of most of the available GCM outputs is still too coarse (~100-200 km) to adequately drive hydrological models. To overcome this problem, a number of high resolution Regional Climate Models (RCM) outputs are available nowadays for current (1961-1990) as well

[14] http://geodata.grid.unep.ch

as for future (2071-2100) climates under different greenhouse-gas emissions scenarios over Europe (EU/FP5 "PRUDENCE" Project; Christensen et al., 2002). In order to provide global land coverage of driving inputs to the hydrological models in this project, a regional climate model driven by available GCM outputs (e.g., Hadley Centre GCM HadAm4h, available in the framework of the "PRUDENCE" project) will be run over some of the regions not yet fully covered. In addition to that, some regional climate model runs are available through EU/FP6 "ENSEMBLES" project (Hewitt, 2005), where a raster resolution of 25 km is been achieved, about twice of the horizontal resolution of PRUDENCE RCM simulations. Although this is not the ultimate resolution to provide inputs to hydrological model, the latter models the state-of-the-art high resolution climate model simulations available to date. An alternative is to perform short-term time-slice experiment at very high resolution (i.e., less than 25 km) using a RCM available to us in the current project. The RCM which will be used is the Canadian RCM (CRCM, Laprise et al., 1998). The horizontal resolution would be similar to the one used in the former experiments, e.g., a grid spacing of roughly 25 to 50 km, similar greenhouse gas emission scenarios would be considered, e.g., the SRES A2 scenario (IPCC, 2001), and similar time slices for future projections, e.g., 1961-1990 for the current climate and 2071-2100 for the future projection respectively (e.g., Beniston et al., 2007). There are many advantages in using the CRCM: 1) local expertise and remote assistance is guaranteed and 2) this model offers a multiple self-nesting option allowing a resolution as fine as 1 km over a limited study domain. This may be an important issue to validate hydrological models during a specific case study.

2) Spatial interpolation and downscaling of climatological data

Geographical Information Systems (GIS) can complement the results obtain from physically-based simulations models at ground level. Indeed, RCM are so complex that it is still impossible to obtain high resolution predictions of key hydrological parameters such as daily air temperature and rainfall variables on continental extend and for long periods of time.

The COST project 719 [15] has made an inventory on the use of GIS in spatial interpolation application in climatology. Their conclusions was that "… utilizing GIS in spatial climatology and meteorology is still in an early phase. There are many challenges ahead. The potential using GIS and spatially distributed data is large, and there is a lot of research which is carried out and which may be implemented in a GIS-framework. It is therefore of major importance to get spatialisation and GIS specialists together".

Another project, FP5 STARDEX [16] (Statistical and Regional dynamical Downscaling of Extremes for European regions) has shown that global climate models are the entry point for constructing climate scenarios but due to their coarse spatial scales, downscaling is required to get finer resolution for studying the impacts of climate change. The EU funded project ACCORD [17] (Atmospheric Circulation Classification and Regional Downscaling) has also explored GIS methods to downscale outputs of climatic models.

These projects have paved the way to GIS downscaling of climate model outputs to get finer data resolution. We propose to follow their steps within the EnviroGRIDS project to obtain daily surface rainfall and temperature according to several extreme IPCC scenarios. Our idea is to further develop a statistical package built by Anthony Lehmann to make Generalized Regression Analysis and Spatial Prediction (GRASP[18]; Lehmann et al., 2002, Maggini et al., 2006) in order to downscale PRUDENCE and/or ENSEMBLE datasets.

Task 3.3: Land cover change module (UAB, ONU, DDNI) D3.3, D3.7

Land use and land cover change is one of the most important human modifications of the Earth's surface. The rate of land cover alteration is increasing dramatically worldwide due to increasing and intensifying human use of the land. This has important consequences for the local population and natural resources. In the face of mitigation and adaptation to climate change, land cover is one of the more dynamic systems that, in turn, has a feedback to climate.

[15] http://www.knmi.nl/samenw/cost719
[16] http://www.cru.uea.ac.uk/projects/stardex
[17] http://www.cru.uea.ac.uk/cru/projects/accord
[18] http://www.unige.ch/ia/climate/grasp

Determining the effects of land use and land cover change on the Earth system depends on an understanding of past land use practices, current land use and land cover patterns, and projections of future land use and cover, as affected by human institutions, population size and distribution, economic development, technology, and other factors. The combination of climate and land use change may have profound effects on the habitability of Earth in more significant ways than either acting alone. While land use change is often a driver of environmental and climatic changes, a changing climate can in turn affect land use and land cover. Climate variability alters land use practices differently in different parts of the world, highlighting differences in regional and national vulnerability and resilience.

Land use and land cover change is linked in complex and interactive ways to global climate change, and the feedback between the two exists at multiple spatial and temporal scales. Key links between changes in land cover and climate include the exchange of greenhouse gases (such as water vapour, carbon dioxide, methane, and nitrous oxide) between the land surface and the atmosphere, the radiation (both solar and long wave) balance of the land surface, the exchange of sensible heat between the land surface and the atmosphere, and the roughness of the land surface and its uptake of momentum from the atmosphere. Because of these strong links between land cover and climate, changes in land use and land cover can be important contributors to climate change and variability. Moreover, reconstructions of past land cover changes and projections of possible future land cover changes are needed to understand past climate changes and to project possible future climate changes; land cover characteristics are important inputs to climate models. In addition, changes in land use and land cover, especially when coupled with climate variability and change, are likely to affect ecosystems and the many important goods and services that they provide to society.

The interaction between land use and climate variability and change is poorly understood and will require the development of new models linking the geophysics of climate with the socioeconomic drivers of land use. Providing a scientific understanding of the process of land use change, the impacts of different land use decisions, and the ways that decisions are affected by a changing climate and increasing climate variability are priority areas for research.

The ability to forecast land use and land cover change and, ultimately, to predict the consequences of change, will depend on our ability to understand the past, current, and future drivers of land use and land cover change. These factors as well as other emerging social and political factors may have significant effects on future land use and cover and provides the scientific underpinning for land use decision-making and projections of future land use, and has substantial benefits beyond climate change assessment and mitigation by supporting a wide array of issues important to users of this information. Patterns of land use, land cover change, and land management are shaped by the interaction of economic, environmental, social, political, and technological forces on local to global scales.

An improved understanding of historical land use and land cover patterns provides a means to evaluate complex causes and responses in order to better project future trends of human activities and land use and cover change. We must understand the primary modern and future drivers of land use and their interrelationship with land management decisions and resource policies to develop projections of future land use and management decision outcomes under a range of economic, environmental, and social scenarios. This ability will allow better projections and hopefully minimize negative impacts, especially as related to climate change. This type of analysis will require the integration of various disciplines from the physical and social sciences.

There is clear evidence that changing land use and land cover has significant impacts on local environmental conditions and economic and social welfare. For example, the water cycle depends heavily on vegetation, surface characteristics, soil properties, and water resources development by humans (e.g., dam construction, irrigation, channelling, and drainage of wetlands) which in turn affects water availability and quality. Land use and land cover change, climate variability and change, soil degradation, and other environmental changes all interact to affect natural resources through their effects on ecosystem structure and functioning. In turn, ecological systems may respond unexpectedly when exposed to two or more perturbations.

In the context of the current project, forecasting land cover/land use changes in the coming 50-100 years is an input for the assessment of water availability and vulnerability to this resource. However, the predicted outputs will be very useful in many other applications within and outside this project.

In particular the activities proposed under this work package are divided in two sub-tasks:

1) Definition of scenarios in the Black Sea Catchment (2050). The basis for the scenarios will be the results obtained under the PRELUDE project (EEA, 2006). It should be noted that the selected approach focuses on the problem analysis, i.e. developing different scenarios with a view to gaining better insights into main trends that shape Europe's landscape, and identifying early warning indicators of change. Moreover, the scenarios combine the assessment of changes in the bio-physical environment with simultaneous changes in the socio-economic environment, providing an integrated approach. A broad variety of driving forces that influence different land use types and land use change in Europe are ordered in a "influence chain" and categorised. This step is followed by a qualitative evaluation of the magnitude of change for each driver. Finally the driving forces are clustered into 5 main categories and diagrams for each scenario provided.

2) Assessment of the land cover/use changes for different scenarios in the Black Sea Catchment. It is proposed to apply the Louvain-la-Neuve land use/cover change model as it has been proved to be useful at European level in previous projects (EEA, 2006).

The demand for six different land use types (defined as an area) is derived at an aggregated spatial level. Then these land use areas are disaggregated using spatial allocation rules. The following land use/land cover classes are then simulated: urban, cropland, grassland, biofuel crops, forests and abandoned land. The model will produce maps and data tables for the Black Sea Catchment. The LEAC methodology (EEA, 2006) to analyse land cover changes will be applied for the period 2005-2050.

Task 3.4 Scenario integration (UAB, UNIGE) D3.4, D3.8

The objective of this task is to combine the outputs of tasks 3.1 to 3.3 into integrated scenarios at the Black Sea Catchment level. These scenarios will be built around regional storylines closely connected to well established global scenarios published for instance by IPCC and UNEP.

According to the different storylines, the corresponding data on climate, land cover and demography will be grouped in packages to be further used as inputs in WP5 impacts on Societal Benefit Areas.

The different scenarios combine the assessment of changes in the bio-physical environment with simultaneous changes in the socio-economic environment. Taking into account the results from the three different scenarios, it is proved that the population and climate changes scenarios produce directly impact on the land use changes scenarios at medium and long term due the population needs and the effects of the climate change for cities and natural areas, additionally the land use changes has also feedback on climate.

For this integration, a combination of the different scenarios is needed especially to identify the effects of all of them on the territory. How the different fluxes affect the changes on the landscape and the land cover and how these changes can affect the population lifestyle and its sustainability.

The scenario integration results should be able to provide a scientific understanding of the different processes that have been analysed using the socio-economic, climatic and land use drivers. This type of analysis will also require the integration of various disciplines from the physical and social sciences.

WP 3 Deliverables (Month due) [responsible beneficiary]

D3.1: Demographic model inputs and efficient data model with possibilities to be updated (Internal report) (24) [UNIGE]

D3.2 Climate model inputs and efficient data model with possibilities to be updated (Internal report) (24) [UNIGE]

D3.3 Land cover model inputs and efficient data model with possibilities to be updated (Internal report) (24) [UAB]

D3.4 Existing scenarios and data compilation on integrated scenarios using demographic, climatic and land cover parameters in other regions of the world. (24) [UAB]

D3.5: Proposed demographic scenario analysis and overview of driving forces and justification, model input parameters and allocation rules. Outputs from Spatially explicit demographic scenario (report) (36) [UNIGE]

D3.6 Proposed climatic scenario analysis and overview of the more relevant driving and its justification, model input parameters and allocation rules. Outputs from Spatially explicit land cover change scenario (report) (36) [UNIGE]

D3.7 Proposed land cover scenario analysis and overview of the more relevant driving and its justification, model input parameters and allocation rules. (36) [UAB]
D3.8 Outputs from Spatially explicit combined scenarios (report) (36) [UAB]

Work package no.	4			Starting month				1			
Work package title	Catchment Hydrological Models										
Activity type	RTD										
Partic. No.	11	18	15	10	25	19	24	26	9			Total
Partic. Short name	EAWAG	INHGA	IHE	DHMO	UTC	ONU	USRIEP	VITUKI	DDNI			
Person-months per beneficiaries	36	24	30	14	8	10	14	16	8			160

Summary Box

WP 4 Objectives:

- To gather, format, and bring into ArcGIS the necessary data for the application Soil Water Assessment Tool (SWAT) to model water spatial distribution of water quantity and water quality in the Black Sea Catchment
- To calibrated and validate hydrological models, and perform uncertainty analysis using EGEE network for distributed computations
- To run land use/cover and climate change scenarios generated in WP3 using EGEE network for distributed computations

WP 4 Description of work:

New advances in computing technology plus data availability from the Internet have made high resolution modelling of distributed hydrologic processes possible. Using the program Soil Water Assessment Tool (SWAT) (Arnold, et al., 1998) (http://www.brc.tamus.edu/swat/), in this WP, we will apply a high-resolution (sub-catchment spatial and daily temporal resolution) water balance model to the entire Black Sea Catchment (BSC). The BSC model will be calibrated and validated using river discharge data, river water quality data, and crop yield data. Looking at the hydrological components in Figure 4.1, calibration and validation based on ET and RO ensure a correct aquifer recharge and soil water storage component. As part of the modelling work, uncertainty analysis will also be performed to gauge the confidence on all model outputs. As SWAT is an integrated model containing a large agricultural management component, the spatial variation in the quality of water balance components shown in Figure 4.1 will provide a good indication of critical regions across the BSC. Subsequent analyses of land use change, agricultural management change, and/or climate change can then predict the consequence of various scenarios.

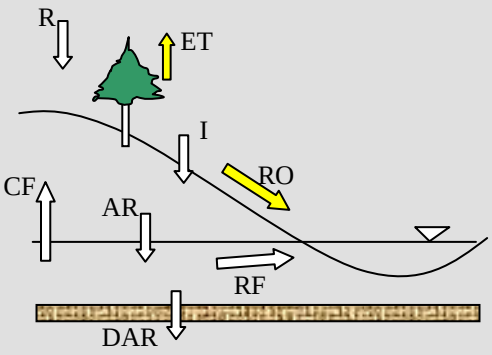


Figure 4.1. Hydrologic components of water balance. R=rainfall, ET=evapotranspiration, I=infiltration, RO=runoff, RF=return flow, CF=capillary flow, AR=aquifer recharge, DAR=deep aquifer recharge

WP4 is divided in 3 tasks under the supervision of EAWAG beneficiary:

Task 4.1 Data collection for SWAT
(INHGA, DHMO, IHE, USRIEP, ONU, VITUKI, DDNI) D4.1

- Soil Water Assessment Tool (SWAT) is a hydrologic program used for large scale simulations. This watershed-scale program performs simulations that integrate various processes such as hydrology, climate, chemical transport, soil erosion, pesticide dynamics, and agricultural management. SWAT accounts for variable soil and land cover conditions by subdividing the simulated catchment into sub-areas. The model uses a daily to sub-hourly time step, and can perform continuous simulation for a 1- to 100-year period. SWAT has an ArcGIS interface, which takes layers of information such as soil, land cover, elevation, and management, and calculates hydrology, erosion, and chemical transport both inland and in-stream. (see annex 6.1)

About 50 peer-reviewed papers discussed the application of SWAT on pollution loss studies for a wide range of small and large river catchments (Gassman et al., 2005).

SWAT is already used to simulate the continent of Africa (Schuol et al., 2007), and in the "Hydrologic Unit Model for the United States" (HUMUS) (Arnold et al., 1999), where the entire U.S. was simulated with good results for river discharges at around 6000 gauging stations. This study is now extended within the national assessment of the USDA Conservation Effects Assessment Project (CEAP [19]). Other large scale SWAT application included the work of Gosain et al. (2006) where twelve large river catchments in India were modelled with the purpose of quantifying the climate change impact on hydrology. SWAT is recognized by the U.S. Environmental Protection Agency (EPA) and has been incorporated into the EPA's BASINS (Better Assessment Science Integrating Point and Non-point Sources).

For the simulation of SBS, SWAT requires data on DEM, soil, land cover, and climate for model setup, and river discharges, river water quality, and crop yield (as available) for calibration and uncertainty analysis. Most of this data is available can be obtained from the Internet and in collaboration with WP2 from remote sensing.

Task 4.2: Calibration, validation, sensitivity and uncertainty D4.2
(EAWAG, IHE, USRIEP, NIVHM, VITUKI)

Distributed watershed models are increasingly being used to support decisions about alternative management strategies in the areas of land use change, climate change, water allocation, and pollution control. For this reason it is important that these models pass through a careful calibration and uncertainty analysis. Furthermore, as calibration model parameters are always conditional in nature the meaning of a calibrated model, its domain of use, and its uncertainty should be clear to both the analyst and the decision-maker. Large-scale distributed models are particularly difficult to calibrate and to interpret the calibration because of large model uncertainty, input uncertainty, and parameter non-uniqueness. To perform calibration and uncertainty analysis, in recent years many inverse modelling procedures have become available. As only one technique cannot be applied to all situations and different models can benefit from different procedures, we propose to link various procedures to models in a generic platform.

In particular, we will include: Generalized Likelihood Uncertainty Estimation (GLUE) (Beven and Binley, 1992), Parameter Solution (ParaSol) (van Griensven and Meixner, 2006), Sequential Uncertainty FItting (SUFI-2) (Abbaspour et al., 2007), and Monte Carlo Markov Chain (MCMC) (Vrugt et al., 2003) in the calibration program package.

Task 4.3: Predictions of hydrological models under different scenarios
(UTC, EAWAG) D4.6

The high-resolution calibrated SWAT model will be used to predict water quality and quantity according to the different scenarios in the Black Sea Catchment. This information is then provided to WP6.

[19] http://www.nrcs.usda.gov/Technical/nri/ceap/ceapgeneralfact.pdf

About 50 peer-reviewed papers discussed the application of SWAT on pollution loss studies for a wide range of small and large river catchments (Gassman et al., 2005). With the European Water Framework Directive in mind, SWAT was applied in the framework of several EU research projects on catchment modelling such as in "Climate Hydrochemistry and Economics of Surface-water Systems" (CHESS) (2001) to investigate the effect of climate change on water quality in European rivers, in the "Evaluation and Improvement of Water Quality Models for Application to Temporary Waters in Southern European Catchments" (TempQSim) (2004) for the analysis of Mediterranean and semi-arid catchments with intermittent flow regimes, in the "European Harmonized Procedures for Quantification of Nutrient Losses from Diffuse Sources" (EuroHarp) (2004) for nutrient modelling studies, and in the "Benchmark Models for the Water framework Directive" BMW (2004) for the use in integrated modelling assessment. In the latter project, SWAT was successfully evaluated against the qualitative diffuse pollution benchmark criteria for the application of models for the Water Framework Directive, where it received 'good' classification for 70% of the questions asked and at no point during the assessment was it 'not recommended' for use (Dilks et al., 2003). An overview of SWAT application in Europe for sediment, nitrogen or phosphorous predictions list, among many others, several river catchment applications in Finland, Belgium, Italy, and the UK (van Griensven, 2007) or other EU member states.

From an EGEE point of view, we envisage introducing two types of scenarios for running EnviroGRIDS applications:

- large scale simulation (exploring vast parameters space for example to validate theoretical models or explore future scenarios starting from the present data, especially for planning purposes.
- usage of the Grid to react to emergency solutions (reusing our experience with several applications like ITU, UNOSAT and BirdFlu but evolving to a dependable system to support this project).

After a first phase of porting the applications and involve pilot users from the different communities, we will have to make provision to integrate more resources coming from the EnviroGRIDS community. This is the main approach of EGEE, where the computing and storage resources are ultimately contributed by the users' communities (and shared in the best possible way). On the other hand, in the early phases of the "gridification" we plan to use available resources and negotiating support for this new community on the case-by-case basis (see previous task).

The Grid provides the ideal platform to share heterogeneous data (see the SDI part). In addition we will like to introduce the EnviroGRIDS project to the usage of data sharing techniques in usage in other VOs. Our experience in supporting and the multidisciplinary character of EnviroGRIDS project makes it a very attractive a collaboration with EGEE. We believe that the possibility to integrate data and computing resources with the power of the Grid will attract more new communities to share the EnviroGRIDS framework and to expand it according to experience and new requirements.

Sharing information across the boundary of the scientific and technical partners will be probably the most interesting spin off of EnviroGRIDS.

For both scenarios (large-scale processing and peak usage of resources) we plan to contribute our experience in supporting our existing applications and in disseminating the current state-of-the art within the EnviroGRIDS community.

WP 4 Deliverables (Month due) [responsible beneficiary]

D4.1 Database with of useful data for SWAT modelling and report on data availability and quality for hydrological modelling in the Black Sea Catchment (18) [INHGA, DDNI]

D4.2 Calibrated high-resolution water quantity and water quality models for BSC accounting for agricultural activities and point source pollutions (24) [IHE]

D4.3 Hydrological model running over the grid and technical report on the performance optimization of the grid based hydrological model execution (36) [UTC]

D4.4 A package of calibration procedures linked to SWAT through a generic platform to perform calibration, validation, and uncertainty analysis (36) [EAWAG]

D4.5 Analysis of the effect of landuse change and climate change on the water quantity and water quality distribution across the BSC region (48) [EAWAG]

Work package no.	**5**														**Starting month**		**1**
Work package title	**Impacts on selected Societal Benefit Areas**																
Activity type	**RTD**																
Partic. No.	**17**	**24**	**3**	**5**	**13**	**14**	**1**	**22**	**20**	**19**	**11**	**21**	**9**	**26**	**Tot**		
Partic. Short name	**ITU**	**USRIEP**	**AZBOS**	**BSERC**	**IBSS**	**IGAR**	**UNIGE**	**TNU**	**SPSU**	**ONU**	**EAWAG**	**SOREMSMA**	**DDNI**	**VITUKI**			
Person-months per beneficiaries	**56**	**14**	**52**	**30**	**48**	**24**	**6**	**36**	**46**	**36**	**36**	**9**	**16**	**32**	**441**		

Summary Box

WP 5 Objectives:

WP 5 includes the following specific objectives:

- To identify key areas of impact and vulnerability in GEO Societal Benefit Areas (Fig.5.1) based on existing analyses and through dialogue with relevant stakeholders
- To provide in-depth analysis of vulnerability based on interactive models
- To identify policy responses and adaptation options focused on key vulnerabilities based on quantitative model results and consultations with stakeholders
- To assess sustainability based on criteria and indicators and the analysis of interlinkages among key emerging pressures and vulnerabilities using modelling results and stakeholder validation

Figure. 5.1 GEOPORTAL presenting various services on Societal Benefit Areas by regions (www.geoportal.org)

WP 5 Description of work

This WP involves the analysis of the impacts of the climate, land use and demographic scenarios on river catchment processes, primarily water quality and quantity. Based on this analysis the impacts of all these changes will be assessed on selected Societal Benefit Areas in the present and the future. The emphasis will be on impacts on ecosystems, biodiversity, agriculture, health and energy sectors.

WP5 methodologies will be grounded in integrated environmental assessment (IEA) and the analysis of impacts in the context of the Driving force-Pressure-State-Impact-Response (DPSIR) framework, as applied in UNEP's GEO-4 report (UNEP 2007) at the global scale and as subsequently translated into sub-global applications. In order to ensure the analysis reflects policy priorities and stakeholder perspectives, participatory methods in the form of stakeholder dialogues will be embedded throughout the process, from the identification of major impact areas to the mapping of impact pathways. Analysis of projected vulnerability will be synthesized based on the relevant results of WP3 and 4, including projected impacts through the analysis of thematic scenarios.

A key goal of WP5 is to build a solid analytic foundation for the identification of adaptation options at multiple scales, which will firmly connect the project to actual users of the information where real life positive impacts can be realized. Adaptation options will be developed at thematic, place-based and at higher region-wide levels. The development of policy and management responses will build on the adaptive management and resilience school of thought. While it will respond to the challenges arising from climate change, it will go beyond that and reflect a more synthetic reality where impacts and adaptive responses emerge in the context of a wider range of interacting forces of local and global change that includes, but that is not limited to climate change (Leichenko and O'Brien 2006).

WP5 is divided in seven tasks under the supervision of ITU beneficiary:

Task 5.1: Biodiversity (SPSU, AZBOS, ITU, ONU, TNU, DDNI) D1.11

1) Invasive alien species (SPSU)

Human-mediated introductions of invasive alien species (IAS) are considered as one of the most serious trans-boundary environmental issue for the Black Sea region, causing severe losses in native biodiversity and even negative socio-economic consequences which require timely and effective management both at the Black Sea coastal ecosystems and its river catchments level. Black Sea region is also serving as donor area for IAS introductions in adjacent regions of Europe and worldwide. Currently effective approaches to the management of IAS in the Black Sea region do not exist and development of the regional online information system on aquatic alien species is urgently needed (Panov 2004, Panov and Gollasch 2004, Galil et al. 2007, Panov et al. 2007).

The main objective of this task is to develop an online Risk Assessment Toolkit (RAT) as part of the regional Decision Support System (DSS) on IAS. The DSS will also include early warning component on IAS (see Task 5.6). To achieve this objective, we will use the risk assessment protocols for IAS introductions via the European inland waterways developed in the context of the EC FP6 Integrated Project ALARM and tested for main European water catchments, including the Black Sea catchment (Panov et al. 2007, Panov et al. 2008a) for comprehensive assessments of risks related to IAS introductions for biodiversity of the Baltic Sea catchment and its socio-economic values. For making these assessments, we will consider relevant recommendations of the European strategy on IAS (Genovesi and Shine 2004), specifically those on the listing system for alien species. The European Environmental Agency (EEA) 'Typology of indicators' and the Driving force, Pressure, State, Impact, Response (DPSIR) framework will be used to structure environmental indicators on IAS in the socio-economic context (Smeets and Weterings 1999, Gabrielsen and Bosch 2003, Maxim et al. 2007) (Fig. 5.2). In addition, considering the current gap in addressing invasive

alien species in the river catchment management in Europe, our goal will be also to further develop relevant water quality indicators on IAS for consideration in the Common Implementation Strategy of the EC Water Framework Directive (CEC 2000, Arbačiauskas et al. 2008, Panov et al. 2008a).

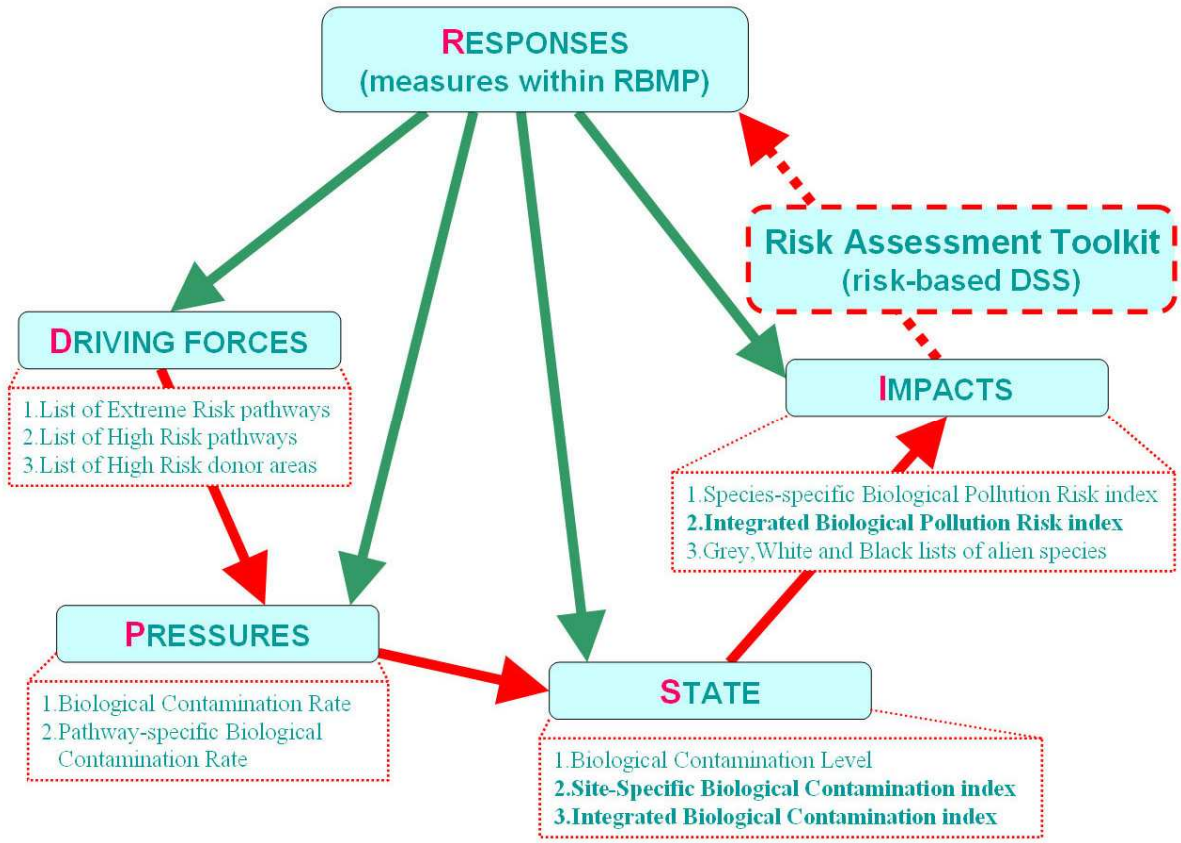


Figure 5.2 Possible Environmental indicators and Risk Assessment Toolkit (RAT, risk-based Decision Support System) introductions of invasive alien species for their consideration in the River Basin Management Plans (RBMP) in the DPSIR framework

The RAT will work using relevant information collected by the consortium and by the associated partners and independent experts using the European Commission-supported e-journal "Aquatic Invasions" as instrument of support of online databases with primary data via protection of authors rights on this information (Panov and Gollasch 2006, Panov et al. 2008b).

The online risk-based Decision Support System on IAS introductions will provide decision-makers and other interested stakeholders with relevant information and scenarios needed for development of most relevant management options on IAS within the River Basin Management Plans.

2) Biodiversity (AZBOS)

In this task the AZBOS team will focus on selecting Black Sea indicator species for use in assessments from among sea weeds, higher plants (including 11 key vegetation communities), insects, hydrobionts, fishes (including ecological groups), reptiles, birds and mammals. Monitoring of these indicator species makes it possible to assess impacts of climate, land use and demographic scenarios on the state of their populations. Moreover, indicator species (or ecological groups of species) must reflect the general condition of biodiversity in controlled ecosystems. The monitoring and data collection approach used during earlier research can provide a methodological basis for the organization of a long-term monitoring effort. During the first year a longer list of potential indicator species will be developed, which will be reduced to a manageable

indicator set focused on priority species. Key observed parameters will include number of individual plants/animals, productivity (biomass), and population structure (including phenotypic structure).

3) Igneada forest (ITU)

Moving from the regional to the specific ecosystem scale, the project will demonstrate the analysis of biodiversity impacts at the ecosystem scale using the Igneada forest as a case study. The Igneada forest (2,500 ha) is a unique Turkish alluvial forest with associated aquatic and coastal ecosystems. It is one of the protected and wildlife management areas on the Thracean Black Sea coast (2,500 ha.).

Biological features can be summarised as:

- Alluvial forest with associated aquatic and coastal ecosystems.
- Dominated by ash (*Fraxinus spp.*), elm (*Ulmus* spp.), beam (*Carpinus* spp.) and oak (*Quercus* spp.).
- Largely pristine forests include approximately 200 ha of pristine pure stands of ash forest (*Fraxinus excelsior*).
- Includes several permanent mesotrophic wetlands, and is separated from the marine environment of the Black Sea by a narrow border of sand dune ecosystems.
- Important winter sanctuary for migratory water birds and a bottleneck for many bird species (including tens of thousands of raptors) that move along the Bosphorus flyway between the Western Palearctic and Africa.

İgneada is one of the Important Birds Areas (IBAs). Igneada bottomland forests support a breeding population of *Ciconia nigra* and a high number of *C. ciconia* and other migratory raptors. İgneada and its vicinity are rich in herpetofauna due to abundant fresh water habitats in the area. The area provides suitable habitats for feeding and dwelling of the amphibian and reptile species. The team will compile all existing biodiversity information recorded in Turkey's Black Sea coast, one of the most important regions in terms of the biodiversity. The team will also assess the indicator species in these particular regions to contribute to the overall list of Black Sea indicator species.

The ITU team will compile all existing biodiversity information recorded in Igneada forest. The team will also assess the indicator species in the region to contribute to the overall list of Black Sea indicator species.

ITU team will also analyze the current national policies on management of biodiversity and determine the links and gaps in the priorities set for the biodiversity issue as a whole and also for the selected region. The stakeholder engagement can be integrated into the process by identifying the stakeholders in the region (Igneada) and gathering their opinions and suggestions on the current policies.

Task 5.2: Ecosystems (IBSS, AZBOS, ONU, TNU, DDNI) D5.1, D5.9

This task is divided in two sub-tasks:

1) The Black Sea ecosystem (IBSS)

The Black Sea is a unique ecosystem. Most of the organisms inhabit a thin (150m) layer, with a few anaerobic bacteria in the hydrogen sulfide zone (which otherwise is lifeless). This makes the ecosystem vulnerable to human stress and climate impact. Invasive species play an important role in the Black Sea ecosystem.

In the late 1980's, sea temperatures increased and an intruder gelatinous zooplankton species *Mnemiopsis leidyi* was recorded for the first time and started to dominate the planktonic ecosystem. The invasion of this non-indigenous species has cost the economy of Black Sea countries over 10 billion dollars. Fish stocks collapsed and fisheries crashed (from landings of 700,000 to 100,000 tons per annum). Thousands of fishermen closed their businesses, while the biomass of the comb jelly rose to a value that exceeded that of the world's annual fish landings.

It is proposed that in terms of the EnviroGRIDS objectives, the Black Sea plankton ecosystem will be investigated by the IBSS which has been involved in the Black Sea studies for over 80 years and officially leads the biological component in the IOC/Black Sea-GOOS program.

The IBSS beneficiaries will be represented by two senior scientists (Drs. A. Gubanova, S. Piontkovski), three leading engineers (A. Sergeeva, V. Gorbunov, D. Altukhov), and one graduate student (A. Khvorov). All five experts worked for many years at the IBSS and posses expertise in the analysis of large biological, oceanographic and atmospheric data sets. They have strong publication records and considerable field experience as the beneficiaries of 12 expeditions to the Black Sea, Atlantic, and Indian Oceans.

The team will focus on:

- Analyzing large environmental data sets - seasonal and interannual changes of plankton biodiversity and hydrology in the Black Sea over the past 50 years with regard to the atmospheric anomalies and anthropogenic impact.
- Developing a 50-year database on plankton surveys of the Black Sea available from IBSS archives; and,
- Supporting the long-term time series of plankton sampling in the Gulf of Sevastopol.

The database assembly along with additional monthly physical and biological measurements (temperature, salinity, phyto- and zooplankton abundance) will serve the EnviroGRIDS aim to improve data access and use in the Black Sea catchment. As well, it will gradually compensate the lack of information on the basin-scale and interannual trends of the Black Sea coastal (regional) ecosystems. It will enable researchers to classify plankton ecosystems of the Black Sea on the basis of their spatial-temporal trends.

Retrospective analysis of historical data (archived by IBSS and other institutes) will be used to analyze the relationship between the zooplankton species diversity, species abundance, physical dynamics of water masses, and atmospheric fluctuations-all dealing with the climate change issues of the EnviroGRIDS. For example, in mid latitudes, the North Atlantic Oscillation (NAO) is the dominant mode of atmospheric fluctuations over eastern North America, the Northern Atlantic Ocean and Western Europe (Cayan, 1992). Recent explorations of the NAO impact on interannual sea-level patterns in the Mediterranean, Black and Caspian Seas, deep-ocean convection and dust transport across the subtropical Atlantic reflect the scale of this event (Arpe et al., 2000; Ribera et al., 2000; Tsimplis and Josey, 2001).

Studies of linkages between the Atlantic Ocean zooplankton and atmospheric anomalies have evaluated correlations in the abundance response of copepods to the NAO (Piontkovski and Hameed, 2002). The above linkages need to be investigated over a broad range of geographical regions, spanning different degree of the NAO influence, including the Black Sea. Therefore, from the data obtained, the project team will determine the role of the NAO in interannual variations of the abundance of key zooplankton species.

2) Black Sea and Azov wetlands (AZBOS)

Black Sea and Azov wetlands have peculiar characters, which should be paid a particular attention in the project. First of all, it is the absence of the tidal zone at the seacoast, which forms a relatively stable (in respect of hydrology) type of ecosystems that does not show any adaptations and buffer characteristics against changes of the water level regime, etc. Over the last 28 years the water level of the Black Sea has been rising (from 30 to 40 cm for this period according to different data sets), and in connection with the supposed warming of the climate this process will be intensified. Climate change will be first experienced as a change in variance, and pattern shifts particularly in extreme events will test the wetlands' already limited resilience. It means that the most vulnerable marine ecotones will be subjected to gradual impact of new factors, which can cause serious consequences in changes of spatial structure and functioning of ecosystems. So we should choose the indicator species with high global importance, including regional rare and indigenous forms, for which monitoring will be extremely important.

In the first place we consider as the most vulnerable the ecosystems, which are close to Mediterranean type, but to some extent different - they are Black Sea coastal salt marshes. Apart from them, estuarial zones of large and middle rivers should be under special control, because nowadays there are concentrated the most rich (in respect of biodiversity) ecosystems and also limans, connected with the sea to a greater or lesser extent. Finally, areas transformed by people, development of fish-ponds and systems of rice paddies have entailed a chain of productive artificial ecosystems, which are important not only for the regional economy, but also for conservation of the local biodiversity, which is continuously changing under impact of various factors.

The Sea of Azov (Azov Sea) is even more specific, because in the global context it represents a vast shallow estuary of the rivers Don and Kuban. Possible climatic and anthropogenic impacts will be reflected on this area more rapidly and intensively than for the Black Sea. And we should not forget that a third of Ramsar sites of Ukraine and a part of Russian Ramsar sites are concentrated in this area.

The principal emphasis will be placed on assessment of a structure of ecosystems, their stability and risk factors, taking into account the classification and unique characteristics of Black Sea ecoregions. A particular attention will be paid to parameters of general bioproductivity: estimation of biomass and volume of phytomass growth/gain (rate of carbon absorption/binding on control plots) in ecosystems inhabited with populations of indicator species.

Task 5.3: Agriculture (EAWAG, IGAR, ONU) D5.2, D5.5

This task will focus on the integrated assessment of environmental impacts on agricultural production in the Black Sea catchment. In order to ensure the analysis reflects the concerns and priorities of both policymakers and agricultural producers in the region, the key vulnerability issues identified through the analysis of existing data and the results of WP4 and 5 will be validated through stakeholder involvement. An iterative engagement with stakeholders is critical, not only because it helps establish focus on issues that truly matter, but also because through an iterative process local beneficiaries become familiarity and develop ownership of the results. This is essential from the point of view of capacity building beyond the project and from the point of view of increasing project impact. As the agroecosystems and farming conditions within the region vary widely, we will focus on umbrella groups of producers and policymakers on the one hand, and on Ukraine and Romania as case examples on the other.

The main activities under this Task will include the following.

Modeling agri-environmental issues with the GIS-based EPIC model (GEPIC) (lead: EAWAG)

The purpose of activities under this phase is to develop and query analytic tools that can be used to model the likely impacts on agriculture under different biophysical and policy scenarios. The model will be used in tandem with a stakeholder dialogue to help keep focus on issues that matter and to ensure modelling results can be clearly communicated to audiences, both at the farm and at the policymaker level.

The Environmental Policy Impact Calculator (EPIC), the main modelling engine used in this phase of WP5 was developed by USDA-ARS and TAES in the late 1980s. The model has been continuously upgraded over the years. The latest version is EPIC0509 (2005). The model has the following advantages:

- Can be freely downloaded from internet with access to source code.
- Coupling of GIS with EPIC – GEPIC, developed by EAWAG (Fig.5.3)

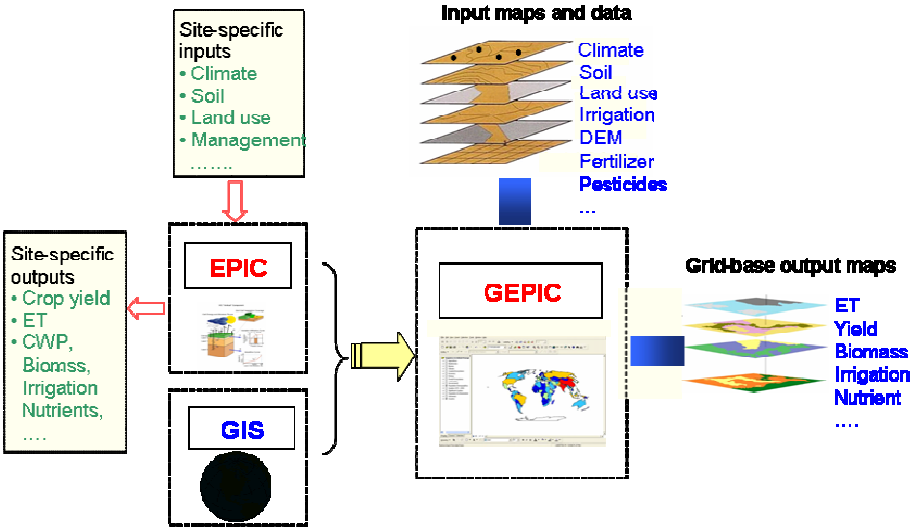


Figure 5.3 GEPIC is coupled model between the Environmental Policy Impact Calculator (EPIC) and a GIS interface developped by EAWAG beneficiary.

GEPIC in the Black Sea Catchment

- A systematic tool to quantitatively estimate effects of changes in any input factor as shown in the above diagram (e.g., fertilizer, irrigation water availability, land use, management, etc.) on crop yield. This information can support WP5 in estimating social benefits of improved GEO info.
- Alternatively, based on the known crop yield, GEPIC can estimate how much input (e.g., fertilizer or water) is used for producing this yield, holding other input factors constant. For example, it can estimate how much of the applied fertilizer is NOT used by crops. The model has been widely used in assessing environmental impacts caused by agricultural practices. The model results can provide useful supporting information to WP4 and other elements of WP5 in assessing the water quality relating to agricultural activities.
- The model can provide visualized results (e.g., maps) with high spatial resolution at any geographic scale (catchment, river catchment, country and continent). The maps can also facilitate the communication with policy makers and stakeholders.
- The model can be used to analyse the effects of land use change and climate change on agricultural water use under various scenarios.
- GEPIC is compatible to the SWAT model. The crop component in the SWAT model is a simplified EPIC model. However, GEPIC is more powerful and flexible for agriculture related analysis.

Sub-regional case studies (lead: IGAR and ONU) Building on the modelling phase, a country level analysis of the agriculture sector will be carried out with focus on agri-environmental issues in Romania and Ukraine. Both countries have significant agriculture sectors with practices that are both subject to the impacts of and affect environmental change, including water and biodiversity. Country-level EPIC GIS runs will help identify potential hotspots, current policy and physical drivers of change, and test alternative national or local measures to help achieve measurably sustainable outcomes.

Task 5.4: Energy (BSREC, USRIEP, ITU) D5.6

The scenarios, based on demography, climate, and land cover changes, will help assess the potential of renewable energy sources (RES). RES development is gradually (but inevitably) becoming one of the priorities for the governments of the Black Sea countries. It is widely recognized that the evaluation of the potential of many of these sources, such as wind, solar, biomass, and hydro energy, is poor in these countries. More precise data obtained via GEOSS will increase the confidence of investors and their creditors in RES installations, and will improve the legislation and regulations related to RES, developed by

the State and regional authorities. Additionally, the forecast (both short term and long term) will help matching energy supply and demand.

The utilization of renewable energy in the Black Sea countries is increasing, driven by promotion measures adopted by the governments of these countries. The utilization of biomass, solar and hydro energies is growing. In the last 5-6 years wind energy has also started its commercial application installed capacity in the Black Sea countries amounts to several thousand megawatts (MW).

In some of the Black Sea countries, there are sufficient data about the hydropower resources, but not about the solar and wind energy. Particularly, the data about the wind energy potential is very poor. There are not enough measurement stations and they do not provide useful data for the wind potential at the height of the wind turbines. For this reason, the potential is measured by the investors individually at each prospective location, for a period of (normally) one year. As a consequence, these data are not representative.

In addition to improved evaluation of the potential of solar and wind energies, GEOSS and especially the scenarios developed within WP3 will help forecast the changes in RES potential, driven by the changes in the climate, pollution, and land use.

Under this task the following activities are planned, with specific focus on solar and wind energy:

1. The ITU team will compile all relevant information available for Turkey's Black Sea region regarding the assessment of the solar and wind energy potential.
2. ITU will also evaluate the appropriateness of the existing solar and wind measurement stations and procedures to collect data (quantity, quality, compatibility) for evaluation of these potentials through representative data. Recommendations will be elaborated.
3. BSREC will assess the solar energy potential in Bulgaria, using all available information, and, based on the scenarios developed within WP3, will develop a forecast of the solar energy potential in the country by 2050.
4. BSREC will assess the wind energy potential in Bulgaria, using all available information, and, based on the scenarios developed within WP3, will develop a forecast of the wind energy potential in the country by 2050.
5. BSREC will make a comparison between the existing methods for measurement of the solar and wind energy potentials and the opportunities offered by GEOSS. The benefits offered by GEOSS will be summarized. Special emphasis will be put on the opportunities of GEOSS to support the work of the International, State, and local authorities in the Black Sea region, as well as to improve their policies.
6. Development of suggestions for improvements in the existing framework and for future work that will need to be done in view of the expected climatic effects. This activity will be carried out jointly by ITU and BSREC.

Task 5.5: Health (ITU, TNU) D5.7

Public health mainly depends on safe drinking water, sufficient food, secure shelter, and good social conditions. These requirements are strongly affected by social, political, economic, environmental and technological factors, including urbanization, affluence, scientific developments, individual behaviour and individual vulnerability (e.g., genetic makeup, nutritional status, emotional well-being, age, gender and economic status) (EPA 2007).

A changing climate should be considered as one of the main factors affecting the health by changing all mentioned issues especially the health. According to the report published by World Health Organization (WHO) climate change on one hand directly affects health by means of heat waves, air pollution, aeroallergens and other extreme events such as storms, floods, droughts and cyclones. On the other hand, it has indirect effects on health by causing social and economic disruptions, vector or water borne infectious diseases and by affecting the food production and supply (WHO, 2003). Since the consumption of the water is the fundamental requirement for surviving, any kind of effects of the climate change on the water quality and the quantity should be considered as serious threats on human health.

Within the context of complex relationships between human health and water quality, water quantity, sanitation and hygiene, heavy rainfall events can transport terrestrial microbiological agents into drinking-water sources resulting in outbreaks of cryptosporidiosis, giardiasis, amoebiasis, typhoid and other infections. Additionally, global warming is expected to lead not only changes in the marine environment that alter risks of bio-toxin poisoning from human consumption of fish and shell-fish but also increases on surface water temperatures which can increase the occurrence of algal blooms that may affect human health directly. Besides, the changes in surface water quality and quantity are likely to affect the incidence of diarrhea diseases and climate can increase directly the amount of pathogen in the water through increasing the biotic reservoir of the infectious agent (cholera) or by decreasing the amount of water in a river or a pond and thus raising concentration of the bacteria (typhoid).

In the frame work of the Task 5.5, the impacts of the climate, land use and demographic scenarios on primarily water quality and quantity will be assessed on Public Health. In this concept, first a preliminary work will be executed with epidemiologists in the medical field to outline the environmental factors affecting human health. Epidemic diseases especially in terms of diarrhea caused by environmental factors will be determined and they will be classified based on their sources using existing reports published by WHO and EPA (WHO 2003, WHO 2006, EPA 2007).

In the second stage, the scenarios developed in WP3 and the hydrological models introduced in WP4 will be assessed to determine the risk areas with a high potential for breed diseases. Integrated remote sensing data in Task 2.4 will be used to classify the vegetation cover, landscape structure, and water bodies temporally.

In this work package a system will be implemented, which assesses the imported data obtained by WP3 and WP4 in terms of health and gives the results of the assessments as cartographic thematic maps. Spatial and temporal analysis will be executed through the implemented GIS to determine the health impacts of changes in land use and land cover especially by means of water bodies.

Experiences gathered in previous studies (Ulugtekin et al, 2005; Ulugtekin et al, 2006 ; Alkoy et al, 2007a; Alkoy et al, 2007b; Ulugtekin et al, 2007a; Ulugtekin et al, 2007b; Bektas and Goksel, 2005; Goksel et al,. 2003; Goksel et al., 2004; Seker et al., 2005) will be used to evaluate the results of this project.

Task 5.6: Disasters early warning (SPSU, IGAR, VITUKI, SORESMA) **D5.10**

1) Invasive species: (SPSU, IGAR)

Outbreaks of invasive alien species and accidental oil spills are among the most important human activities-related disasters for the Black Sea region which require development of relevant regional early warning system (EMS). Also, the early warning systems are considered as essential components of a holistic (cumulative) risk-based management of European river catchments (Brack et al. 2009). Effective monitoring and rapid detection system along with online transmitter of essential information to the level of decision-making are the most important components of the EMS.

The objective of this task is to develop such system for the Black Sea area and test it for both invasive alien species introductions (IAS) and oil spills for possible further application for other environmental stressors.

In case of IAS introductions, we suggest to use the monitoring and rapid detection information collected in the Black Sea catchment by members of the project consortium and experts of the European Research Network on Aquatic Invasive Species (ERNAIS). The ERNAIS activities are supported by online services by the Regional Euro-Asian Biological Invasions Centre (REABIC) and the European Commission supported e-journal “Aquatic Invasions”. Both ERNAIS and REABIC were already recognised by the European strategy on invasive alien species as relevant mechanisms of IAS-related information dissemination on regional and Pan-European levels (Genovesi and Shine 2004). The concept of the ERNAIS e-journal *Aquatic Invasions* as an essential part of the developing European early warning system on aquatic invasive species was first introduced in 2006 (Panov and Gollasch 2006) and during 2006-2007 it was implemented under support of EC FP6 Integrated Project ALARM (Panov et al. 2008b).

During implementation of this task we will develop software for linking the online regional Risk Assessment Toolkit of IAS, serving as interactive transmitter of primary information on IAS from data providers upwards to the level of decision-making, with *Aquatic Invasions* information system, with the latter as essential component of this novel information technology on invasive alien species, by protecting the authors' rights on primary geo-referenced data of IAS records from monitoring and biological survey efforts, thus facilitating the flow of essential information needed for decision-making processes (Fig. 5.4) (Panov et al. 2008b).

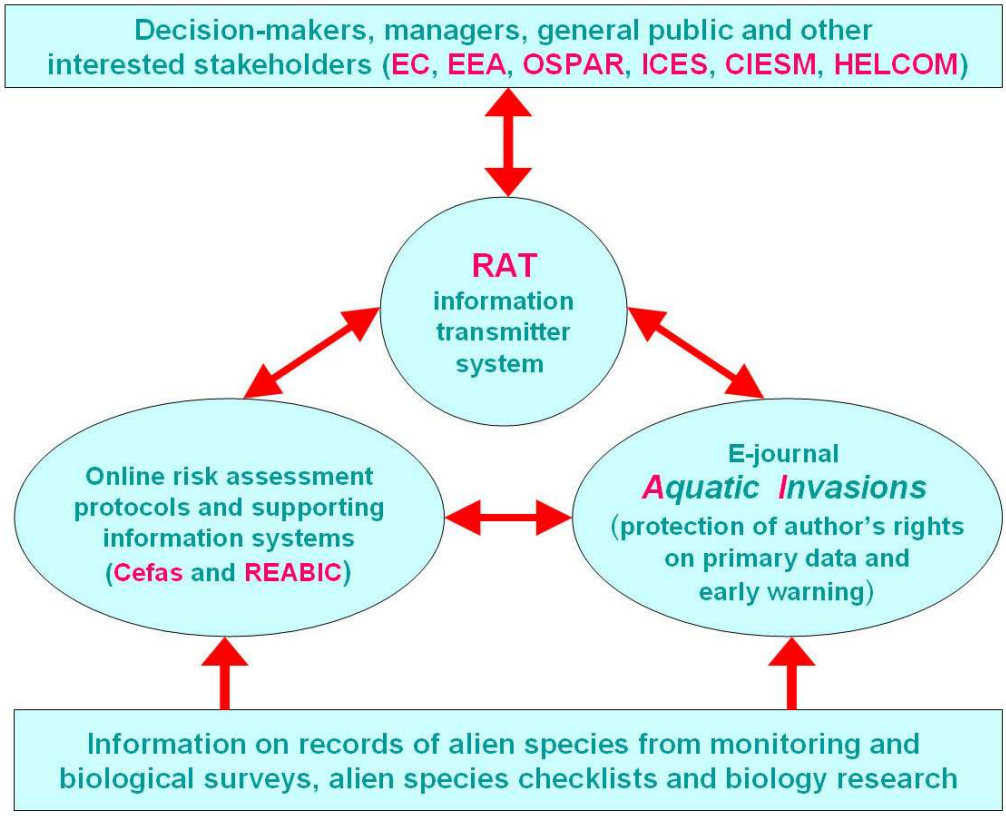


Figure 5.4. Conceptual presentation of the early warning system on invasive alien species (EWS IAS), modified from Panov and Gollasch (2006).

2) Contribution to flood early warning systems (VITUKI, SORESMA)

Among experts it is widely accepted that flood protection is not simply an engineering problem which can be solved by technical measures only. In fact, the foundation of current European flood research activities focuses on a more deliberate and transparent discussion of flooding risks. It has become generally accepted that floods are a recurring natural phenomenon and complete protection against flood damage (no risk) is an illusion. Following this approach, it has been frequently stated that only an adequate combination of structural and non structural measures is suitable to provide efficient strategies for successful flood risk management. Forecasting and early warning systems for floods are therefore needed.

Exemplary for non structural measures for flood mitigation, also mentioned in task 5.6.3 as part of risk management, this sub-task will focus on early warning systems (EWS) for floods. Main targets are collecting information of the state of EWS in the Danube Catchment including tributaries and the way of communication to the public. Experiences and benefits from the different systems get evident. Recommendation for harmonisation and development of EWS will be given as results.

To increase the territorial scope of some ongoing European efforts to create and extend flood early warning at international level could encapsulate the whole Black Sea Catchment or major parts of it. European Flood Alert System (EFAS) initiated by the European Commission to support National Hydrological Services in their longterm flood forecasting. The system for transnational river catchment is under development and since July 2005, JRC IES started providing real-time flood information 3-10 days in advance int he frame of EFAS. Already considerable efforts have been put to create a Danube nod for the system. Applications for the region are expected as the result of the ongoing **PREVIEW** - **PREV**ention, **I**nformation and **E**arly **W**arning pre-operational services to support the management of risks Integrated Project EU with work packages related short and medium range flood forecast (EU 516172 Integrated Project.)

To improve the system further, meteorological and hydrological data needs are supplied the European Terrestrial Network for River Discharge (ETN-R) and Euro Flood GIS programmes.

The mission of the flood component is to enhance the existing scientific knowledge and organisational experience at the regional level. As far as possible common issues with drought forecasting will be used and flood forecast dissemination will be combined with drought forecasting dissemination in the design of an extreme event forecasting centre.

Objectives

- To define common indicators of extreme events.
- To optimize the use of meteorological forecasts for flood forecasting and warning.

During the last decades the knowledge on flood hydrology has improved significantly and major advances have also been made in the forecasting of floods. The various objectives all aim at the improvement of flood warning and forecasting in transboundary catchments that still suffer lacks of knowledge and data.

More precisely this task will explore:

- the definition of flood indicators in various types of catchments and their role in flood formation
- the possibilities of use of low-technology forecasting techniques in various types of catchments in the Black Sea.
- Medium and long term assessment and warning for snowmelt induced floods
- Improve international dissemination of applicable forecast tools and exchange of input data including meteorological forecasts and products.

3) Flood Risk Assessment in the context of analyzing the vulnerability of the Black Sea Catchment in the past, present and future. (VITUKI, SORESMA)

A spatially wide distributed system like the Black Sea Catchment is subjected to severe flood impacts like the extreme flood events in the years 2002, 2005, 2006. The purpose of this sub-task is to develop and test a concept which could be widely applied to assess flood risk.

Major efforts have been put under EU Water Directors to promote the application and use of state –of-the-art knowledge and techniques in the field of flood management EU Best Practices on Flood Prevention, Protection and Mitigation and EU Communication on flood risk management, COM(2004)472 The recently accepted EU Floods Directive (2007) requests to compile flood hazard maps for the territory of member countries. Flood risk maps are also planned in the medium term plans. Major technical capacity is under mobilisation and harmonisation of these efforts is an eminent goal together with the possible sharing and extension of those for the entire Black Sea Catchment. [Action Programme for Sustainable Flood Protection in the Danube River Basin (ICPDR, 2004).]

In general, flood risk is characterised by a random event (exposure), exceeding a given threshold level (resistance or capacity), its probability of occurrence (expressed by a probability distribution function) and the consequences (response function, vulnerability). As a random event the exposure is, for a given amplitude, deterministic ascertainable and therefore predictable by means of forecasting systems. For the river reaches in the Black Sea Catchment the protection level (resistance) is given by normative approaches, defined discharge levels or if no mitigation measure or strategy is set by the river morphology itself.

Probability distribution functions can be extrapolated and derived by historical data sets if they are available in adequate time scales. Still remaining but crucial is the estimation of the vulnerability to be able to warn target populations about risks of the considered system. Provided that a methodology and data is accessible the social, ecologic and economic vulnerability can be assessed. The scarceness of data and methodologies to assess flood risks and possible damages related to the ecology, economy and social systems leads to the need of developing a tool which is applicable to major parts of the Black Sea Catchment. This sub-task focuses on the finding of a methodology which is negotiable to all parts and countries in the Black Sea Catchment. By conducting a few selected case studies the data base will be provided to be able to develop ex-ante damage functions by mapping and surveying the utilisation of the considered area and linking them with the anticipated exposure. The assessment tool should provide the basis to assess direct, indirect, tangible and intangible losses in the flood prone area. Based on defining the exposure, affected utilisations, the vulnerability and the consequences a broad accessibility ought to be guaranteed.

To be able to develop flood risk management plans on different institutional levels, flood mitigation measures by means of structural and non structural measures (e.g. flood early warning, sub-task 5.6.2), alarm plans and the assessment of social, economic and environmental impacts the development of a flood risk assessment tool is a major and indispensable task and will be conducted in the sub-task 5.6.3.

Task 5.7: Assessing sustainability and vulnerability (UNIGE, EAWAG) D5.3, D5.8

Sustainable development is a high level policy priority of both the EU as well as most countries in the Black Sea catchment. In order to translate it from a high level goal into an operational concept, the impact of past, current and future activities needs to be analyzed from the point of view of their impact on sustainability outcomes. The analysis requires the identification of sustainability criteria and if possible, specific goals and targets, and a tight set of sustainability indicators. Both the criteria and indicators need to have scientific validity but also reflect stakeholder perspectives. For the purposes of this WP we adopt the conceptualization of vulnerability by Turner et al. (2003) as simplified for the GEF Lake Balaton project (Fig. 5.5). The analysis will consider both internal and external processes in the context of functional exposure units, which may range from the entire catchment to sub-ecosystems.

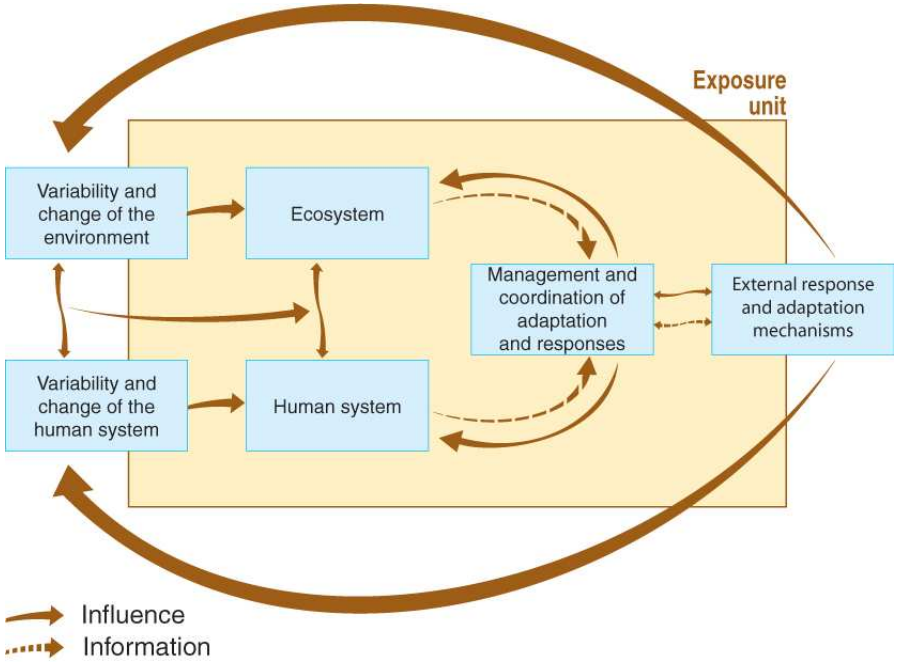


Figure 5.5: Conceptual framework for integrated vulnerability and sustainability analysis (IISD 2006)

Through channelling data flows from multiple sources into integrated analytic models, EnviroGRIDS will elevate our ability to carry out sustainability assessment on real-life policy issues to a new level. The analytic engine in EnviroGRIDS will satisfy two key requirements for understanding sustainability implications of policies and activities: it will provide improved data at least for some key environmental indicators and through the use of relevant models it will help project impacts into the future. The analysis of sustainability under this Task will also require looking at the thematic, temporal and spatial interlinkages between ecological and social processes to identify potential vulnerabilities and implications for sustainability that emerge at their interface and that may not arise from narrow thematic analyses. Identifying priority sustainability concerns will involve technical analysis of current and projected trends and interactions, but will also involve participatory work with local stakeholders who are often already aware of key sustainability issues and would have to play a key role in conceptualizing and implementing adaptive responses.

Activities under this task will include the following:

1. Initial scoping to identify key vulnerabilities / sustainability concerns on the interface of societal benefit areas, with emphasis on processes that affect aquatic ecosystems. This work involves active stakeholder consultation where issues are identified and mapped using a simple version of the DPSIR framework. This work will also rely on integrated vulnerability assessment methods
2. Characterization of a selected set of priority issues using a common indicator system across the different SBA. Rather than reinventing new measures, EnviroGRIDS will where possible operate with indicator systems developed and accepted at the European level, while in a second tier allow for the application of context-specific measures. This approach would help further integrate the use of Europe-wide measurement systems that are critical for monitoring progress towards common objectives, not the least those associated with the EU's Sustainable Development Strategy, but at the same time also allow member states and others entities to customize their information and seeing themselves as a unique part of a cohesive whole. Where possible, this work will also help identify high level policy goals and indicator specific targets.
3. Development of vulnerability / sustainability projections using a Stella-based meta-model taking, where relevant input from other thematic submodels (such as EPIC) developed through the project. Projects to be improved through cycles of interaction between modelers and local stakeholders.
4. Identification of adaptation options that take both stakeholder capacity and interactions / synergies among the various sustainability issues into account. Future adaptation options will be developed on the basis of analyzing past adaptation experience and emerging adaptation needs.

WP 5 Deliverables (month due) [responsible beneficiary]

D5.1 Analysis of retrospective data, selection of indicators and ecological groups of species, control plots and parameters to assess risk factors and impacts of climatic parameters. Organisation of monitoring. (24) [SPSU, IBSS]
D5.2 Baseline analysis of agri-environmental trends, impacts and vulnerabilities (24) [EAWAG]
D5.3 Reports on identifications and qualitative assessment of priority vulnerability and sustainability issues (24) [UNIGE]
D5.4 Risk Assessment Toolkit and DSS. The online Risk Assessment Toolkit and Decision Support System for introductions of invasive alien species for the Black Sea catchment (36)[SPSU]
D5.5 GEPIC model for the entire Black Sea catchment, validated through stakeholder dialogue, plus country specific model runs for Romania and Ukraine (36) [EAWAG]
D5.6 Assessment of the wind and solar energy potential, and improved policy for their promotion (36) [BSREC]
D5.7 Report on Impacts of water quality and quantity change on public health (36) [ITU]
D5.8 Synthesis of vulnerability and adaptation issues for the Black Sea region (42) [EAWAG]
D5.9 Realization of monitoring, final preparation of databases, reporting (48) [IBSS, AZBOS]
D5.10 Black Sea catchment Disaster Early Warning System. The online regional Early Warning System on main environmental disasters, including first records and outbreaks of invasive species and oil spills (48) [SPSU]
D5.11 Report on the Biodiversity societal benefit area (48) [SPSU, AZBOS, ITU]

Work package no.	**6**												**Starting month**	**1**
Work package title		**Black Sea Catchment Observation System**												
Activity type		**RTD**												
Partic. No.	**25**	**15**	**24**	**8**	**18**	**6**	**10**	**5**	**23**	**21**	**19**			**Total**
Partic. Short name	**UTC**	**IHE**	**USRIEP**	**CRS4**	**INHGA**	**CCSS**	**DHMO**	**BSREC**	**UAB**	**SORESMA**	**ONU**			
Person-months per beneficiaries	**71**	**36**	**38**	**58**	**12**	**28**	**4**	**6**	**6**	**9**	**4**			**272**

WP 6 Objectives

Practically, the objectives can be summarized as follows:

- To strengthen Black Sea Catchment network of active players in the field of Observation Systems
- To start developing a Black Sea Catchment Observation System (BSCOS) providing services to GEOSS, INSPIRE, UN-SDI (Fig 6.1)
- To make the processed information on future regional vulnerability available through the Internet to warn concerned populations and authorities
- To create a portal tool on the Internet to guide adaptation strategies aimed at addressing issues of water resource vulnerability

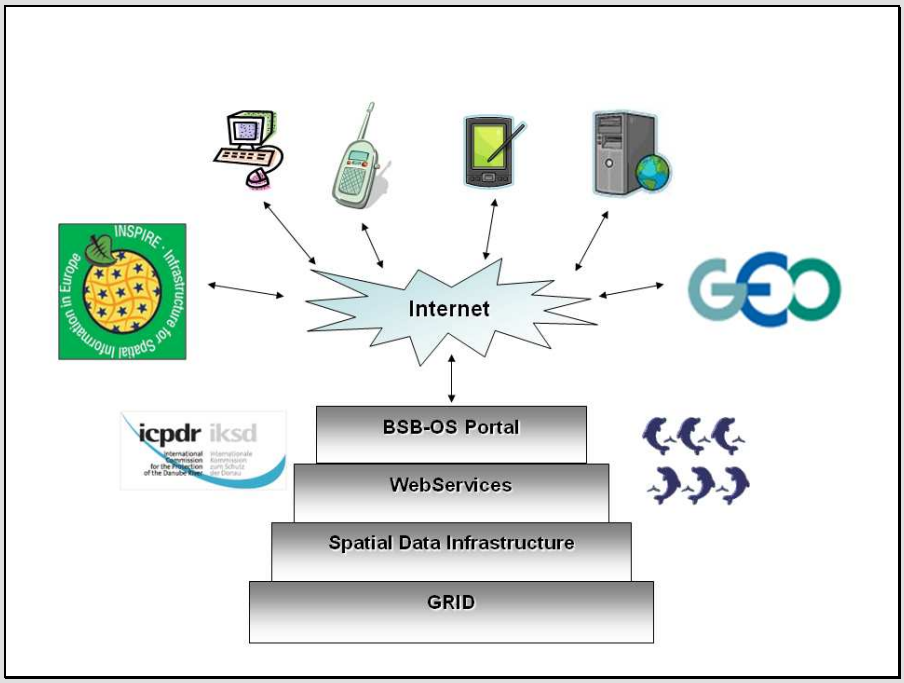


Figure 6.1 Black Sea Catchment Observation System complete with a portal the EnviroGRIDS Spatial Data Infrastructure

WP 6 Description of work

This WP organises all the activities of the project that relate to developing a Black Sea Catchment Observation System (BSCOS) in a harmonised way and takes the responsibility of the quality control of these activities.

The overall objective is enhance the use of EnviroGRIDS SDI with an Observation System centred on two specific goals; to raise awareness of Societal Benefit Issues of the general public and to build regional capacities on GEO and INSPIRE new standards and approaches.

In the first place, the outputs of the EnviroGRIDS will be brought to the general public by developments of a Graphical User Interface and visualisation tools, and in providing guidance and help functions for the entire computer based knowledge sharing through a WebPortal and platform.

In a second place, the BSCOS will be used and tested with decision-makers.

WP6 is divided in 3 tasks under the supervision of UTC beneficiary:

Task 6.1 Building regional network of GEO partners (USRIEP, CCSS, UTC + Black Sea Catchment partners) D6.1, D6.2, D6.3

The objective of this task is to strengthen Black Sea Catchment network of active players in the field of Observation Systems. Partners located within the Black Sea Catchment will activate and expand their own network to encourage a broader community to adopt and support the GEOSS philosophy of data sharing for a more sustainable environment. These efforts will be supervised and monitored by the USRIEP beneficiary in order to assess progresses made.

To support effective exchange of knowledge and information, CCSS will build a Uniform Resource Management (URM) platform that will be integrated within BSCOS Portal and EnviroGRIDS Platform. The main objective of URM will be easy description, discovery and validation of relevant information sources. URM will ensure that any user can easily discover, evaluate and use relevant information. The free text engine (e.g. Google) cannot be used due to the fact in many cases user obtains thousands of irrelevant links. This happens because the free text engines do not fully recognize the context of information they are looking for. The context makes particular any information, knowledge and observation. The context determines the meaning and the manner in which information is used. Presently, the Uniform Resource Management (URM) solution is implemented by the AJAX technology (WEB 2). It supports information management on the portal and context awareness knowledge discovery by the new concept of URM. The URM concept has been defined and developed through the NaturNet-Redime project and extended by c@r to support knowledge sharing inside the community by metadata and catalogue standards based description and discovery.

Task 6.2 Black Sea Catchment Observation System for decision-makers (CRS4, UTC, SORESMA)

D6.5,D6.6,D6.8

This task aims at developing a Collaborative Management Tools to support adaptive strategies to face issues of water and soil resource vulnerability. The tools assist the decision-makers, in the field of sustainable water resources management. The users access the main functionality through the BSCOS Portal (see Fig. 6.1), available in several languages spoken by the partners. The portal is based on an experimental Collaborative Working Environment (CWE) for environmental sciences that relies on the hydrological OpenMI models and DB-GIS technology. The experimental CWE environment is based on the EnviroGRIDS SDI, that is a set of web and grid services through which the system store, manage and query data collections, run real-time applications and map the results. Complex environmental models and pre/post processing GIS tools will be used to model, analyze and visualize environmental dynamics.

The BSCOS portal will:

- Analyze pressures on the environment and climate from natural and anthropogenic emissions and improve our understanding of the complex climate system of the Black Sea region;
- Identify critical areas (e.g. the major contributors to nutrient losses or affected by desertification processes) and prioritize critical sub-areas in order to develop a multi-year management analysis. This analysis can be essential, for instance to reduce the nutrient impact from point and non-point source pollution to downstream water bodies;
- Design climate change scenarios and evaluate their effect (from the global to sub-regional scales to assess possible environmental changes, ecological and socio-economic impacts and critical thresholds). Observation, analysis and modeling must be used to assess climate induced changes to the water cycle, nutrient cycle and to the sediment fate (e.g. soil erosion);
- Design sub-regional and regional remediation strategies and evaluate their effectiveness using a standardized framework (DPSIR framework). DPSIR is the causal framework for describing the interactions between society and the environment. It was adopted by the European Environment Agency, and states for Driving forces, Pressures, States, Impacts, Responses.
- Run complex models and produce report on a friendly environment;
- Improve model usability to aid in making management decisions and watershed-scale (multi-scale) modeling to address more realistically the fate of multiple pollutants in multiple environmental media;
- Address the subjects related to data archiving, distribution and interpretation through the use of interoperability standards and standardized procedures;
- Improve capabilities for coordinating, accessing, using and sharing environmental data, information and services;
- Improve public consciousness for environmental problems and strategic remediation strategies on the local/regional/national scale;
- Deploy new applications exploiting the TEMPLATE TOOLKIT, PERL, and XML technology;
- Manage contents and layout (Content Management System - CMS) in an easy fashion.

The portal will be developed using free software and in-house technologies to transparently and automatically deploy the applications. Data objects will be natively digested by the CWE environment, allowing Web services to be exposed for data mapping, querying and sharing, processing and output distribution, using secure connections through the Web interface. The CWE framework can be thought as an easy to use open interoperable, scalable, and extensible development framework for constructing spatially enabled Internet- applications.

The system will be developed to be cross browsed by the usual navigator such as Internet Explorer, Mozilla Firefox etc. No any external program or plug in will be required. The complexity functionality is supported only by the server side, through the BSCOS EnviroGRIDS SDI. The software will be made of different layers, where the web portal is its front end. The interoperability layer will be called to transparently share heterogeneous data sources (distributed databases and file systems) and collaborative computing resources, while the web-service layer will command data management tools and numerical applications. Distributed storage and computing resources will be accessed through the portal. The web-service layer is expected to supply an abstraction layer between the archives/computing resources and the actual computing tasks performed for running applications, geo-processing and data dissemination mechanisms.

The CWE environment will be based on the TEMPLATE TOOLKIT (http://www.template-toolkit.org/) framework, which is a fast, flexible, and highly extensible template processing system. With its wide support of operating systems and application servers, our framework will allow to deploy innovative applications with a new approach on the web or easily integrate existing applications. The portal will allow web designers and developers to concentrate on generating web applications (e.g. constructing web GIS, charts and graphs directly on the web) without getting bogged down in programming matters, making the whole process of developing, updating and maintaining web applications significantly easier.

The portal will also support a web based live programming environment exploiting the PERL and XML technology making the programming features available to developers with almost-zero learning curve. This increases developer productivity by reducing scaffolding code when developing web, GUI, database, GIS or applications.

The GIS rendering will be optimized using Open Source technologies, such as the MapServer for the GIS rendering. This will be accomplished, exploiting the scripting languages capabilities to access the MapServer CGI and OGC (WMS, WFS) interfaces. MapServer can work as a map engine providing a spatial context where it is required. The GRASS (Geographic Resources Analysis Support System) technology will also be employed within our system for the processing and analysis of the geo-databases.

On the client side AJAX (web 2.0) technologies, such as the msCross[2] cross-browser interface developed by CRS4, will be customized and further developed to allow users dynamically display and browse the geographical information layers. In this way the CWE will inherit all the Geographic Information System (GIS) capabilities granted by these technologies. Through it, our web based system aspires to become a state-of-the-art tool (desktop-like) for the geospatial data management and analysis, image processing, graphics/maps, spatial modeling, and visualization productions.

Particular attention will be paid to support a multitude of raster and vector data formats (ESRI shapefiles, PostGIS, Oracle Spatial, MySQL, Open Geospatial Consortium (OGC) web specifications WMS and WFS etc.) using open source libraries such as GDAL (Geospatial Data Abstraction Library) and OGR (Simple Feature Library). Thus it is proposing that a single and comprehensive PostGIS geoDatabase be used as repository of OpenMI simulation output.

The demand of Web-based human interaction in a lot of situations, scenarios and applications is still unsupported. The portal will sustain user and group awareness, and communication facilities such as that based either on dynamic group building or static acquaintance groups, and cooperative navigation. This feature will be enhanced by investigating more generic group building mechanisms and effectively working on cooperation support for structured activities.

The portal will be based on the concept of groups and roles (e.g. administrator, developer/modeler, environmental manager and public). The public environment for the citizen will be designed to completely hide the complexity of the system, to produce reports on the environment and to easily access updated information. The other roles will have an increasing degree of freedom but conversely a higher complexity/potentiality. Part of the work will be devoted to interact with non technician and experts in the different fields to improve the usability of the web interfaces. The CWE framework, through the TEMPLATE TOOLKIT and the script programming, will also permit to design new applications, the easy assessment, customization and exploitation of services (wiki like) directly on the web browser. At an advanced stage of the project each beneficiary of the consortium and regional/national water agencies within the Black Sea area will be enabled to contribute to the deployment of new environmental applications and analysis tools. On line manuals and guided examples will be made available to use the system. The web portal will be deeply improved, benefiting from this enlarged collaboration group, exposing even more innovative and useful environmental applications.

One solution for the Web portal will be based on BASHYT, an innovative software package developed in Sardinia by the ERA Progetti group, entirely built with open source technologies, to consume and expose Web services for data mapping, querying and sharing, processing and data distribution, with a high degree of freedom.

Task 6.3 BSC Observation System for citizens (UTC, IHE, INHGA)

D6.4, D6.7,D6.9

The main focus of this task is the development of a web platform for knowledge dissemination that will also enable active and collaborative citizens' participation in environmental resources management, with emphasis on fresh-water resources through integrated River Basin Management (RBM). It is quite obvious that dealing with the complex environmental problems requires cross-disciplinary approach through virtual organizations over the web-based environment. This approach offers significant advantages in reducing costs

and increasing efficiency of environmental management, but, more importantly, facilitates the sharing common interests and objectives among different agencies, but also among the concerned citizens. Not only efficiency criteria, but also citizenship as a fundamental democratic concept in Europe, require facilities for citizens' active involvement in environmental management.

This task will rely heavily on the work carried out in the previous work packages (particularly WP3, WP4 and WP5), and on task 6.2 of WP6, using the CWE infrastructure for provision of environmental information. The main focus of this task is to develop adaptive components for custom-based content delivery to various actors in Integrated River Basin Management (IRBM) and concerned citizens. This customization will not be limited to the appropriate content and form and the spatio-temporal scales as required by various users. It will also cover a proper description of the decision making context in a given river basin so that the main actors and their inter-relationships will be considered together with the descriptions of the physical system and the problem at hand. This approach will enable the informed citizens' involvement through the process of learning about the social and physical aspects of a given river basin.

Translating this information into useful information for citizens is the main thrust of this task. It will be developed for two main purposes:

1. Involvement of citizens in long term river basin planning
2. Near real time dissemination of environmental data and information

For the first purpose the primary platform will be the web, and the primary communication vehicles will be map-based mashup applications, together with supporting descriptions formulated within the DPSIR framework. The main feature of the system will be the possibility to learn not only about the pressures, impacts, and remediation strategies on catchments and sub-catchments scale, but also to enable learning the effects of these interventions at the level of the individual citizen's interest (individual house, street or city section). This second requirement depends on on-request integration and mashing of the modeling results and other data within detailed map representations. To enable this functionality, relevant data and model results will be implemented as services using the Service Oriented Architecture (SOA).

The second purpose will make use of the developed infrastructure of integrated data and models to deliver real-time data and forecasts on various environmental aspects (floods, pollution etc).While this information will be delivered on the web in a similar way as above, the system will extend these services to clients like mobile phones and /or other GPS enabled devices. The obvious advantage of this approach is the speed of dissemination and the possibility of reaching mobile citizens, which are crucial in managing critical situations. However on-request dissemination through mobile devices has wider benefits beyond critical situations. The interfaces on the mobile devices for formulating the user requests will be developed with existing technologies for mobile phone applications such as Java Micro Edition (ME). The back-end of the system will be again composed of software components implemented as SOA services, while knowledge presentation on the client devices will make use of existing mapping platforms such as Google Maps.

The task accomplishment will consist of several steps:

- Generic conceptual design of prototype systems for (1) Involvement of citizens in long term river basin planning, and (2) Near real time dissemination of environmental data and information, based on the infrastructure from task 6.2;
- Identify two pilot case studies from two regions in the Black Sea region, one close to the sea coast and another in the upstream catchments. For these two pilot case studies, the main actors involved in river basin management activities will be identified, together with their respective responsibilities. Data, model results and predictions for future scenarios will be associated with these actors and their responsibilities. The aim will be to present to the citizens of the regions an integral view which will cover both the physical / environmental aspects of the issues at hand and the social / institutional actors involved;
- Development and deployment of prototype systems for (1) Involvement of citizens in long term river basin planning, and (2) Near real time dissemination of environmental data and information, which will be applied in the two identified regions;
- Prototype testing with selected user groups involving relevant institutional stakeholders and citizens;

- Report including conclusions, lessons learned and assessment of potential for expanding the applicability of such systems to other fields of citizen's concern, beyond water (such as health, and energy).

WP 6 Deliverables (month due) [responsible beneficiary]

D6.1 Requirements and specifications for the development of BSCOS Portal (12) [UTC].

D6.2 Report and URM for regional involvement of GEO partners (24) [USRIEP]

D6.3 First implementation of the portal and adaptation of the BASHYT CWE (24) [CRS4].

D6.4 Report with the generic conceptual design of the BSC Observation System for citizens and a full description of the pilot case studies where the prototype applications of the BSC observation system for citizens will be implemented and tested (24) [IHE]..

D6.5 BSCOS EnviroGRIDS SDI supporting description, discovery, and validation of relevant information over the EnviroGRIDS community. Development guides and technical documentation (24) [CCSS]

D6.6 Guidelines on integration of EnviroGRIDS services developed by different partners through BSCOS Portal (30) [CCSS]

D6.7 Inclusion of CWE framework into BSCOS Portal, and tools and applications for citizens through BSCOS Portal (36) [UTC].

D6.8 CWE framework is available to the partners to design their own applications and upload scenarios and data. Technical reports and seminars. Scenarios of interest run through Web Portal. Environmental regional agencies will be involved in the development/testing of the interfaces and services. On line help and guiding material (42) [CRS4].

D6.9 Functional prototypes of BSCOS for citizens available on the web, together with reports from tests with user groups (48) [IHE].

Work package no.	**7**								**Starting month**	**1**
Work package title	**Dissemination and training**									
Activity type	**OTHER**									
Partic. No.	**21**	**15**	**25**	**16**	**12**	**4**	**20**			**Total**
Partic. Short name	**SORESMA**	**IHE**	**UTC**	**ICPDR**	**Geographic**	**BSC PS**	**SPSU**			
Person-months per beneficiaries	**18**	**20**	**9**	**12**	**16**	**18**	**14**			**107**

WP7 Objectives

Practically, the objectives can be summarized as follows:

- To build capacity of end-users in the Black Sea catchment for the domains of EnviroGRIDS; thereby contributing to the Global Earth Observation System of Systems (GEO) by means of workshops, conferences and virtual platforms
- To distribute data and open source software for local implementation of different models used within the EnviroGRIDS project on DVD and the Internet
- To promote the sustainability of partnerships and enhance local ownership of the data and outcomes

WP7 is divided in five tasks under the supervision of SORESMA beneficiary:

Task 7.1 End-user communication and conference (SORESMA, ICPDR, BSC)

D7.1, D7.2, D7.5, D7.11, D7.15, D7.16, D7.17

Production of multi-lingual leaflets, newsletters, policy briefings and end-user deliverables

A project webpage will be developed and implemented under the activities of WP1. This work package will provide input for external communication. This includes the announcement of dissemination, training and stakeholder involvement activities. Information on the projects's progress will be communicated by means of annual newsletters in the different languages of countries belonging to the BSC. Policy briefings describe the lessons learned and recommendation. Deliverable reports with outcomes from the other WPs, intended for end-users and/or the public. Deliverable reports with outcomes from the other WPs, intended for end-users and/or the public, are placed publicly on the website as well. As well, the most important documents will be translated to enhance the impact to Black Sea end-users. A limited list of end-users is already set-up. The group of end-users however will be extended throughout the work of WP6, where end-users will be actively invited and supported to take part in the different workshops and as well in training organised .

Organisation of a final conference

A final conference will be held to present the outcomes of the project and the plans for further use of the observation system. It will be organized in association to the last project meeting.

Outreach to international platforms

Communication activities are as well targeted to higher level policy processes and international platforms able to influence the development and implementation of policy in the Black Sea Catchment. This will be facilitated through many international platforms such as UNEP/GRID, UNEP/GEO, UNESCO/GOOS, the UNSDI initiative, EC/GMES with links to those via partners in this project. Other key partners have extensive international networks. The Project will generate important policy lessons that will be applicable at this level. This will be a means to greatly magnify the scope of impact of the project's research and development activities. To achieve this, the Project partners will develop a strategy early in the project in which they will identify the most important policy and implementation process targets and the key institutions and fora to engage during the project. The strategy will capitalise on the current engagement of several partners in related processes and seek to benefit from their participation and networks. A strategy for outreach to international platforms will enhance the impact of EnviroGRIDS.

Development of an after-life plan to ensure the continuity of the project and to clarify the ownership of the data and project outcomes

To clarify the ownership of the data as well as to ensure a sustained engagement of the end-users, an after-life plan (post implementation plan) will be setup with active involvement of the end-users. An after-life plan aims to ensure the use of the developed system and obtained data when the project stops.

The after-life plan aims 1) to consolidate the build up capacity in the Black Sea Region, 2) to clarify the ownership of the obtained data and outcomes, 3) to consequently transfer project outcomes, data, tools and guidelines, 4) to institutionalize the activities, 5) to ensure the updating of the developed systems and 6) to include lessons learned.

This plan will essentially concentrate on the needs of the BSC and ICPDR partners by making sure that they can continue to use the spatial data infrastructure built during the project, as well as the Observation System.

Task 7.2 Organisation of workshops and training (IHE, SORESMA, Geographic + all partners) D7.3, D7.4, D7.6, D7.8, D7.9, D7.13, D7.14

The objective of this task is to enhance the application and use of EnviroGRIDS system by the organisation of workshops in the Black Sea Region on main topics addressed in EnviroGRIDS and related to GEO work plan such as climate, demographic and land cover change scenarios, hydrological models, impacts on societal benefit areas, local, national and regional sustainability and vulnerability. Technical trainings on Grid computing, sensors integration, hydrological models will also be considered. The target groups are principally the end-users, such as stakeholders environmental managers, ngo's. In addition, trainers-of-trainers, such as senior academics, are invited in order to foresee a transfer of knowledge towards the next generation of water managers to ensure a long-term impact. For this purpose, all training materials are made available to enhance an incorporation of EnviroGRIDS into regular educational programmes. Training sessions are also organised at central locations in Europe to stimulate the transferability of EnviroGRIDS to other river basins.

The overall aim of the workshops is to promote, present and discuss the results and progress made in WP 3, 4 and 5. The specific aims are given in the overview table below. The schedule below is foreseen for the organisation of workshops. Given the high-tech nature of the project, workshops are only organized from month 18 in order to avoid loss of interest by stakeholders.

- 2 thematic workshops around 4 themes: change scenarios, hydrological models, risk assessment and early warning, and sustainability and vulnerability in the Societal Benefit Areas (SBA); the aim of these workshops is to bridge the gap between scientists and authorities; the expected outcome are bottlenecks that inhibit authorities to use the obtained environmental data and recommendations on how to solve these bottlenecks.
- 2 technical workshops focusing on 3 themes: grid computing, data visualization and sensors integration
- 3*3 citizen meetings, i.e. to organize 3 meetings in one period at three different locations in the Black Sea catchment to show non-expert users how to retrieve and look at environmental data.

meeting	target group	objective
citizen meeting	citizens	use of environmental data by non-experts
thematic workshop	authorities and experts	policy-science interface; improve use of data by authorities
technical workshop	experts	clarify technical bottlenecks

Task 7.3 Virtual training center (IHE, UTC) D7.7, D7.12

E-learning modules will be developed that aim at training as many professionals as possible in environmental management and data acquisition that will be delivered to the URM system (WP6). In an e-Learning environment beneficiaries can follow the lectures and complete assignments in their convenient time and being in their countries. By means of the e-Learning Environment beneficiaries can download training material and communicate with trainers and beneficiaries. The following packages will be delivered:

- Understanding and using the BSCOS, URM and Multimedia events
- Environmental management, Integrated River Basin Management and the EU Water Framework Directive
- GEO and INSPIRE framework
- Sensor technologies and integration into ICT
- Risk analysis and risk management (health, floods, drinking water, air,...)
- Use of SWAT and LISFLOOD modelling tools.

The material will have a modular structure that can easily be adapted for regional use (and under translation) according to the target groups. The course will be conducted by the following multi-channel approach:

- Videos
- Slide show with audio explanations
- Slide show with text explanations
- Computer modelling exercises
- Supplementary material
- Interactive forum and individual discussion
- Virtual digital libraries based on URM
- On line video lectures
- Email communication

In addition, cross-continental workshops will be organised using video-conferencing technologies whereby beneficiaries from several regions in the world will be reached and brought in contact to each other.

Open Source video lecture solution, which will support on line training in WP7 will reuse so called multimedia events that can be easily integrated with URM described in WP6.

The EnviroGRIDS tools will increase possibilities of exchange of knowledge and best practices between regions. These trainings will open new possibilities for exchange knowledge of experts in Black see area, but also between region and rest of Europe.

Task 7.4 Scientific dissemination (IHE + all partners)

This task is co-ordinating the dissemination of the research results towards the scientific world through steering peer-reviewed publications, co-ordinate the attendance to relevant scientific conferences, contacting publishers for special issues or special series, organisation of special session in scientific conferences.

Task 7.5 Decision and policy makers involvement (ICPDR, BSC PS) D7.10

This task is co-ordinating the dissemination of the research results towards decision-makers and policy makers. The two Commissions are in a perfect position to help improving the use of enviroGRIDS outputs to policy makers through their existing networks of communication. These Commissions have for instance members of environment ministries of all countries in the Black Sea catchment in their different boards.

More particularly the Commission on the Protection of the Black Sea Against Pollution comprises nationally appointed Commissioners to represent the countries in the Commission, and thus ensure representation at the country level. Expert work is carried out mainly through the Advisory Groups and other activities, however for any scientific or other results to disseminate and translate in political or policy decisions they will be reviewed by the Advisory Groups, and then by the Commissioners.

The final conference will be organized in Istanbul by ITU and BSC in order to gather scientists and policy makers to help filling the gap between science and decision making.

WP 7 Deliverables (month due) [responsible beneficiary]
D.7.1: Flyers on main topics + general flyer on project (in all languages of BS countries) (9) [SORESMA]
D7.2: First newsletter and policy briefing (12) [SORESMA]
D7.3: Report on thematic workshops series 1 (change scenarios, hydrological models, sustainability and vulnerability in SBA, risk assessment and early warning) (18) [UAB, EAWAG, UNIGE, SPSU]
D7.4: Report on citizens meeting 1 region a,b,c (21) [SORESMA]
D7.5: Second newsletter and policy briefing (24) [SORESMA]
D7.6: Report on technical workshop series 2 (grid computing, data visualisation, sensors integration) (24) [UTC, CRS4, CCSS]
D7.7: The Virtual Training centre off-line operational (24) [IHE]
D7.8: Report on thematic workshops series 3 (change scenarios, hydrological models, sustainability and vulnerability in SBA, risk assessment and early warning) (30) [UAB, EAWAG, UNIGE, SPSU]
D7.9: Report on citizens meeting 2 region a,b,c (33) [SORESMA]
D7.10 Policy makers involvement report (36) [ICPDR]
D7.11: Third newsletter and policy briefing (36) [SORESMA]
D7.12: The Virtual Training centre on-line (36) [IHE]
D7.13: Report on technical workshop series 4 (grid computing, data visualisation, sensors integration) (40) [UTC, CRS4, CCSS]
D7.14: Report on citizens meeting 3 region a,b,c (45) [SORESMA]
D7.15: Fourth newsletter and policy briefing (48) [SORESMA]
D7.16: Report on End-conference (48) [SORESMA]
D7.17: Project “After-Life Plan” (48) [UNIGE]

B1.3.7 Efforts for the full duration of the project

Partic. No.	Partic. short name	WP1	WP2	WP3	WP4	WP5	WP6	WP7	Total person months
1	**UNIGE**	24	30	36		6			**96**
2	**ARXIT**		24						**24**
3	**AZBOS**					52			**52**
4	**BSC PS**		18					18	**36**
5	**BSREC**					30	6		**36**
6	**CCSS**		30				28		**58**
7	**CERN**		36						**36**
8	**CRS4**		4				58		**62**
9	**DDNI**			10	8	16			**34**
10	**DHMO**			12	14		4		**30**
11	**EAWAG**				36	36			**72**
12	**Geographic**		18					16	**34**
13	**IBSS**					36			**36**
14	**IGAR**					24			**24**
15	**IHE**		4		30		36	20	**90**
16	**ICPDR**		12					12	**24**
17	**ITU**		24			56			**80**
18	**INHGA**				24		12		**36**
19	**ONU**			10	10	36	4		**60**
20	**SPSU**					46		14	**60**
21	**SORESMA**					9	9	18	**36**
22	**TNU**					36			**36**
23	**UAB**			38			6		**44**
24	**USRIEP**				14	14	38		**66**
25	**UTC**		16		8		71	9	**104**
26	**VITUKI**				16	32			**48**
Total		**24**	**216**	**106**	**160**	**429**	**272**	**107**	**1314**
%		**1.8**	**16.4**	**8.1**	**12.2**	**32.6**	**20.7**	**8.1**	**100**

Project Effort Form 2 - indicative efforts per activity type per beneficiary: Project number 226740 (EnviroGRIDS)

Activity Type	1 UNIGE	2 ArxIT	3 AZBOS	4 BSC PS	5 BSREC	6 CCSS	7 CERN	8 CRS4	9 DDNI	10 DHMO	11 EAWAG	12 Geographic	13 IBSS	14 IGAR	15 IHE	16 ICPDR	17 ITU	18 INHGA	19 ONU	20 SPSU	21 SORESMA	22 TNU	23 UAB	24 USRIEP	25 UTC	26 VITUKI
RTD/Innovation activities																										
WP 2	30	24		18		30	36	4				18			4	12	24								16	
WP 3	36								10	12									10				38			
WP4									8	14	36				30			24	10					14	8	16
WP5	6		52		30				16		36		36	24			56		36	46	9	36		14		32
WP6					6	28		58		4					36			12	4		9		6	38	71	
Total 'research'	72	24	52	18	36	58	36	62	34	30	72	18	36	24	70	12	80	36	60	46	18	36	44	66	95	48
Dissemination activities																										
WP 7				18								16			20	12				14	18				9	
Total 'demonstration'				18								16			20	12				14	18				9	
Consortium management activities																										
WP 1	24																									
Total ' management'	24																									
TOTAL BENEFICIARIES	96	24	52	36	36	58	36	62	34	30	72	34	36	24	90	24	80	36	60	60	36	36	44	66	104	48

B1.3.8 List of milestones and planning of reviews

Milestone	Milestone name	WP	Leader	Delivery date	Comments
1	General Assembly meetings	all	UNIGE	1,12,24,36,48	Meeting report
2	Project Management Board face to face meetings	all	UNIGE	1,6,12,18,24,30,36,42,48	Meeting report
3	Project Management Board distant meetings	all	UNIGE	3,9,15,21,27,33,39,45	Meeting minutes
3	Gridified SWAT code	2	CERN	24	Report and software
4	Launching of project web site	1	UNIGE	1	Internet site
5	Launching of project groupware	1	UNIGE	1	Intranet site
6	Launching of project Spatial Data Infrastructure	2	ARXIT	3	Database
7	Data and metadata standards specification	2	UTC	3	Report
8	Remote Sensing integration guidelines	2	ITU	6	Report
9	Sensor integration guidelines	2	CCSS	6	Report
10	First series of E-learning course	7	IHE	24	Report
11	Specifications for the development of BSCOS Portal	6	UTC	12	Report
12	Report on Gap analysis	2	BSC	12,24	Report
13	Gathering of hydrological data	4	INHGA	18	Report and database
14	Reporting to the EC	1	UNIGE	18,36,48	Project report
15	First newsletter and policy briefing	7	SORESMA	12	Newsletter
16	First workshops series report	7	SORESMA	18,21,24	Report
17	Priority vulnerability and sustainability issues	5	UNIGE	24	Report
18	First implementation of the BSCOS portal	6	UTC	24	Internet site
19	Prototype applications of the BSCOS for citizens	6	IHE	24	Internet site
20	Second newsletter and policy briefing	7	SORESMA	24	Newsletter
21	Outputs from Spatially explicit demographic scenario	3	UNIGE	24,36	Database
22	Outputs from Spatially explicit regional climate scenario	3	UNIGE	24,36	Database
23	Outputs from Spatially explicit land cover change scenario	3	UAB	24,36	Database
24	Calibration of hydrological models		EAWAG	24,36	Report and database
25	Outputs from hydrological models according to scenarios	4	EAWAG	24,36,48	Report and database
26	GEPIC model for the entire Black Sea catchment	5	EAWAG	30	Report
27	Second workshops report	7	SORESMA	30,33,36	Report
28	Integration of scenarios	3	UAB	36	Report
29	Risk Assessment Toolkit and DSS	5	SPSU	36	Internet site
30	Assessment of the solar energy	5	BSREC	36	Report
31	Assessment of the wind energy	5	BSREC	36	Report
32	Impacts of water quality and quantity change on public health	5	ITU	36	Report
33	Scenarios of interest run through Web Portal	6	CRS4	36	Internet site
34	Third newsletter and policy briefing	7	SORESMA	36	Newsletter
35	Functional prototypes available on the web of BSCOS for citizens	6	IHE	48	Internet site
36	Forth newsletter and policy briefing	7	SORESMA	48	Newsletter
37	End conference	7	ITU	48	Conference
38	Project “After-Life Plan”	7	UNIGE	48	Report

Reviews should ideally be synchronised with ends of project reporting periods – which may coincide with the major milestones of the project. A tentative planning has to be indicated using the following template table:

Tentative schedule of project reviews

Review no.	**Tentative timing, i.e. after month X = end of a reporting period**	***planned venue of review***	***Comments , if any***
1	After project month: 18	**20**	**Independent reviewer sub contracted**
2	After project month: 36	**38**	**Independent reviewer sub contracted**

B2 Implementation

B2.1 Management structure and procedures

Summary Box

The EnviroGRIDS @ Black Sea Catchment project will be managed by a team of several people under the responsibility of a Project Coordinator and a Project Manager. The proposed management structure is inspired from successful projects to which different partners have contributed recently:

- Top level decisions will be made during meetings of the Project Management Board (PMB) taking place every three months (face-to-face or internet) with Work Package Leaders having one vote each.
- The Project Manager will work closely with the administration of the University of Geneva that has a long experience in managing European projects and funding.
- Work package leaders with their steering group will insure that the decision made in the PMB are carried out in their respective work package.
- An independent Quality Assurance Scientific Committee directed by a consultant who will be hired and will work closely with the BSC and ICPDR expert groups.

The communication among partners will be mainly maintained by the UNIGE-GRID information officer through several tools. This work will be made in close collaboration with the external communication that is carried out in WP6 and WP7.

B2.1.1 Management capability of the co-ordinators

Dr. Anthony Lehmann, who will be coordinating the project, holds a Masters Degree and a PhD in Aquatic Biology from the University of Geneva, and a Postgraduate Master in Statistics from the University of Neuchâtel. He specialized during his career in combining GIS analyses with statistical models. During his postdoc in New Zealand he developed an original tool called Generalized Regression Analysis and Spatial Prediction to build species potential distribution maps of ferns across the country. This approach was made available on the Internet and his now used across the world on all sorts of organisms. He organized two international workshops on this topic in 2001 and 2004 with 50 experts from around the world. These workshops were followed by the publications of a total of 5 special issues in international peer reviewed journals. He is authored or co-authored more than 24 peer reviewed publications. Since 2006, he obtained a senior lecturer position at the University of Geneva within the group of Prof. Martin Beniston. Dr. Lehmann will have an active role as work package leader in the FP7 project named ACQWA that Prof. Beniston is coordinating. He is also participating until September 2008 in a FP6 project called Metafunctions where he was coordinating the environmental database development on global oceans. He was also involved an Interreg III project called Habitalp to predict Natura2000 habitats in several European national parks.

He is sharing is working time at a 50% rate with the United Nations Environment Programme (UNEP) Global Resource Information Database (GRID) under a special agreement between the University of Geneva and UNEP. At GRID, Dr. Lehmann is responsible for organizing research activities by leading the "environmental monitoring and modelling" unit. He is in charge of several projects among which the project on Lake Balaton Adaptation to Climate Change funded by UNDP/GEF and finishing in 2008. He is also responsible for managing the budget of more than 10 projects and as many staff members. He is therefore ideally placed to effectively coordinate the EnviroGRIDS project, given his scientific and managing activities within the C3i group at the University and at UNEP-GRID.

B2.1.2 Management structure and decision-making structure

Project management will be carried out through the management work package (WP1) under the responsibility of the Project Coordinator (PC), namely Dr. Anthony Lehmann, and a Project Manager (PM) that will be hired for the project.

The responsibility for the overall co-ordination of the EnviroGRIDS project falls under WP1. The primary objective of WP1 will be to ensure that the activities carried out in the various work packages are fully integrated towards a common purpose, and hence the project delivers the full benefits to the users and wider community of the extensive and innovative research that will be carried out within EnviroGRIDS. WP1 will also provide the top level management of the project to ensure that it is carried out effectively and efficiently with regular reports on the scientific progress to the European Commission.

Because of the size and complexity of the EnviroGRIDS project, a multi-tier structure for the project is proposed in order to facilitate the timely completion of deliverables with as little administrative impact on the scientists as possible. This organizational structure is designed to ensure that the work within the different work packages adheres as closely as possible to the planned schedule, and that each contribution is then integrated effectively to achieve the goals of the project.

The proposed management structure will insure good communication and organisation between all partners, project leaders and the European Commission. It will be comprised of:

Coordination and Management

The EnviroGRIDS Project Coordinator (PC) will monitor progress of the work packages, facilitate communication between the different groups, organize the scheduled meetings of the project (in particular the Annual General Assemblies and the Management Board meetings) as well as small working sessions between groups as appropriate.

The **Project Coordinator (PC)** will:

- Communicate all information in connection with the Project to the Commission.
- Receive the entire financial contribution from the Commission. The Coordinator shall manage this contribution by allocating it to the beneficiaries according to the Document of Work.
- Prepare regular accounts as requested by the Commission and prepare within a reasonable time, an actual statement upon request of the Commission.
- Inform the Commission of the distribution of the funds among the Beneficiaries, specifically the amounts allocated and the dates of payment to each Beneficiaries.
- Ensure the signature, by all Beneficiaries, of the EC Grant Agreement and the Consortium Agreement.
- Address the Project Deliverables to the Commission, after prior validation by the Executive Committee.

A **Project Manager (PM)** will be hired specifically for the project and will:

- Manage the administrative, legal, financial and other non-technical aspects of the Project.
- Assist the Project Management Board in the steering of the Project (follow-up of planning schedule, issue reminders for task initiation or completion, etc.).
- Prepare for the Project Management Board the Project Deliverables based on the reports, the supporting documents and audit certificate to be provided to the Management team by the Beneficiaries.

Project Management Board (PMB)

The top level management of the project will be carried out by the Project Management Board (PMB). The PMB is responsible for assisting and advising the PC and PM in the overall project administrative management and for representing the interests of each beneficiary in the project. It is composed of the PC and PM, and the Work Package Leaders (WPLs with one vote each). The PMB will meet every three months by internet phone calls or face-to-face meetings to discuss with the PC the status of the project and decide on

any corrective or planning actions required for keeping the project focused on the overall vision and mission and deal with any conflicts or risks. The PC is responsible for the organization of such meetings and to prepare the agenda. The partners will be required to sign the Consortium Agreement before the start of the project.

The **University of Geneva will provide full administrative support** in the following areas:

- Financial service: managing accounts, invoices, payments.
- Juridical service: managing legal conflicts.
- Infrastructures: making available the necessary meeting rooms, equipment, informatics, multimedia for the project.
- Logistic: consulting with EU research specialist in charge of helping in European projects at the university and National level in Switzerland.

Work package coordinators

The work package coordinators are responsible for ensuring a smooth flow of work within the various subcomponents included in their respective work packages and, with the help of the EnviroGRIDS Project Coordinator and Manager, are expected to communicate the relevant results, data, and methodologies across work packages. The work package coordinators are to take part in the decisions of top level project management through their participation in the Project Management Board (PMB, see below).

Work package Steering Groups (WPSG)

The tasks of each work package will be coordinated by a Steering Group consisting of the work package coordinators and the principal investigators of each component of the work package or his/her delegate. Some Steering Groups will also include other persons relevant to the project, e.g., representatives of other work packages and stakeholders. Costs for the meetings of the Steering Groups will need to be met from the program funds allocated to each work package/work package component. Steering Groups are expected to maintain regular contact through e-mail exchange and electronic boards.

Quality Assurance Scientific Committee (QASC)

The Project Management Board will decide to hire an external consultant to follow and report on the progresses of the project (e.g. evaluation of deliverables). Given the participation of both the Black Sea Commission (BSC) and the International Commission for the Protection of the Danube River (ICPDR), it is foreseen that this mission will strongly linked with the expert groups of both Commissions. The chosen consultant will organize the QASC in order to monitor the overall quality and impact of the project by identifying and mobilising experts in different fields.

Gender Committee (GC)

This committee aims at ensuring gender equitability, defining specific women needs and proposing appropriate solutions (mobility, meetings) and actions to the Coordination and Management team and the Project Management Board. It is composed of 3 members elected amongst partners. The Gender Committee will meet at least once a year. It can invite the Manager or representatives from the other Committees. Decisions will be adopted on a simple majority basis.

B2.1.3 Communication strategy

The communication between the different partners will use some e-tools in order to minimise travel costs.

Sharing of resources/documents

Gradually, all the tools, models, methods and information documents generated by the EnviroGRIDS project will be made available through the project website [20] .Links between the organisations, people and resources involved are made available on the website at the different stages of the project. Some resources have already been made available for the project proposal submission.

[20] http://www.envirogrids.net

The EnvrioGRIDS project website is based on the SPIP (System for Participative Internet) publishing system[21]. SPIP is a free software content management system designed for Web site publishing, oriented towards online collaborative editing. This software, written in PHP, and relying on a MySQL database, is widely used by networks of people. The system allows the private interface to appear in several languages as well as managing multilingual websites, and boasts a search and content indexation module. It also enables syndication of other sites' contents.

The system allowing the management of documents will be largely used to share all the documents, links and other resources used by the different partners. It will also allow feedback from the partners and this tool can be extended to people not involved in the project. Other developments we will made in order to ensure the display and download of all the products derived from the EnviroGRIDS project.

Newsletters and policy briefings

The project will issue annual e-newsletters and policy briefings. This is elaborated in WP7.

Meetings

Video Conferencing Software will be used as much as possible. The Project Calendar includes several types of meeting, each with its own scope. Good practices for all type of meetings are given in these guidelines as well as the definitions of the responsibilities for the meetings.

Other publications/outputs:
Other project outputs, not included in the deliverables, will be

- Project Brochure
- Project Poster
- The EnviroGRIDS project team will produce peer-reviewed scientific publications from its research

All the documents will be made available on the project website.

B2.1.4 Monitoring, reporting progress and documenting results

Internal reporting

Internal reporting will be used to track project progress and identify rapidly problems and risks, in order to optimize the project management. The internal reporting will be implemented through status reports every 2 months, and activity and resource consumption reports every 3 months.

Management Reports

- Progress Reports

At the end of each reporting period, EnviroGRIDS management team will submit Progress Reports documenting activities undertaken, results obtained, and expenditures incurred.

- Terminal Report

Within 60 days of the Project completion, the EnviroGRIDS management team shall submit a Terminal Report. This report will include an overall assessment of the results, and progress toward achievement of the EnviroGRIDS Project objectives. This report will recommend follow-up activities.

Document management

Several documents will be produced during the EnviroGRIDS project timeframe. A few simple rules defined by the management team will facilitate document management. Responsibilities or ownership of documents are specified, as well as other general rules of formats and on the level of confidentiality of the documents.

[21] http://www.spip.net

Production of deliverables

Some deliverables are bound to submission to the EC. Before launching the production of the deliverable, the Work Package leaders and the Manager will define the document structure and the contributions expected from each beneficiary in a preliminary Deliverable Development Plan.

Quality check procedures, including peer review, will be defined by the manager in cooperation with the Scientific Steering Committee.

B2.2 Beneficiaries

Summary Box

The EnviroGRIDS Project Team includes 27 partners from 15 countries, representing also several European (CERN, EEA) and United Nations organisations (UNEP, UNESCO). Among these partners, 22 belong partially or entirely to the Black Sea Catchment. Eight partners belong to an International Cooperation Partner Countries (Ukraine, Georgia and Russian Federation) and five to Associated Countries (Switzerland and Turkey). Five partners can be defined as Small and Medium Enterprises (SME).

Project coordinator, beneficiary 1: University of Geneva, Switzerland
- UNIGE-GRID: www.grid.unep.ch
- UNIGE-C3i: www.unige.ch/climate

a) Global Resource Information Database , UNIGE-GRID

The Global Resource Information Database (GRID) is a worldwide network of 15 environmental data centres managed by the Division of Early Warning and Assessment (DEWA) of the United Nations Environment Program (UNEP). Based in Geneva's International Environment House, GRID-Europe has a scientific and administrative partnership with University of Geneva (UNIGE).

GRID-Europe specialised in handling and analysing spatial and statistical data on environmental and natural resource issues through computerised Geographic Information Systems (GIS) and remotely-sensed imagery. Over the years, GRID-Europe has compiled an archive of global and European geospatial and tabular databases, and makes them accessible to the global community through Internet-based applications.

Grid-Europe has expertise in Geographic information systems (GIS), remote sensing, and modelling to provide: better insights to decision-makers, sustainable use of natural resources, analysis of emerging environmental problems and threats. Recent applications in this domain include:

- Lake Balaton Integrated Vulnerability Assessment, Early Warning and Adaptation Strategies project[22].
- IMOS: Evolution of the Mesopotamian marshlands ecosystem.

The group specialised also in the integration, dissemination and communication of geographic information visually on the World Wide. GRID-Europe is responsible for the complete design, data gathering and formatting, and on-line interface of several data portals and map servers such as:

- FP6 METAFUNCTIONS project, is pooling expertise in bioinformatics, computer science, geographical information systems and marine sciences to develop a data-mining system that correlates genetic patterns in genomes with contextual environmental data.
- The GEO Data Portal, the authoritative source for data sets used by UNEP and its partners in the Global Environment Outlook (GEO) report.

[22] http://www.chrome.hu/bft/bam

- FP7 ACQWA project data warehouse and spatial direct interface.

The project will essentially be implemented by:

- Dr. Anthony Lehmann was trained as an aquatic biologist who specialized in GIS and statistical analyses. He is the Project Coordinator. (more details in section 2.1.1)
- Ron Witt is the Director of UNEP/GRID-Europe and will coordinate the project with UNEP activities in this field and region.
- Dr. Hy Dao is a geographer who will coordinate the task on demographic scenarios.
- Dr. Andrea de Bono and Bruno Chatenoux are geologists specialized in GIS analyses who will contribute to the demographic and climatic scenarios.
- Jean-Philippe Richard is a geographer specialized in GIS data and metadata management who will contribute to the spatial data infrastructure.
- Gregory Giuliani is a geologist and environment scientist who specialized in GIS analyses and Internet map server. He will act as a contact point between GRID and other partners of WP 2.
- Diana Rizzolio, is an environmental-rural engineer. She is the information officer of GRID-Europe and will lead the tasks on organizing meetings, managing the website and producing the project newsletters.

b) Climatic Change and Climate Impacts research group, UNIGE-C3i

The University of Geneva was founded in 1559 and is a world-class university, made up of 7 faculties, and is one of the 20 members of the League of European Research Universities. It has a distinguished academic record in very diverse fields of natural sciences, social sciences, medicine, the arts, law and psychology. Because of its geographic proximity to the UN and other international organizations, the University has privileged links to bodies such as the WMO (in particular the IPCC and WCRP Secretariats), the GEO secretariat, the WHO, and the European offices of UNEP. The domain of climatic change and climate impacts is a relative newcomer to the University, which has rapidly closed the gap by appointing the coordinator, Martin Beniston, in October 2006 Full Professor and head of C3i (Climatic Change and Climate Impacts Research), and his research team. More details on its activities can be found in section 2.1.1. Prof. Beniston is presently finalizing the negotiation of a new FP7 project called ACQWA that he is coordinating on climate change impacts on water resources in mountainous regions. The ACQWA and EnviroGRIDS projects would create a very interesting synergy for all beneficiaries of both projects.

The project will essentially be implemented by:

- Prof. Martin Beniston will coordinate activities related to climate change.
- Dr. Anthony Lehmann will insure the project management in coordination with the GRID team.
- Dr. Stéphane Goyette will supervise a postdoc fellow hired to create the regional climate models.
- Dr. Douglas Cripe (M.Sci. in Atmospheric Science and Ph.D. in Physical Geography) is a Project Officer within the Group on Earth Observation Secretariat, working primarily on the administration of Tasks in the Water and Agriculture Societal Benefit Areas (SBAs), as well as the Data and Architecture Transverse Area.. He also occupies a position as senior scientists at the University within the C3i group.

Beneficiary 2: Arx iT SA, Switzerland (ARXIT: www.arxit.com)

The company Arx iT SA is a Swiss and French market leader in the Geographical Information Systems (GIS) domain. Arx iT's core business consists in technologies consulting and GIS integration solutions combined with quality assurance practices. Arx iT is actually focused in customized applications which tend to make easier the edition, the treatment, the use and the diffusion of GIS data. Therefore, Arx iT opted for a team of co-workers and partners specialized in environment, mobility and transportation matters.

As more and more GIS projects have to be integrated with others IT systems, Arx iT chooses to develop its know-how in four main activities :

- Geographic Information Systems (GIS)
- Information Systems
- Multimedia
- Technology consulting

Through its various projects, Arx iT has always adopted a quality-focused process. The company has therefore naturally set up a quality control system and it has also recently obtained the ISO 9001-2000 certification.

Related to this project, the expertise of Arx iT will be useful especially for software development associated to the Spatial Direct Server architecture (WP2). The GIS expertise combined with our know-how on data treatment and processing will be helpful in the project's success.

Beneficiary 3: Melitopol State Pedagogical University, Ukraine (AZBOS, http://ornitology.narod.ru)

Melitopol State Pedagogical University was founded in 1923. The University has 7 Faculties, 19 specialties. There are more as 5.000 students. Scientific Department of University represent from 300 scientists, specialists, engineers and administration.

The department involved within the framework of the project is Azov-Black Sea Ornithological Station (AZBOS). AZBOS was born on the 12th December 1985. It is an interdepartmental subunit of two institutions: 1- Schmalhausen Institute of Zoology (National Academy of Sciences of Ukraine) and 2- Melitopol Pedagogical University (Ministry of Education and Science of Ukraine).

Principal direction of the Station's scientific investigations: Control of ornithofauna, estimation of ornithological situation in the south of Ukraine and current changes in bird distribution and number; Investigation of wetlands in the region, having international importance and development of recommendation on their conservation; Study of bird migratory routes, their structure and stability to conserve bird species, migrating in Eurasia; Biological monitoring of rare and threatened bird species of Ukrainian steppe zone, finding of their nesting grounds; Inventory of natural reserve areas.

In 2000 due to the initiative and financial support of WWF Odessa Project Office there was created Wetland Management Unit (WMU) as department of Azov-Black Ornithological Station. WMU has wide network of experts in ornithology, herpetology, terriology, geobotany, floristics, ichthyology, hydrobiology and landscape diversity. The Unit is a centre of technical expertise and international cooperation to conserve and sustainable use of wetlands and their resources. Its activity is directed at: Preparing management-plan and propositions to support biodiversity in coastal and aquatorial ecosystems; Carrying out monitoring; Gathering and analysis of data on use of wetlands and their resources; Implementing of trainings, technical consultations and expert estimation on problems of wetland management and support of their biological diversity.

Main international research activities:

- the section within the World Bank supported project "Conservation of biological diversity of the Ukrainian part of the Danube Delta" (1996)
- projects of Wetlands International - AEME "Support for the conservation of wetlands and wetland species in the Azov-Black Sea region of Ukraine" (1998)
- projects of Wetlands International - AEME "Strategy for Waterbird Monitoring in the Black Sea Region" (2000)
- GEF project "Second phase of support of biodiversity enabling activity" (2003)
- GEF project "Estimation of biodiversity of migratory waterfowls in wetlands along the Corridor and identification of important area of seasonal feeding distribution and routes of bird movements" – the part of GEF project "The support of biodiversity of Azov-Black sea Ecological Corridor (the project covered wetlands of the south part of Ukraine) (2004-2005)
- TACIS project "Emergency Planning and Flood Protection in the Lower Danube EuroRegion" (2005 - 2006) (some experts).

- TACIS project "Technical Assistance for the Lower Dniester River Basin Management Planning" (2006-2007) (some experts)
- 14 projects on management and restoration recommendation for Danube delta region of DCPO WWF (2000-2007)

The project will essentially be implemented by:

- Josef Chernichko, Candidate of Biological Sciences, ornithologist, ecologist – team leader.
- Yury Andryushchenko, Candidate of Biological Sciences, ornithologist, geographer, ecologist
- Vladimir Popenko, Candidate of Biological Sciences, ornithologist, ecologist
- Vladimir Siokhin, Candidate of Biological Sciences, ecologist, ornithologist
- Alexandr Koshelev, Doctor of Biological Sciences, ornithologist, ecologist
- Sergey Podorozhny, Candidate of Biological Sciences, botanist, ecologist
- Raisa Chernichko, Candidate of Biological Sciences, ornithologist, ecologist, specialist in ecological education
- Mikhail Zhmud, Candidate of Biological Sciences, ornithologist, ecologist
- Viktor Demchenko, ichthyologist, ecologist
- Semen Volovnik, Candidate of Biological Sciences, entomologist, specialist in ecological education
- Yury Karmyshev, Candidate of Biological Sciences, herpetologist, ecologist
- Oleg Dyakov, Candidate of Geographical Sciences, hydrologist, ecologist
- Svetlana Vinokurova, programmer, ecologist, GIS specialist
- Sergey Suchkov, entomologist, ecologist

Beneficiary 4: Black Sea Commission Against Pollution, Turkey (BSC PS: http://www.blacksea-commission.org)

The Commission on the Protection of the Black Sea Against Pollution (the Black Sea Commission or BSC PS) via its Permanent Secretariat is the intergovernmental body established in implementation of the Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention), its Protocols and the Strategic Action Plan for the Rehabilitation and Protection of the Black Sea.

There are seven BSC PS Advisory Groups which provide their expertise and information support to the Commission and Secretariat on following sectors: (a) pollution monitoring and assessment (PMA); (b) control of pollution from land based sources (LBS); (c) development of common methodologies for integrated coastal zone management (ICZM); (d) environmental safety aspects of shipping (ESAS); (e) conservation of biological diversity (CBD); (f) environmental aspects of the management of fisheries and other marine living resources (FOMLR); and (g) information and data exchange (IDE).

Within the institutional framework co-ordinated by BSC PS, seven Black Sea Regional Activity Centres (RAC) have been established on base of existing national organizations.

BSC PS possesses co-operation links and options for consultative conversation with other intergovernmental organizations involved in marine pollution affairs at the global and regional level, including the United Nations Environment Program (UNEP), International Maritime Organization (IMO), Global Environmental Facility (GEF), International Commission for the Protection of the Danube River (ICPDR), Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS), Organization of the Black Sea Economic Cooperation (BSEC), European Environment Agency (EEA), different institutions of the European Union (EU) and some other organizations.

The Black Sea states collaborate with all above organizations directly or through the BSC PS Secretariat.

The project will essentially be implemented by:

- Dr Violeta Velikova, Pollution Monitoring and Assessment Officer
- Dr Ahmet Kideys, Executive Secretary

Beneficiary 5: The Black Sea Regional Energy Centre, Bulgaria (BSREC, http://www.bsrec.bg)

The Black Sea Regional Energy Centre (BSREC) was established in Sofia, Bulgaria under the EC SYNERGY Programme in 1995, aiming at reinforcing the co-operation between the European Union and the Black Sea region countries in the energy sector as well as among the Black Sea countries themselves.

BSREC has 13 member-countries: Albania, Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Moldova, Romania, Russian Federation, Serbia, Turkey, Ukraine, and The FYR Macedonia.

The Centre's core activity is targeted to promote the development and implementation of market oriented energy policy, encourage restructuring of the monopoly structures, liberalisation and privatisation activities, to support the energy efficiency and renewable energy projects. The Centre has established good connections, knowledge and experience in collaborating with public administration, research institutes, universities and enterprises in Bulgaria and the other countries from the Black Sea region. Since 2003 BSREC works mainly in the field of energy efficiency and renewable energy. Many projects dedicated to the identification of the potential of renewable energy sources, transfer of renewable energy technologies, removal of administrative and regulatory obstacles have been carried out by the Centre.

The project will essentially be implemented by:

- Dr. Lulin Radulov, BSREC Director, is an electrical engineer, research professor and PhD in electrical engineering. Since 1995, in his position of Director of BSREC he is working on projects of common interest for the Black Sea region countries in the field of reliability of energy supply, reform of the energy sectors in compliance with EU regulations, energy efficiency and renewable energy sources. He has participated in more than 10 projects within FP5 and FP6, dedicated to renewable energy.
- Dr. Petko Vitanov obtained both M.Sc. and PhD in Physics. Dr. Vitanov is associate professor since 1986. Since 1993 he is the Director of the Central Laboratory of Solar Energy and New Energy Sources at the Bulgarian Academy of Sciences. Dr. Vitanov is an author and co-author of 145 papers that have been published in scientific journals and conference proceedings. He has worked on 5 European research projects within FP5 and FP6 in the field of solar energy.
- Mr. Plamen Ivanov is a researcher in the field of solar photovoltaics at the Central Laboratory of Solar Energy and New Energy Sources at the Bulgarian Academy of Sciences since 2001..
- Ms. Radostina Todorova is a researcher in the field of climatology. She has both B.Sc. and M.Sc. degrees in Physics (subject Meteorology) from Sofia University, and M.Sc. degree in Energy Economics. Since 2004 she is a PhD student at the National Institute of Meteorology and Hydrology at the Bulgarian Academy of Sciences.

Beneficiary 6: Czech Centre for Science and Society, Republic Czech (CCSS: http://www.ccss.cz, http://www.unsdi.cz)

CCSS is an association of high tech SMEs, the public administration and research organisations. It is an independent, non-profit and non-governmental organisation. CCSS is a type of virtual centre of excellence with the focus on the implementation of new communication and navigation technologies which have potential for sustainable development.

The CCSS co-operates with a wide range of institutions and individuals, home and foreign ones. International activities in the field of international projects, utilisation of modernist technologies, co-operation networks of the small and medium business within the framework of regional economies comprise intensive contacts, particularly in Europe, Africa and South America.

CCSS is national coordination office for the United Nations Spatial Data Infrastructure (UNSDI) initiative. The objective of UNSDI is to enhance spatial data and information sharing between UN agencies and programmes, as well as national and regional SDI's, and promote and achieve sustainable development through a.o. opensource software solutions.

The project will essentially be implemented by:

- **Dr CHARVÁT Karel:** Education: Charles University in Prague - Doctor in theoretical cybernetics.
- **Dr BOUKALOVÁ Zuzana** Education: Charles University in Prague – Faculty of Science, Department of Hydrogeology and civil engineering, RNDr (doctor in environmental science).

Finished projects:

- EMIRES supported economic development and the creation of new jobs in some less favoured regions by providing suitable mobility. (http://www.emires.net/)
- Rural Wins - Thematic Network aimed to build a strategic RTD roadmap developing an Information and Communication Technologies vision which ensures the economically and technically feasible deployment of information and communication solutions for rural areas (including also maritime regions and islands). (http://www.ruralwins.net/index.htm)
- A BARD Analysing Broadband Access for Rural Development (A-BARD) is the Coordination Action (2005 – 2006) to research rural broadband provision and use, as part of the Scientific Support to Policies in the EU Sixth Framework Programme.
- Armonia - The overall aim of the research project ARMONIA (Applied multi Risk Mapping of Natural Hazards for Impact Assessment) is to provide integrated risk maps in areas prone to natural disasters in Europe.(http://www.armoniaproject.net)
- NaturNet Redime. The general objective of NATURNET-REDIME project (NNR) is the improvement of knowledge and the provision of education concerning all aspects of Sustainable Development. (http://www.naturnet.org)

Running projects:

- WINSOC. The key idea of WINSOC is the development of a totally innovative design methodology, where the high accuracy and reliability of the whole network is achieved by introducing a suitable coupling among adjacent, low cost, sensors that gives rise to a distributed detection or estimation more accurate than that of each single sensor, without the need for sending all the data to a fusion centre.

Beneficiary 7: CERN, Switzerland (CERN: www.cern.ch)

CERN is funded by 20 European member states with an annual budget of approximately 1000 MCHF, counting 2600 permanent staff. CERN is currently constructing the Large Hadron Collider (LHC) will be the world's most powerful accelerator providing research facilities for several thousand High Energy Physics (HEP) researchers from all over the world. The LHC start up is planned for mid-2008. Four LHC experiments designed and constructed by large international collaborations (each with up to 2000 scientists and engineers coming from more than 250 institutes) will collect data over the next 10 years. These experiments will generate of the order of 15 Petabytes per year, to be shared with all the participating scientists looking for discoveries to understand the fundamental laws of nature. The computing capacity required to analyse the data far exceeds the capacity needs of any comparable physics experiments today and needs the combined resources of some 200 computer centres world-wide. CERN has chosen Grid technology to address the huge data storage and analysis challenge of LHC. CERN, "where the Web was born", has been at the forefront of computing for many years and now coordinates the world's largest Grid project "Enabling Grids for E-SciencE" (EGEE).

CERN also has a long tradition of collaborating with IT industry, including via EU-supported research programmes. The IT Department currently has 280 staff, predominantly engineers, who operate one of Europe's largest Computer Centres supporting over 10,000 users. CERN has prominently contributed to a number of EGEE-related FP6 Grid projects aiming at extending the EGEE production Grid infrastructure to new geographical areas and to serve new applications domains (EuMedGrid, EuChinaGrid, EELA, BalticGrid, SEEGRID-2, Health-e-Child, DILIGENT, OMII-Europe). CERN also coordinates the ISSeG project, focusing on site security, and the ETICS project, providing a build and test infrastructure for Grid developments, currently being used by EGEE.

Beneficiary 8: Center for Advanced Studies, Research and Development in Sardinia, Italy (CRS4, www.crs4.it)

CRS4 is an interdisciplinary research centre developing advanced simulation techniques and applying them, by means of High Performance Computing, to the solution of large scale computational problems in science and engineering, and developing innovative applications in the field of the Information and Communications Technology.

Since 1992, the *Environmental group* (today named Energy and Environment Program) of CRS4 has gained extensive experience in developing highly effective environmental applications by means of numerical modelling, and GIS-DB technologies. The CRS4 activities in this field are today centred on the development and application of numerical models (soil and water contamination, superficial hydrology, extreme events and hydrogeological risk) and other computational tools, such as Geographical Information System, Relational Database, and Decision Support Systems, for the analysis of environmental data and for the simulation of the dynamics of hydrological and meteorological state variables. Specific skills are focused on the development of web based portals for the environmental sciences and application of numerical models, large scale simulations and high performance and parallel computing solutions.

The project will essentially be implemented by:

- Ernesto Bonomi (Advanced Master's degree in Physics and Ph.D. in Theoretical Physics) is the Director of three highly-motivated groups (Imaging and Numerical Geophysics, Water Resources and Management, and Process Engineering and Combustion), which include about 20 research staff, developing and applying numerical simulation models and data analysis tools for earth exploration and imaging, hydrology and territorial planning, meteorology, and chemical and combustion processes.
- Pierluigi Cau is an hydraulic engineer graduated at the University of Cagliari. Researcher for the Water Resources Management group, Energy and Environment Program of CRS4, since 2000.
- Simone Manca is a software engineering for CRS4 since 2000. He has worked in more than ten years projects on C/C++, scripting language, GIS (Geographical Information System) and environmental applications
- Marino Marroccu (Degree in Nuclear Physics at the University of Cagliari) is a senior researcher since April 2003 and head of the Water Resource Management Area.
- Andrea Piras. (Master's degree in Computer Science Technologies, University of Cagliari) is a researcher in the Network Distributed Applications area of CRS4.
- Giuditta Lecca is a senior researcher of the Hydrology and Water Resources Management Group of CRS4 where she has been working since 1992. She got a degree in Civil Engineering at the University of Cagliari in 1991.

Beneficiary 9 : Danube Delta National Research Institute for Research and Development, Rumania (htpp://www.indd.tim.ro)

The Danube delta National Research Institute for Resesrch and Development is divided into three sub-departments: (i) Conservation of Biodiversity and Sustainable Development (ii) Ecological Reconstruction and (iii) Information Systems. DDNI has been nominated Centre of Excellence for Deltas & Wetlands; National Reference Centre for Land Cover and Fisheries; The DDNI is beneficiary within the European Topic Centre on Land Use and Spatial Information (ETC-LUSI). DDNI has participated in several FP 4, FP5 and FP6 projects including NaturNet-Redime project.

DDNI is also the main scientific advisor of the Ministry of Environment and Sustainable Development for establishment of NATURA 2000 network in Romania. DDNI co-ordinated several projects in order to achieve the objectives of the National Strategy for Environment Protection, focused on the enlargement of the network of protected areas, rehabilitation of the coastal infrastructure, improvement of ecological and economical features of the Danube Delta, coordination of activities focused on inventory & GIS mapping of the natural habitats and gathering data on distribution of wild species for selection the Sites of Community Interest (SCI) and Special Protection Areas (SPA). DDNI co-ordinated restoration projects of Danube Delta agriculture polders and the ecological restoration of Danube river flood plains.

DDNI co-ordinated the process aiming the completion of N2000 Standard Sheets for SCIs and SPAs, being nominated to develop a set of standard criteria for monitoring of the current status of species and natural habitats occurring in N2000 sites from Romania.

The project will essentially be implemented by:

- **Jenica Hanganu** of the Department of Natural Resources, Danube Delta Institute, holds a Ph.D. in ecological reconstruction of wetlands. His primary experiences include survey and mapping of wetland vegetation and wetland soils. He is responsible with sustainable management strategy of natural resources of the Danube Delta Biosphere Reserve. He graduated GIS and remote sensing course in Amherst Massachusetts University, SUA. Recent experience includes research studies on aquatic macrophysics in relation with water quality in lakes within REBECCA FP 6 project. Presently he is national coordinator of CORINE LAND COVER 2006 project within EEA GMES Land Fast Track Service project and national coordinator of the NARDUS project dealing with inventory of semi-natural grasslands in Romania.
- **Adrian Constantinescu** has a degree in Electric Engineering. His main research interest is the GIS applications and hydrology modeling with 10 years of experience in hydraulic modeling using Sobek and 15 years in GIS processing and acting as beneficiary in EU projects such as: FP5 “Nutrient Management in the Danube Basin and its Impact on the Black Sea - DANUBS”, “Centre of Excellence - DELWET”, “Corine Land Cover 1990, 2000, 2006” .
- **Dr. Ioan Grigoras** has a degree in Electronics and Telecommunication Engineering. Graduated GIS and remote sensing course in Amherst Massachusetts University, SUA. Have PhD Diploma in Geography. His main research interest is the GIS applications (15 years), satellite image processing, photo-interpretation for biodiversity and environmental protection. He was coordinator of Natura2000 network set up in Romania, beneficiary in “Corine Land Cover 1990, 2000, 2006” and GIS/remote sensing environmental projects in Ukraine, Russian Federation and West Africa.

Beneficiary 10: Danube Hydrometeorological Observatory, Ukraine (DHMO)

Danube Hydrometeorological Observatory (DHMO), is the structural unit of State Committee for Hydrometeorology of Ukrainian Ministry of Emergency Affairs, was established in September 1960. It comprises 3 hydro-meteorological stations, 14 hydrological stations and three research boats used for surveys in the Danube Delta and the adjacent Black Sea area. It staff consist of 99 persons. DHMO studies the Ukrainian Danube Delta, the adjacent part of the Black Sea and the Lower Danube Lakes.

The main tasks of the DHMO are the following:

- daily hydrological observations according to the standard programmes on the network of permanent river, lake and sea stations;
- special field surveys to study the natural and anthropogenic changeability of hydrological processes;
- daily meteorological observations according to the standard programmes on the meteorological stations;
- forecasting and warning of natural emergency accidents.
- monitoring of river, lake and sea water pollution;
- collecting, processing and analyses of the data from the observations;
- forecasting of the weather conditions and hydrological regime of the Danube River;
- supplying of consumers with hydrometeorological and hydrochemical information and forecasts.

Research Activities:

- Participation in the National System of Hydrometeorological Monitoring in the Danube Delta and the Adjacent Black Sea Area (1960 - currently)
- joint Ukrainian and Romanian hydrological studies of water and sediments discharge changeability in the Danube Delta (2000-2008);

- development of hydrological substantiation of the navigable channel between the Danube and the Black Sea on the Ukrainian segment of the Delta (2002-2004);
- TACIS Project «Lower Danube Lakes: Sustainable Restoration and Protection of Habitats and Ecosystems » (2000-2003);
- hydrological and hydrochemical monitoring of the Ukrainian part of the Danube Delta under the conditions of restoration and use of the deep navigable channel between the Danube and the Black Sea (2004-2008);
- Tacis Project «Technical Assistance for the Lower Dnister River Basin Management Planning» (2006-2007);
- Tacis Project «Development of Transboundary Cooperation in the Sphere of Integrated Water Resources Management in the Lower Danube Euroregion in the Framework of the Neighborhood Programme «Ukraine – Romania» (2007 – 2009).

The project will essentially be implemented by:

- Dr. Victor Morozov – team leader – expert in hydrology of the Danube River and the adjacent Black Sea area;
- Mikhail Kornilov – hydrology, data collecting and processing, GIS;
- Olga Krutko – hydrochemistry of the surface and sea waters;
- Alexander Cheroy - hydrology, studies of the delta-formation processes;
- Vladimir Boychuk – oceanography and marine hydrology.

Beneficiary 11: Swiss Federal Institute for Aquatic Science and Technology, Switzerland (EAWAG: www.eawag.ch)

Eawag is a Swiss-based and internationally-linked aquatic research institute committed to an ecological, economical and socially responsible management of water – the primary source of all life. It carries out research, teaching and consulting and forms a link between science and practical application. Multidisciplinary teams of specialists in the fields of Environmental Engineering, Natural and Social Sciences jointly develop solutions to environmental problems. The acquired knowledge and know-how is transmitted nationally and internationally by publications, lectures, teaching, and consulting to the private and public sector.

400 employees are active at the locations in Dübendorf (near Zurich) and Kastanienbaum (near Lucerne). Eawag was founded in 1936 as an information centre for wastewater treatment of the ETH Zurich. It is a Swiss Federal Research Institute which is part of the ETH-Domain.

- Dr. Hong Yang is an Economic Geographer by training and is currently a senior scientist at Eawag,, and a visiting professor of the Institute for Geographical Science and Natural Resources Research, the Chinese Academy of Science. She is the leader of the group for Water, Food and Environmental Studies in the Department of Systems Analysis, Integrated Assessment and Modeling at Eawag. Her main research interests include integrated land and water resources management, water scarcity and its impacts on food security and implications for the global food trade, environment, regional development, poverty alleviation and agricultural policies.
- Dr. Abbaspour is in the field of hydrology and soil physics with a background in civil engineering and mathematics. He has done extensive work and published numerous articles in modelling of flow and transport in soils, groundwater, and catchments. On the mathematical side, he had developed internationally used inverse modelling techniques. He also has substantial expertise in using GIS and developing GIS-based risk analysis systems.

Beneficiary 12: GIS and RS Consulting Centre, Georgia (GeoGraphic: www.geographic.ge)

The Geoinformation Systems and Remote Sensing Consulting Centre (GeoGraphic) was founded in 1998. GeoGraphic is devoted to create and deliver corporative and specialized software, flexible data management

technologies, reliable and high quality cartographic production. GeoGraphic makes every effort to meet practical needs of its clients. It uses geographic information systems and improved data management tools to help with better decisions making.

Since 2002 GeoGraphic has been offering its customers a wide range of services in geoinformation systems formation, geodatabase management, GIS projects implementation, sectoral systems and user-oriented software development. During the short period of its activities GeoGraphic has served its clients by carrying out expert researches and evaluations, spatial modeling and improving decision-making process.

Since 2004 GeoGraphic has been expanding area of its activities offering a wide spectrum of services – from topo-geodetic survey to management systems development. GeoGraphic operates in almost all fields: environmental protection, natural resources management, urban development and architect, transport and communications, infrastructure, real estate market, education, cultural heritage, municipal management, emergency situations, defence and security, health care and social issues – these are directions where Geographic has achieved significant results demonstrating efficiency of GIS technologies application.

Expertise gained by GeoGraphic over the years includes: Spatial Data Processing and Spatial Analysis; Aerial Photography and Satellite Image Processing Information Technologies Development; Corporate Geoinformation Systems; Expert Systems Development; Photogrammetry and Orthophoto Production; Customized Software Development; Management Information Systems; Environmental Survey and Analysis; Geomonitoring Survey; High-End Cartographic Production; Topogeodetic and Cadastral Works; Land Use Planning; Urban Development; ESRI and Leica Geosystems Software Distribution, Training and Certification.

Beneficiary 13: Institute of Biology of the Southern Seas, Ukraine (IBSS: www.ibss.iuf.net)

Established in 1871 as a small biological station, IBSS has at present three campuses along the coast (with the headquarter in Sevastopol), two State Reserves, and an Aquarium-Museum. The IBSS staff comprises 137 Ph.D. scientists, 80 engineers and a group of technicians. Two IBSS research vessels carried out over 150 expeditions to the Black Sea, the Atlantic and Indian Ocean.

The IBSS research deal with taxonomy, fisheries aquaculture, ecotoxicology, biotechnology, physiology, environmental impact assessment, radioactive processes, and modelling. The library stock represents a diversity of disciplines with 150 000 items including 75 000 in foreign languages and over 1000 rare books (published in 1766-1880).

In terms of the activity matching the EnviroGRIDS objectives, IBSS is involved in oceanographical database development, studies of the spatial-temporal structure, biological productivity, and physical-biological coupling in the pelagic and benthos marine ecosystems with regard to climate change. For example, the IBSS data bank has physical, chemical, and biological data on 157 research cruises to the Black and Mediterranean Seas.

The IBSS involvement in the international projects incorporates: SESAME, GODAR, Euro-GOOS , EUR-OCEANS, Science for Peace Program (NATO), INTAS and targeted cooperation programs with Amsterdam University, Stony Brook University, Woods Hole Oceanographic Institution (USA), and Plymouth Marine Laboratory (UK).

The project will essentially be implemented by:

- Dr. Alexandra Gubanova (Senior Scientist, Ph.D): Project coordination; Selection of data for the project and processing of zooplankton samples. Quality assurance of the plankton data sets (taxonomy). Writing papers (based on project materials) dealing with biodiversity changes of the Black Sea ecosystem.
- Dr. Sergey Piontkovski (Senior Scientist, Ph.D): Statistical data analysis; Basin scale data comparison. Writing papers (based on project materials) dealing with spatial-temporal changes of the Black Sea ecosystem with regard to climate change.

- Alexandra Sergeeva (Leading Engineer): IBSS database development. Incorporation of the archived physical, chemical, and biological data into the project database.
- Vladimir Gorbunov (Leading Engineer): Development of the interoperability for the IBSS data, facilitation of network access and sharing of data.
- Denis Altukhov (Leading Engineer): Data mining for the EnviroGRIDS models. Processing of zooplankton samples and taxonomical identification of species.
- Alexander Khvorov (Graduate student): Data entry. Training in oceanographic database development and the analysis of the spatial patterns in the Black Sea ecosystem.

Beneficiary 14: The Institute of Geography of the Romanian Academy, Romania (IGAR: www.geoinst.ro)

The Institute of Geography (IG) is the main institution of fundamental and applied geographical research in Romania. It carries out research and documentation work, also coordinating Ph.D. activities. The focus of research is the relationships between the components of the physical and biotic environment (relief, water, soil, vegetation and fauna) and of the social and economic milieu, as well as their spatial distribution in connection with global environmental change.

The Institute is engaged in the two main activities. 1) The elaboration and publication of synthesis works on Romania (treatises, atlases and regional studies) and on Central and Eastern Europe and Black Sea countries; 2) The development of research into Physical Geography and Environmental Geography, closely connected to the interests of global international programmes, such as IGBP (International Geosphere-Biosphere Programme), IHDP (International Human Dimensions Programme on Global Environmental Change) and ISDR (International Strategy for Disaster Reduction).

At present, the Institute of Geography has 3 laboratories within which the research activities focus on the study of man-environment relations and global change. The research personnel of the Institute of Geography is formed of 10 senior researchers, and 20 young researchers and PhD students.

The Institute of Geography is already involved in a EU FP6 project (CLAVIER - Climate ChAnge and Variability: Impact on Central and Eastern EuRope), coordinated by Max-Planck Institute (Hamburg, Germany). Researchers from 6 countries (Germany, Austria, France, Hungary, Bulgaria, Romania) and different disciplines are investigating the links between climate change and its impact on weather patterns, air pollution, extreme events, and on water resources and are evaluating the economic impact on agriculture, tourism, energy supply and the public sectors in 3 CEE Countries (Hungary, Romania and Bulgaria). The CLAVIER project is supported by the European Commission's 6th Framework Programme (contract number 037013) as a 3 year Specific Targeted Research Project from 2006 to 2009 under the Thematic Sub-Priority "Global Change and Ecosystems".

The project will essentially be implemented by:

- PhD, Monica Dumitrascu is a senior researcher, head of Laboratory of Physical Geography and expert in environmental change, land use and GIS analysis. Her scientific field of interest is environmental change and the impact of global climate change on landscape, agriculture and environmental degradation. She published over 50 publications on landscape change and environment issues in Romania.
- PhD, Prof. Dan Balteanu is the Director of the Institute of Geography and Chair of the Romanian National Committee on Global Environmental Change. He is senior researcher at the Institute of Geography, PhD supervisor, his research field being environmental change and natural & technological hazards. He published over 15 volumes, and 100 scientific papers, many of them referring to the global change issues.
- PhD, Ines Grigorescu is a researcher within the Institute of Geography, with expertise in studying man-environment relations, integrated environmental assessment, human induced impact on the environmental quality and environmental change.
- PhD Candidate Mihaela Sima is a researcher in the Institute of Geography in the Geomorphological Hazards team.

- PhD Candidate Ana Popovici is a researcher in the Institute of Geography. Her domains of interest are land use - land cover changes and impact on environment and society.

Beneficiary 15: UNESCO Institute for Hydrological Education, Delft, The Netherlands (UNESCO-IHE: www.unesco-ihe.org)

UNESCO-IHE is a world-leading education and research institute running Master of Science and PhD programmes. During its 50 years of history more than 13400 professional beneficiaries from more than 80 countries have been trained at IHE in water, environment and transportation. UNESCO-IHE has been involved in the following European projects: POND-LIVE (ICA4-2000-20034), PAISA (IC18-CT-97-0196), ECOTOOLS (ICA4-CT-2001-10036) and Fingerponds (ICA4-CT-2001-10037). UNESCO-IHE is currently involved in SWITCH Sustainable Water management Improves Tomorrow's Cities' Health (IP 018530) , FLOODSITE (GOCE-CT-2004-505420), Delft Cluster Projects (e.g. WFD-Tools, Floods) and the Nile Basin Capacity Building Network project.

UNESCO-IHE is also member of the Global Development Learning Network (GDLN) of the WorldBank, a network of training and education centres all over the world (www.gdln.org), which provides and excellent infrastructure to deliver e-learning courses and video-conference workshops (e.g. the recently hold inter-river basin workshop on water management) within Europe and globally.

The project will essentially be implemented by:

- Dr. Ann van Griensven, is involved in the modelling related activities of WP4, WP6 and WP7 Senior Lecturer in Environmental Hydroinformatics. She will supervise PhD research on SWAT and OpenMI applications.
- Dr. Andreja Jonoski works at UNESCO-IHE Institute for Water Education as a Senior Lecturer, where he teaches subjects in groundwater modelling and physically-based catchment modeling. His teaching responsibilities and research expertise are in the areas of catchment and groundwater modelling, and integration of models in decision support environments.
- Prof Arthur E Mynett is professor of Environmetal Hydroinformatics at UNESCO-IHE and leading the Strategic Research Department at WL | Delft Hydraulics. His research interest is in environmental hydroinformatics with applications in the natural and urban environment. Specific research topicsrange from mathematical modelling to data mining and data-model integration.Special attention is on integrated modelling and open software architectures. His research group is actively involved in the development of OpenMI.
- Dr. Wim Douven will work on the e-learning and video-conferencing developments and has 20 years of experience in integrated assessment and evaluation approaches, bringing together system and policy analysis, in environmental and water management projects at different scales in EU and Asian regions.
- Dr. Biswa Bhattacharya will implement the e-learning developments. He is lecturer in hydroinformatics at UNESCO-IHE, Delft, the Netherlands is specialised in modelling and management of coastal and hydrological systems.

Beneficiary 16: International Commmission for the Protection of the Danube River, Vienna, Austria (ICPDR: http://www.icpdr.org)

The ICPDR (International Commission for the Protection of the Danube River) is an international organization consisting of 14 cooperating states and the European Union. Since its establishment in 1998, it has grown into one of the largest and most active international bodies engaged in river basin management in Europe. Its activities relate not only to the Danube, but also the tributaries and ground water resources of the entire Danube River Basin.

The ultimate goal of the ICPDR is to implement the Danube River Protection Convention by promoting and coordinating sustainable and equitable water management, including conservation, and rational use of

waters for the benefit of the Danube River Basin countries and their people. The ICPDR pursues its mission by making recommendations for the improvement of water quality, developing mechanisms for flood and accident control, agreeing on standards for emissions and by assuring that these measures are reflected in the Contracting Parties' national legislations and are applied in their policies.

The ICPDR actively organizes and prepares information for the countries on issues related to water quality and quantity in the Danube river basin and is the coordinating platform for the development of the Danube River Basin Management Plan as required by the EU Water Framework Directive. To carry out this coordination role the ICPDR has organized GIS information systems and data collection on water management from the Danube countries and produces numerous reports and documents for technical and public audiences.

The Project Will Be Essentially Implemented By:

- **Philip Weller** is Executive Secretary of the International Commission for the Protection of the Danube River a post he has held since August 2003. He is trained as an Environmental Planner and has extensive experience in ecological restoration and management of water resources in both Europe and North America. He has managed and participated in numerous multidisciplinary research projects in the Danube and the Great Lakes of North America and is author is numerous publications including 3 books on environmental themes.
- **Dr. Igor Liska** works as Technical Expert for Water Quality and Water Management at the Secretariat of the International Commission for the Protection of the Danube River (ICPDR) in Vienna, Austria. He provides managerial and technical support to the activities concerning monitoring and assessment of the surface and groundwater quality and quantity in the Danube River Basin as well as the maintenance, operation and further development of the Danube Accident Emergency Warning System. He contributed to the preparation of the Action Programme for Sustainable Flood Protection in the Danube River Basin and currently supports its implementation. In the recent years he has also been project manager of the Joint Danube Survey 2007 (the world's largest river expedition), author of the monitoring strategy for the Danube River Basin District and coordinator of the sediment management issues under the ICPDR.
- **Alex Hoebart** is the ICPDR Technical Expert on Information Management and GIS. He is responsible for the management of the ICPDR Expert Group dealing with information management and has extensive experience in organizing and operating information systems and electronic data collection. He is also responsible for the development of the Accident Early Warning System of the ICPDR and the purchase and maintenance of hardware to secure effective storage and utilization of information within the ICPDR.
- **Dan Teodor** is the Expert recently assigned by the ICPDR to assist in the development and maintenance of the ICPDR GIS system and in particular in ensuring the uploading data from representatives of the Danube countries. He recently joined the ICPDR from his post with the agency responsible for water management in Romania (Apela Romana) where he was responsible for the organization of GIS and data collection for the EU Water Framework Directive.

Beneficiary 17: Istanbul Technical University – Geodesy and Photogrammetry Department & Environmental Engineering Department (ITU) (http://www.ins.itu.edu.tr)

ITU was established in 1773 and is strongly identified with architectural and engineering education in Turkey. ITU's mission is to provide education to individuals who are able to compete in the global environment. ITU's academic staffs, reaching to 2000 members, helps the university to adopt a dynamic, global, high-quality, creative and communicative approach to education as well as to research and development. Keeping abreast with modern developments, ITU is constantly restructuring itself and renovating its physical infrastructure as well as its research and education facilities.

Environmental Engineering Department

Environmental Engineering Department (EED) at ITU was founded in 1978 and currently houses one of the major environmental engineering undergraduate programs together with two leading graduate programs "Environmental Biotechnology (EnviroBioTech)" and "Environmental Science and Engineering (EnvSciEng)" namely. The Department is a highly dynamic and exciting education and research centre, which attracts highly qualified students and top-class academics. The department accommodates total of 5 laboratories for research and education, several lab-scale and pilot-scale systems.

ITUEED conducts research and provides technical assistance in the following areas: Integrated Watershed Management and Quality, Water Quality Management, Environmental Biotechnology, Chemical Processes and Their Applications, Industrial Pollution Control, Hazardous and Solid Wastes Management, Water and Wastewater Treatment Technologies, Environmental Infrastructure Engineering and Air Quality Management

Geodesy and Photogrammetry Engineering Department

Geodesy and Photogrammetry Engineering Department (GPED) at the Istanbul Technical University was founded in 1969 and consists of five main divisions namely, Geodesy, Photogrammetry, Surveying Cartography and Remote Sensing. The department offers high quality and multidisciplinary undergraduate and graduate programmes, which attract high achieving students and top-class academics.

There are currently 54 faculty members; 14 Professors, 10 Associate Professors, 5 Assistant Professors, 3 Teaching Associates, 22 Research Assistants and 5 Visiting Scholars, associated full time with the department. Many highly talented members from different fields such as environmental engineering, architectural and city planning engineering, civil engineering, contribute to the multi-disciplinary approach.

The GPED conducts research and provides technical assistance in the following areas: Spatial Information Systems, Satellite Surveying, Digital Photogrammetry, Data Structure Analysis, Deformation Measurements, Digital Terrain Models, Visualization of Spatial and Scientific Data, Remote Sensing, Disaster Management Using GIS, GPS and Remote Sensing, Conceptual Data Modelling

The project will essentially be implemented by:

- **Prof. Dr. Seval Sözen:** Dr. Seval Sözen is currently full time professor at ITU, Department of Environmental Engineering and the academic coordinator of ITU- Centre of Management for Disaster Management. Dr. Sözen has 22 years of teaching and research experience in the field of Environmental Science and Technology. She has strong experiences in implementation of EU projects (Framework projects and EU-MEDA) as responsible coordinator at ITU. She holds a list of scientific publications with over 80 papers, which received more than 400 citations.
- **Assist. Prof. Dr. Cigdem Goksel**: She is currently full time assistant professor in Geodesy and Photogrammetry Engineering Department. Her research area focuses on Remote Sensing and GIS Applications. She has been working as a Visiting Professor in the Mid-America Remote Sensing Center - Murray State University in USA in 1999. She is assigned as the Regional Coordinator of Eastern Europe/Central Asia of ISPRS (International Society Photogrammetry Remote Sensing) WG VII/7. She has more than 50 scientific papers published in cited journals and proceedings in the field of Remote Sensing and GIS Applications.
- **Senem Teksoy Başaran**, Environmental Engineer **(MSc.)**: She is currently a PhD student at the ITU-EED and served as Project Assistant in several EU projects.
- **Prof. Dr. Necla Ulugtekin** is a senior lecturer in the Cartography Division of Department of Geodesy and Photogrammetry in Istanbul Technical University – ITU. Her main interests recently are cartography, visualization, GIS and small display cartographic design.
- **Research Assist. Ahmet Ozgur Dogru (MSc.):** He started to work in Istanbul Technical University, Cartography Division (Department of Geodesy and Photogrammetry Engineering) as a PhD assistant in 2002.
- **Research Assist. Filiz Bektas Balcik (MSc.):** She graduated from Yildiz Technical University as a Geodesy and Photogrammetry Engineer in 2000. She has been working at ITC in the Netherlands as a researcher PhD student at department of Natural Resources since 2006.
- **Research Assist. Filiz Kurtcebe (MSc.):** She was graduated from Yildiz Technical University (YTU), Geodesy and Photogrammetry Engineering in 2003. She has started her PhD in 2006.

Beneficiary 18: The National Institute of Hydrology and Water Management, Romania (INHGA: http://www.inhga.ro)

- The National Institute of Hydrology and Water Management (INHGA) is a public institution and a subunit of the "Romanian Waters" National Administration, the national authority in hydrology, hydrogeology and water management. INHGA develops research activities and provides operational services of national and international public interest for the protection and socio-economic well-being of people. INHGA's activities help improve peoples' quality of life and help protect the environment.

Currently, the INHGA is involved in the elaboration and implementation of certain projects that pursue the development of hydrological forecast models, the monitoring of extreme hydrological phenomena, water resources management etc., like:

- CLimate ChAnge and Variability: Impact on Central and Eastern EuRope (CLAVIER), supported by the European Commission's 6th Framework Programme.
- Monitoring, forecasting and best practices for FLOOD Mitigation and prevEntion in the CADSES region (FLOODMED), partially co-financed by European Community in the framework of the INTERREG IIIB CADSES Program
- Central and Eastern Europe Climate Change Impact and VulnerabiLIty Assessment (CECILIA), supported by the European Commission's 6th Framework Programme
- MOSES PROJECT: Improvement of Flood Management System, in the framework of the INTERREG IIIB CADSES Program
- Hydro-meteological data resources and technologies for effective flash flood forecasting (HYDRATE), supported by the European Commission's 6th Framework Programme
- ENSEMBLES Based Predictions of Climate Changes and Their Impacts, funded by the European Commission and coordinated by the Hadley Centre for Climate Prediction and Research at the UK Met Office.

The project will essentially be implemented by:

- PhD Sorin Teodor, PhD, scientific researcher, leader of the Hydrological Studies and Researches Department. He published one reference book and 2 practical guides regarding the improvement and the analysis of the data concerning the solid suspended discharge and the granulometry of the sedimental particles and more than 50 articles in hydrology.
- PhD Viorel Chendes is the head of GIS Data Processing Laboratory and a senior researcher. His research interest is the transpose of hydrologycal application in GIS environment.
- PhD Borcia Constantin is a Senior researcher in INHGA and the his main expertise is in the area of centralizing and processing data regarding the hydrology, chemistry and radioactivity of the Danube, Danube Delta and the Romanian seacoast of the Black Sea water and sediments.
- Teodor Dan Adrian is a GIS expert in the National Administration. Main activities and responsibilities are: member and participant at all meetings of GIS expert group of ICPDR and EU (WISE), GIS training from all Branches of National Administration „Apele Romane".

Beneficiary 19: Odessa National University, Ukraine (ONU: http://www.onu.edu.ua/?type=en)

The Odessa National University (ONU) was founded in 1865. ONU has 8 Faculties, 3 Educational Institutes and 72 chairs. ONU prepares bachelors, holders of master and Ph.D. degrees in 30 specialties. There are more as 20.000 students from 25 countries. The University disposes of 17 autonomous scientific laboratories, a scientific library, botanical gardens and palaeontological, zoological, geological-

mineralogical museums, in which more than 1700 collaborators work. Odessa National University is one of the biggest Universities of Ukraine with scientific Department from 800 scientists, specialists, engineers and administration.

The departments involved within the framework of the project are the Regional Centre for Environmental Monitoring and Ecological Research (RCIEMER) and the Department of Information Technology.

The main fields of RCIEMER activities are focused on:

- Improvement of education and training in environmental, biological, micro biological and ecological sciences.
- Researches in fields of marine microbiology, hydrobiology and ecology; environmental monitoring, management and protection; coastal zone studies; atmospheric and marine chemistry; climate and environment and health; modelling of natural ecosystems; improving the quality of life and management of living resources; environment and sustainable development, environmental sensing, environmental impact assessment.

RCIEMER has already taken part in various national and international environmental oriented programmes and projects. RCIEMER has monitored the ecosystems of the Black Sea and the Sea of Azov, analysis and forecasting the present regional ecological situation in marine and terrestrial ecosystems. Long-term studies have been carried out on biodiversity, hydrobiology, microbiology and ecotoxicology of the Danube Delta Lakes and the Black Sea ecosystems. RCIEMER has a Development Research and Educational facility in the western part of the Black Sea near to the Danube Delta. The work plan involves the regular monitoring of the Black Sea zone near the station.

International research activities:

- FP6 Nitroeurope Project: 017841 (GOCE). (2006-2011)
- FP6 BlackSeaScene project 022868 (RICA). (2005-2008)
- TACIS CBC Programme. Technical Assistance for Lower Dniester basin water management planning. (2006-2007).
- INTAS - 04-77-7112. New methods of information treatment for management of water quality in river basins. (2005-2007)
- ESA-IAF Project “ERUNET” (European-Russian-Ukrainian GMES Network for Monitoring of Oil Spills and Oil & Gas Pipelines) (2004-2005)
- TACIS CBC Programme. Lower Danube lakes: sustainable restoration and protection of habitats and ecosystems. (2000-2003).
- INTAS-RFRB-97-1435 “Study on nitrogen compounds in the atmosphere over the Former Soviet Union related to acidification and climate change.”(1999-2001)
- INTAS-97-1860 “To establish the network of scientists for improving NIS data on atmospheric chemistry” (1999-2001)
- INCO - Copernicus Project “Oil and herbicide pollution in the Black Sea: detection and biological impact". 1997-2000
- RTD Cooperation with third countries and international organizations “International project "Geological History of Yucca Mountain (Nevada) and the Problem of a High-Level Nuclear Waste Repository", USA, Ukraine, Russia. (1995-1998)

The project will essentially be implemented by:

- Dr. Volodymyr Medinets, team leader - expert for Monitoring and Ecological Research, since 1982 to present - the main activity as principal investigator or team leader in national and international scientific projects in marine ecology, atmospheric chemistry, radioecology for the Black Sea, the Danube River, the Dniester Rivers and other freshwater bodies.
- Dr. Igor Souchkov – Geology and Bottom sediments of the Black sea and geological issues in basin of the Black Sea.
- Dr. Yaroslav Bilanchin – Land cover and soils quality in southern part of Ukraine.

- Dr. Natalia Kovalyova – Microbiology and marine biology of the Black sea.
- Dr. Yulia Molodozgen. – Regional Economy in adjacent to the Black sea areas.
- Yevgen Gazyetov - data processing and management and GIS
- Sergey Snigirev – Ichtiology. Fish biodiversity data.

Beneficiary 20: St. Petersburg State University, Russian Federation

(SPSU: http://www.spbu.ru)

St. Petersburg State University (SPSU) is the oldest university in Russia, it has been established in 1724. At present SPSU is a major Russian centre of science, education and culture, including 19 faculties and 13 research institutes with over 25 000 students and 5000 permanent staff. SPSU has over 100 direct agreements of co-operation with universities in 50 countries in the world. Biodiversity-related research activities of SBPSU include studies in the field of ichthyology and hydrobiology, vertebrate and invertebrate zoology, geobotany and ecology with focus on European part of Russia. Also, SBPSU is conducting research on integrated river basin management focusing on developing approaches to cumulative risk assessments of different stressors. Within Europe, SPSU is participated in cooperative research and education within EC INTAS, TEMPUS Ecodiv and FP6 projects.

Specifically, SPSU is involved in the EC FP6 Strategic Targeted Research Project DAISIE ("Delivering Alien Invasive Species Inventories for Europe", and two EC FP6 integrated projects: ALARM ("Assessing LArge-scale Risks for biodiversity with tested Methods"), and MODELKEY (Models for Assessing and Forecasting the Impact of Environmental Key Pollutants on Marine and Freshwater Ecosystems and Biodiversity"). Within EnviroGRIDS project SPSU will be coordinating activities related to invasive species introductions as one of main threats to biodiversity and disasters early warning.

The project will essentially be implemented by:

- Mr Vadim E. Panov, PhD in biology (aquatic ecology), SPSU team leader in EC FP6 projects DAISIE and ALARM (coordination of the projects activities related to invasive species in the European inland waters), Chief Editor of the international EC-supported "Aquatic Invasions" e-journal, Coordinator of the Regional Euro-Asian Biological Invasions Centre information system and Coordinator of the European Research Network on Aquatic Invasive Species.
- Mr Alexey M. Tomilin, PhD in technical sciences. Expert in development of GIS technologies in environmental issues.

SPSU will subcontract the Southern Scientific Centre of the Russian Academy of Sciences (SSC RAS) and The Scientific and Practical Center for Bioresources of the National Academy of Sciences of Belarus (SPCB).

Participants from SSC RAS:

- Mr Gennady G. Matishov PhD in geographical sciences. Chairperson of the SSC RAS. Scientific activities: marine biology and geology; oceanic periglacial; environmental and radiation monitoring; marine ecosystem, fish productivity and bioresources dynamics; fisheries and oil and gas activities impact assessment on biogeocenoses; topography and geomorphology of the North Atlantic and the Arctic Ocean bottom.
- Ms Sofia V. Kreneva PhD in biology (aquatic ecology). Leading Scientist at SSC RAS (Laboratory of Plankton) and Azov Branch of MMBI KSC RAS. Research interest: aqua ecology, assessment of state, health of aquatic ecosystems, development of pollution control methods.
- Mr Sergey V. Berdnikov PhD in biophysics. Head of Department of Oceanography and Biology of the Southern Seas, studies on the Black and Azov Seas Ecosystems Modeling and Fisheries Management; The study of regularities of biological productivity and fish community changes in aquatic ecosystems under exotic species impact; Ecological consequences of a comb jelly invasion for the Mediterranean sub-areas (Black-Azov seas).
- Mr Vitaly L. Syemin PhD in biology (aquatic ecology), expert in monitoring and bioindication of water bodies in Black Sea basin (focus on benthic communities)

- Ms Ekaterina V. Kreneva PhD in biology (aquatic ecology), expert in monitoring and bioindication water bodies in Black Sea basin (focus on plankton communities)
- Mr Valery A. Luzhnyak PhD in biology (aquatic ecology) expert in ichthyofauna biodiversity, biology and ecology of indigenous and alien fish species and assessment and monitoring of present state of their populations, abundance and distribution in Black Sea basin.

Participants from SPCB:

- Mr Vitaliy Semenchenko PhD in biology (aquatic ecology), expert in ecology of water invertebrates, population ecology, monitoring and bioindication of surface water in Black Sea basin
- Mr Victor Ryzevsky PhD in biology (aquatic ecology), expert in invasive fish in Black Sea basin
- Mr Mikhail Pluta PhD in biology (aquatic ecology), expert in invasive fish in Black Sea basin
- Mr Vasily Vezhnovetz PhD in biology (aquatic ecology), expert in invasive Ponto-Caspian crustaceans

Beneficiary 21: Soresma, Belgium (SORESMA: www.soresma.be)

Soresma is a leading independent engineering consultant, 200 persons, 6 locations; with 9 expertise areas: policy support, environment, water, soil, nature, spatial planning, infrastructure, safety and Geo-ICT. The quality of services complies with the ISO 9001 certification. Our water division, active both nationally and internationally, excels in integrated water management as well as flood risk and forecasting, with a broad expertise in GIS development, data management and processing, rainfall forecast and telemetry, hydraulic and hydrologic modelling, participative master planning and stakeholder participation.

Relevant Experience: Relevant references are 1) the EC-LIFE project FlaFloM (Flash Flood Manager) in Egypt, which aims to develop participative flash flood risk management and 2) the FP7 Twinning project WETwin (in negotiation) on enhancing the role of wetlands into river basin management in EU, Africa and South-America. Further references are 3) EU-Interreg IIIb projects ESCAPE and SafeCoast on safety for flood risk of the entire North Sea coastal zone under climate change; 4) a project in Romania on support for the implementation of the WFD; 5) the development and implementation of state-of-the-art real-time flood forecasting systems for several Flemish river basins including a gauging and telemetry systems, a stabilized chain of numerical models and a web-portal with flood forecasts for for the broad public (http://www.overstromingsvoorspeller.be). Through former non-Soresma related experience of staff members, expertise from other relevant references can be provided (elaborated in the description of key staff).

The project will essentially be implemented by:

- Jan Cools MEng MSc combines a Engineering degree with a MSc degree in Cultures and Development (Anthropology). Jan Cools is project leader of the ongoing project in Uganda, the EC-LIFE project in Egypt and the co-coordinator of the new 7FP twinning project WETwin. He has further been co-coordinator in the EC-INTAS project HYDROMANAGER (2002-2005) with Russia on the integration of hydrologic-economic decision-support and pursued research on farmer-based soil fertility practices at the Institutional Institute of Tropical Agriculture (IITA) in Nigeria (1999). Thanks to his multi-disciplinary knowledge, Jan Cools will be able to integrate information from technical, socio-economical and institutional aspects
- Dr.ir. Veronique Vandenberghe is a bioscience engineer and is halftime affiliated at the Hydraulics Institute of Flanders. She is specialised in uncertainty calculations for hydrological models. She was involved in European funded projects like CD4WC (urban water management) and Harmoni-CA (integrated river basin management).
- Pascal Vlieghe, MEng, is team leader at Soresma and involved in the SafeCoast project. He has former experience at UNDP as team leader of the South Serbia Municipal Improvement and Recovery Programme (SSMIRP)
- Dr.ir. Ivan Rocabado is hydraulic engineer specialised in numerical modelling, operational flood forecasting and warning systems. He was project leader for the development of operational flood forecasting and warning systems.

Beneficiary 22: V.I. Vernadsky Taurida National University, Simferopol, Ukraine (TNU: www.crimea.edu)

Taurida National University is one of the largest higher educational institutions in Ukraine. Established in 1918, now University has 78 chairs that are incorporated in 15 faculties, where more than 17 000 students have studying. About 500 professors, science doctors and professor's assistants make working staff of TNU.

Geoecology Chair of TNU – one of the leaders in graduating of bachelors and masters of ecology in Crimea, it carries out many important researches in the field of environment protection and sustainable development. Jointly with another University structures: Scientific-Research Centre of Technologies of Sustainable Development and Regional Information-Analytical Centre of Environmental Monitoring, the Chair decides the key problems of regional development in the field of natural resources management, protection of environment, ecology-economic optimization of Crimean peninsula territory. On the basis of Geoecology Chair the UNESCO Chair "Renewable Energy and Sustainable Development" was founded at 2006.

Main international research activities:

- "Biodiversity Conservation Needs Assessment in Crimea" (1997-2001). Project was supported by the Biodiversity Support Program (USA), which was consortium of World Wildlife Fund (WWF), organization "The Nature Conservancy" and World Resources Institute (WRI).
- INTAS-UA-952-177 project "Biological effectiveness of forestry actions and environmental protection" (1997-1999).
- Education on spatial planning in the framework of a post-graduate course at Vernadsky Taurida National University - Scientific Co-operation between Eastern Europe and Switzerland (SCOPES 2000-2003).
- Tempus-TACIS project CD_JEP-21242-2000/Ukr «Development of Education in a field of Ecologically Safe Energetics» (2001-2004).
- Strategic Environmental Assessment of Crimean Regional Development Strategy. UNDP Crimea Integration and Development Programme in coordination with Council of Ministers of Autonomous Republic of Crimea (2007-2008).

The project will essentially be implemented by:

- Vladimir Bokov – head of Geoecology Chair, head of UNESCO Chair "Renewable Energy and Sustainable Development" of TNU, Doctor of Geography, Honored Science and Technology Worker of Ukraine, professor – team leader
- Tatiana Bobra – Candidate of Geographical Sciences, Associate Professor - landscape ecology, geographical boundaries, ecotones, econet, environmental audit;
- Alexander Lychak – Candidate of Geographical Sciences, Associate Professor, Director of Regional Information-Analytical Center of Environmental Monitoring - GIS, landscape ecology, econet, environmental situations assessment, protected areas;
- Alexander Rudyk – Assistant of Professor – landscape ecology, management of protected areas, econet, EIA and SEA;
- Vadim Yashenkov – Msc, post graduate student – landscape ecology, alternative energy, EIA.
- Viktor Smirnov – Msc, post graduate student – landscape ecology, hidro-meteorological modelling, EIA.

Beneficiary 23: University of Barcelona, European Topic Centre Land Use and Spatial Information, Spain (UAB: terrestrial.eionet.europa.eu)

The UAB ETC-LUSI is an international consortium contracted by and assisting the European Environment Agency (EEA) in delivering information on the state and trends of the environment through the provision of timely, targeted, relevant and reliable information to policy-making agents and the public. The consortium is leaded by the Universitat Autonoma of Barcelona.

In order to achieve these aims, the UAB ETC-LUSI works closely with the EEA Member States (EIONET) in establishing regular harmonized data flows to support current and upcoming environmental reporting

obligations. The UAB ETC-LUSI Core Team is a group of 12 international experts holding university degrees in geography, geology, biology and IT and experience in regional, national and European projects in several fields of the GIS/SDI and manage the Terrestrial Information System (TERRIS) – a reference database for environmental spatial information in Europe especially oriented to facilitate spatial analysis and the development of environmental indicators.

The work agenda of the UAB ETC-LUSI Core Team is driven by the main policy needs regarding environment, sectoral integration and planning in Europe. Through the analysis and understanding of spatial change, the core team and its wider network is closely interrelated with other EEA priority areas, such as biodiversity loss, climate change, human health & quality of life.

ETC-LUSI core team members have been strongly involved in the following projects:

- Coordination of the European Corine Land Cover 2000 and 2006
- Development of a harmonized European methodology for the identification of risk areas for soil contamination.
- Development of the spatial dimension agro-environmental indicators for IRENA,
- Leading the DG Environment Working Group on Indicator and Data to develop a set of indicators to monitor progress in Integrated Coastal Zone Management (ICZM) since 2002
- Spatial modelling and analysis in support of integrated environmental assessments and development of indicators for assessing the European State of the coast
- Support in developing the Shared European Integrated Spatial Information Service through integration of new basic reference data into TERRIS (e.g. data set on urban morphological zones to analyze spatial changes in and around urban areas and their interaction with the surrounding land – access to recreational areas).
- Developing the method on "Land and Ecosystem Accounting" (LEAC) together with the EEA – a method to measure land cover changes based on different inventories of the CLC (or other) database.
- Through LEAC methodology, a number of indicators have been calculated (eg. fragmentation of land and ecosystems, land take by urban sprawl and transport networks, pressures on protected areas, etc.).

Besides that, ETC-LUSI is partners in several European projects under the framework of FP 6 and FP7. Colleagues are also involved and members of several national working groups like Spanish SDI or UNSDI (United Nations SDI coordination office for Spain). Additionally we are contributing to the conceptualization and development of the European Land Use Data Centre.

The project will essentially be implemented by:

- Mr. Andreas Littkopf degree in agriculture (terrestrial ecology) and degree in business management
- Ms Françoise Breton PhD in social anthropology and master in geography
- Mr. Jaume Fons PhD in Biology, environmental analyst
- Mr. Walter Simonazzi Msc GIS, GIS coordinator
- Ms Nuria Blanes Msc GIS, environmental analyst

Beneficiary 24: Ukrainian Scientific and Research Institute of Ecological Problems (Ukraine) (USRIEP: www.niiep.kharkov.ua)

Ukrainian Scientific and Research Institute of Ecological Problems (USRIEP), Kharkiv, Ukraine was set up as the All-Union Scientific Research Institute for Protection of Waters in 1971. Now USRIEP is the main scientific organisation working in the system of the Ministry of Environmental Protection of Ukraine. The main efforts of the institute are directed at provision of scientific fundamentals for elaboration of the state policy in environment protection, rational use of natural resources, and ecological safety. Major areas of the Institute activities are as follows:

- Elaboration of basic principles of the national environmental policy.
- Development of legislative, normative, economic and administrative means for support of the environment protection activities.

- Development of scientific basis for management and control of water resources quality in river basins.
- Provision of scientific, methodological, metrological, instrumental, technical, programmed informative, legislative and co-ordinative support to environmental monitoring.
- Development of ecological programs and statutory documents, integrated environment-protective measures, and methods for environmental impact assessment; development of scientific fundamentals of ecological expertise and ecological auditing.
- Elaboration of ecologically friendly technologies.
- Co-ordination of management of reserved areas and refuges and protection of biodiversity.

Key implemented projects, relevant to the FP7 proposal:

- FP-6 project "Black Sea Scientific Network", 2005-present time.
- INTAS project "New methods of information treatment for management of water quality in river basins", 2005-2007.
- World Bank project "Environmental Framework Policy and Environmental Assessment for Urban Infrastructure Project and Nistru River/Black Sea Protection Project", 2005.
- "Black Sea Environmental Priorities Study". Global Environment Facility Black Sea Environmental Programme. Ukrainian-USA co-operation, 1997-1998.
- "Impact of Climate Change on Hydrological Regimes and Water Resources in Europe (Using the Southern Bug River Basin)" - International Environment programme PEKO, 1995-1997
- Management of Water Resources. VICAIRE/ Virtual campus in hydrology and water resources.

The project will essentially be implemented by:

- Prof. Alexander Kuzin – Scientific Director of USRIEP, he graduated from Kharkiv Institute of Municipal Engineering and Kharkiv University of Civil Engineering & Architecture. He has a Doctor Degree in Geography. His key specialization is water resources protections and management, climate change issues; he is/was a team leader and expert in various local and international projects (PEKO programme, TACIS, Tempus-Tacis, INTAS, UNDP-GEF, WB projects, FP6 project "Black Sea Scientific Network", etc.).
- Mr. Yevgeniy Makarovsky – Leading Researcher of Environmental Management & Information Systems Laboratory, he has graduated from Kharkiv State University, has a PhD degree in Technical Sciences.
- Mrs. Kateryna Utkina – Researcher of Environmental Management & Information Systems Laboratory, she has graduated from Kharkiv National University and Kharkiv National Academy of Municipal Economy, has a Master degree in Ecology and Environmental Protection. She is dealing with coastal zone protection.
- Mr. Vladimir Kresin – Head of Laboratory of Water Physics and Marine Water Quality Protection. He graduated from Kharkiv Institute of Radio Electronics, has a PhD degree in Technical Sciences. His key specialization is hydrology and mathematical modeling of processes of marine water quality forming; he was the leader of various local projects and expert in international project.
- Mr. Vladimir Bruk - Leading Researcher of Laboratory of Water Physics and Marine Water Quality Protection. He graduated from Kharkiv State University, has a PhD degree in Technical Sciences. He is dealing with hydrological models and assessment of marine environment.

Beneficiary 25: Technical University of Cluj-Napoca, Romania (UTC: www.utcluj.ro)

The Technical University of Cluj-Napoca (UTC) is one of the eight universities in Cluj-Napoca, the second in size, specialized in teaching and further training engineers and technical staff. With its eight faculties and a college, with over 700 academic staff and researchers, as well as 12,000 students, the Technical University offers a wide range of courses in computer science, electrical engineering, mechanical and manufacturing engineering, materials science, civil engineering and architecture.

The Computer Science Department offers BS in Computer Science and Information Technology; MS in Artificial Intelligence and Vision, Communication Networks and Distribute Systems, Computer Science in Engineering, and Software Engineering; and PhD in Computer Science and Applied Informatics.

The project will essentially be implemented by:

- Dorian Gorgan is professor and PhD supervisor in Computer Science at the Technical University of Cluj-Napoca. He graduated Computer Science and Automation from "Politechnica" University of Timisoara, has PhD in Graphical Modeling and Simulation, Visual Programming, and Graphical User Interfaces at the Technical University of Cluj-Napoca. For two years he gave technical and scientifical consultancy in Autodesk's projects (in Milan, Italy) in the fields of location based services (LBS) and geographical information systems (GIS). He is the chair of the CGIS (Computer Graphics and Interactive Systems) Laboratory, director of the MedioGrid project, a Grid software and hardware infrastructure supporting the development of the environmental and geographical applications.
- Cornelia Melenti is senior lecturer in Computer Science Department, Technical University of Cluj-Napoca. She carries out research in the CGIS (Computer Graphics and Interactive Systems) group.
- Ovidiu Muresan is PhD student in Computer Science. He concerns with distributed processing, Grid computing, satellite image processing, and computer graphics. He is involved in the development of the MedioGrid platform, and the basic Grid and Web services supporting the satellite image processing.
- Victor Bacu is PhD student in Computer Science. He works on Grid application development, cluster based visualization, tool packages for flexible classification in the satellite images.
- Teodor Stefanut is PhD student concerning with the development of 2D and 3D graphical annotation techniques in the context of eLearning applications. His fields of interest consist of computer graphics, user interaction techniques, graphical modeling and simulation, distributed interactive applications, and Grid and Web applications.

Beneficiary 26: VITUKI Environmental Protection and Water Management Research Institute, Budapest (Hungary)
(VITUKI: http://www.vituk.hu & http://www.hydroinfo.hu)

VITUKI was founded in 1952 on the basis of the Hydrologic Institute to perform for the Hungarian Water Management both basic and applied research, as well as studies related to the development, conservation and sound management of water resources of the country. Supported by hydraulic, hydro chemical etc. laboratories; equipment, instrumentation and computer facilities, VITUKI has emerged as one of the most complex water-oriented full-service professional organizations in the region. At present, there are about 80 highly qualified specialists on the staff, out of the total 230 employees, including civil, chemical, electrical, mechanical engineers, geologists, biologists, mathematicians, and geophysicists. VITUKI is the reference center of WHO and WMO concerning water quality and hydrology, respectively, one of the founding members of International Association of Hydraulics Research (IAHR) and focal point for the International Association for Hydrological Sciences (IAHS). Hydrologists of the Institute elaborated numerous national projects related to hydrological forecasting also participated in international projects of the European Union, WMO and the Danube countries. The Institution played a key role in the investigation of high floods in the period of 1998-2001 in the Tisza Basin with special emphasis on flood forecasting and flood inundation studies. Drought studies in central Hungary and investigation of the hydrological drought in the Balaton catchment 2000-2003.

The project will essentially be implemented by:

- Dr. Gábor Bálint: Civil Engineer, PhD in Hydrology and water management. Position: Head of the Hydrological Forecasting Unit, Senior Research Associate. Role: Project responsible at VITUKI. G. Balint has been working as forecaster and flood hydrologist more than two decades. He has an important experience in the processing of real time hydrological information and also in the use of hydrological data and forecast for flood-related decision making and operation of hydraulic structures. He took part in the elaboration of the VITUKI-OVSZ modelling system and in the

analysis and simulation studies of climate change impact and extreme flood events in the Danube Basin.

- Dr. Balázs Gauzer: Civil Engineer, Dr Techn. in Hydrology and water management Role: Testing of hydrological forecasting models, flood simulation, developing and operating hydrological software.
- Dr. Károly Konecsny: Geographer, PhD in Hydrology. He has an important experience in analysing flood related information and also in drought studies.
- Dr. Zsolt Mattányi: Geographer, PhD in Physical Geography. He is experienced in GIS tool application, analysing hydrometeorological and rivernetwork related information and also in economic impact studies.
- Dr. István Zsuffa: Civil Engineer, PhD in Hydrology and water management. Budapest Technical University, Wageningen Agricultural University. His research field covers hydrology, hydrodynamics, ecology and operational research. His special interest is wetland management.

Finished projects: EFFS**;** FLOODRISK-Hungary**;** The Tisza River Project: Real-life scale Integrated catchment model for supporting water- and environmental management decisions (FP5).**;** Harmoni-CA Harmonised Modelling Tools for Integrated River Basin Management (FP5)**;** HarmoniQuA Harmonising Quality Assurance in model based catchment and river basin management (FP5)**;** NÉS_Baseline information

Ongoing projects: PREVIEW, CLAVIER, CLIMATE-WATER

B2.3 Consortium as a whole

Summary Box

The partners were chosen for the expertise in several fields of environmental sciences and information technologies and because they are all dealing with spatial data handling. They have a very strong and direct interest in Observations Systems and have connections in numerous local, national, regional and international organisations. Together they form a very strong consortium that will be able to raise significantly the Public awareness in different Societal Benefits Areas, to build Decision-makers capacity to use Observation Systems, and Scientists capacity to construct them and feed them with quality information.

This consortium will be supervised from Geneva where the Project Coordinator is based very close to the Group on Earth Observation headquarter. Together with the CERN and ARXIT partners also in Geneva, this strong hold will favour the construction of the EnviroGRIDS spatial data infrastructure and its connection to GEOSS.

B2.3.1 Consortium overview and role of the beneficiaries

Favourable Context

Geneva occupies a strategic position by hosting several international organizations centred on environmental and related societal issues (GEO, UNEP, UNDP, WHO, WMO, WCO, ICRC, IUCN, WWF…). Indeed, the Global Earth Observation (GEO) intergovernmental project is based in Geneva to establish the Global Observation System of Systems that is recognized by the European Commission as an official partner for global projects. The United Nations Environment Programme (UNEP) with GRID-Europe has a long experience in gathering and making available global environmental data through for instance the Global Environmental Outlook program, and is presently involved in project on the climatic vulnerability of the shallow Lake Balaton in Hungary as well as several other European projects. The Enabling Grids for E-Sciences project (EGEE) will provide the necessary computing power for this project through the use of its Grid of 36000 processors. The Climatic Change and Climate Impacts group at the University of Geneva (UNIGE-C3i) has an excellent international reputation in terms of its research on climate change impacts and

is striving to reinforce its relationships with international organizations. Therefore, the combined expertise of GRID, UNIGE, EGEE and GEO will be easy to gather regularly to guarantee the best possible steering of the EnviroGRIDS project.

Network of Excellence

Many partners in this project are leaders in the field hydrological modelling and already know each other because they belong to the active community of users of Soil and Water Assessment Tool (SWAT), and have already collaborated in other projects. The UNESCO Institute for Water Education (IHE) is a leading institute in research and teaching hydrology for students coming from the entire world. The Swiss Aquatic Research Institute (EAWAG) is an internationally recognized research institute in hydrology and has done some large scale uses of SWAT in recent years for instance across the entire African continent or in Iran. Soresma is leading Belgian consultant company on integrated water resources management. They are another member of the SWAT community and are furthermore involved in many EU-funded projects including FlaFloM, SafeCoast, WETwin and Twin2Go. In the Black Sea catchment, they are active in Romania and Ukraine. The University of Barcelona (UAB) is partner within the European Topic Centre on Land Use and Spatial Information (ETC-LUSI). Finally, the Centre for Advanced Studies, Research and Development in Sardinia (CRS4) is also a leading partner in information and technology and started to develop web based decision support tools based on SWAT outputs.

This strong hold of Western Europe partners is ideally reinforced in the EnviroGRIDS project with several high level education, research, public and private partners within the Black Sea Catchment. For example, IBSS (Ukraine) is one of the leading institutes in terms of the long-term research of the Black Sea ecosystem. IBSS holds and develops the database on over 150 oceanographic expeditions dealing with this region. Along with RCIEMER (Ukraine), DHMO (Ukraine), SPSU (Russia), DDNI (Romania) these institutes have monitored the ecosystems of the Black Sea , the Sea of Azov, the Danube delta, and forecasting the present ecological state of marine and terrestrial components of the basin. INHGA (Romania) has a long-standing experience in water resources, flood and drought risk management, as well as the assessments of the impact of human activity and climate change on the hydrological regime of the basin. GeoGraphic (Georgia) develops specialized software, flexible data management technologies, and cartographic production pertained to the environmental issues of the Black Sea region.

The consortium is composed of 8 partners from ICPC countries (Ukraine, Georgia, Russia). Several partners (UNIGE, CERN, EAWAG, ARXIT) are based in Switzerland and one in Turkey (ITU). Among these partners one is in fact a European research Agency (CERN) and UNIGE-GRID functions also as a UNEP office in Geneva and collaborates closely with several international organisations (GEO, UNDP, WMO, IUCN). There is therefore a strategic advantage in having a concentration of partners in one place in terms of general communication for the project. The anchorage of the project in Geneva is also very important for its future development in trying to gather even more international organisations around the idea of EnviroGRIDS.

B2.3.2 Complementarity of beneficiaries

The beneficiaries are very complementary as they are all bringing state-of-the-art expertise in different fields that are ranging from spatial data infrastructure, web site design, climate change, demographic and land cover predictions, hydrological modelling, supercomputing, sustainable indicator systems, e-learning, open source software, and complex data visualisation. Furthermore, all partners have strong connections through their respective expertise in several areas of spatial analyses. We expect therefore that the communication between partners, tasks and work packages to be excellent through the common language of maps.

B2.3.3 Exploitation of the results

The EnviroGRIDS partners will develop software modules along a common analytical pipeline. They will provide to the end user community new software and data sets that will be made available as soon as published on an open source basis. EnviroGRIDS results will be shared by adopting the modern European and global spatial data standards such as INSPIRE and GEOSS. DVDs with available data and software will

be distributed in developing countries through a specific task. The sustainability of the results will be guaranteed by the UNIGE-GRID that will make sure that its spatial data infrastructure remains available to distribute the results in the future.

B2.3.4 Subcontracting

The UNIGE will subcontract IISD office in Geneva to help in the coordination of WP5 and to review the entire project progresses. IISD brings to the project expertise in several of its programs, including Measurement and Assessment, Sustainable Natural Resources Management and Knowledge Communications. Through its Measurement and Assessment program, founded in 1994, the Institute has developed expertise and a diverse portfolio of projects in the areas of integrated environmental assessment, sustainable development indicators and reporting, scenario analysis, as well as planning, implementation and evaluation of sustainable development strategies. IISD has been working as a Collaborating Centre of UNEP under the Global Environment Outlook, taking a lead role in the areas of capacity building for integrated environmental assessment using the GEO approach and scenario analysis (in GEO-4), using the driving force-pressure-state-impact-response framework (DPSIR). IISD is also a lead partner of UNIGE-GRID Geneva and LBDCA in the Lake Balaton Integrated Vulnerability and Adaptation pilot project of UNDP-GEF in Hungary, with responsibility for indicator development, scenario analysis and capacity building. The Institute's Sustainable Natural Resources Program is focused primarily on the nexus of agriculture and water, advancing the spatially explicit analysis of agriculture's exposure to climate change. IISD's Knowledge Communications program captures the innovation that lies at the intersection of ICTs, networks and partnerships, knowledge sharing and learning, the role of communications in influencing decision making and the tools for communications (€100'000).

The BSC will keep aside a sum of €206'496 as a sub-contract on other costs in order to be able bring new partners in the consortium according of the result of the Gap Analysis that they will run with the ICPDR.

The CRS4 beneficiary will be sub contracting part of the development of the web portal to the ERA group. CRS4 has indeed already started a very fruitful partnership with this private company and started to develop together the web interface for SWAT outputs. The end product will be made available to the consortium on open source basis. Reallocating recourses to do the work again is pointless and would be much more expensive as it took ERA about 2 years to develop the actual system. (€90'000)

The SPSU will subcontract two institutions: a) the Southern Scientific Centre of the Russian Academy of Sciences (SSC RAS) located in Rostov-on-Don, the largest scientific institution in the Russian part of the Black Sea area, for collection of essential information on invasive species and other principal stressors for environment of the region (including oil spills) (€80'000) and b). The Scientific and Practical Center for Bioresources of the National Academy of Sciences of Belarus (SPCB) located in Minsk, a key institution in Belarus for biodiversity research, for collection of information on invasive species and other principal stressors for the upper Dnieper River basin (€60'000).

The CCSS will subcontract part of his work on sensors to one of the SME belonging to its association for a sum of €40'000.

SORESMA will subcontract a private firm (€10'000) to develop attractive presentations using video and animation technologies to inform the public about the project.

Additionally, every beneficiary has put aside a budget for their financial auditing.

B2.3.5 Other countries

No countries from other regions of the world are involved.

B2.4 Resources to be committed

Summary Box

- EnviroGRIDS is investing the largest possible part of the budget in Research, Technology and Development (RTD) activities with 50.6% of the budget directly spent on salaries
- Management costs are kept under 5%
- Overheads represent on average 30.9% of the total cost
- Travel expenses are kept to their minimum with less than 5% of total cost
- Equipment costs are kept low with approximately 3.4% of total cost
- Subcontracting was only used by 5 partners (6.4%) to provide crucial services to the project like independent auditing of project progresses, and money set apart to spend according to the result of the gap analysis.

B2.4.1 Justification of requested resources

The EnviroGRIDS man-months distribution is well equilibrated between the seven work packages, except for management one that is getting only 1.8% of the time. This reflects our desire to invest as much as possible on the productive parts of the project, and particularly on disseminations and capacity building with 20.7% for the Black Sea Observation System development and 8.1% for dissemination and capacity building activities.

Wp	Name	Man-Months	Percent
1	Project Management	24	1.8
2	Spatial Data Infrastructure	216	16.4
3	Scenarios of Change	106	8.1
4	Hydrological Models	160	12.2
5	Impacts on SBA	429	32.6
6	BSC Observation System	272	20.7
7	Dissemination and training	107	8.1

The following table shows that largest part of the total budget (approx. 50.6%) will be used on the salaries for Research, Technology and Development (RTD) that will create the scientific outputs of the project.

Less than 3.5% is used for upgrading the necessary equipment, and around 4,8% for travel expenses. The management of this large collaborative project will necessitate 4.4% of the requested cost (dark grey line). In this table, the total budget is distributed in function of the number of person-months attributed to each partners taking into account the cost of life in every country.

Work package leaders (in light grey) are getting a slightly larger amount of funding according to their larger implication in the project. Every beneficiary gets enough funding to pay for at least a half person during the the duration of the project. This should allow obtaining dedicated staff to the project and improving therefore the general efficiency of the organisation.

Nb	Name	Type	Man-Months	Salaries	Equip-ment	Consu-mables	Audit	Sub-contract	Travel	OVH	Total	Requested	Percent
1	**UNIGE**	MANAG	24	156'000		1'200	3'600	100'000	10'000	100'320	271'120	271'120	4.4%
1	**UNIGE**	RTD	72	468'000	30'000	1'200			14'000	307'920	921'120	690'840	11.1%
2	**ARXIT**	RTD	24	144'000		1'200	2'000		6'000	30'240	183'440	138'080	2.2%
3	**AZBOS**	RTD	52	74'100	15'000	4'000	2'000		12'000	63'060	170'160	128'120	2.1%
4	**BSC PS**	RTD + OTH	36	144'000	10'000	1'200	2'000	206'496	12'000	33'440	409'136	380'576	6.1%
5	**BSREC**	RTD	36	162'450		1'200	1'800		9'000	34'530	208'980	157'185	2.5%
6	**CCSS**	RTD	58	102'200		10'000	2'000	40'000	12'000	98'520	304'720	243'776	3.9%
7	**CERN**	RTD	36	200'000	10'000	1'200			12'000	133'920	357'120	267'840	4.3%
8	**CRS4**	RTD	62	260'400	10'000	4'000	1'500	90000	14'000	128'520	508'420	381'690	6.1%
9	**DDNI**	RTD	34	142'800	5'000	1'200	2'000		12'000	64'400	227'400	171'050	2.7%
10	**DHMO**	RTD	30	42'750	12'000	1'200	1'000		12'000	40'770	109'720	82'540	1.3%
11	**EAWAG**	RTD	72	174'000	5'000		1'200		20'000	119'400	319'600	240'000	3.9%
12	**Geographic**	RTD + OTH	34	80'597			2'000		5'000	64'025	172'734	130'048	2.1%
13	**IBSS**	RTD	36	57'600	10'000		1'000		15'000	16'620	100'720	75'790	1.2%
14	**IGAR**	RTD	24	79'984	10'000	1'216	2'000		12'000	59'520	160'720	121'040	1.9%
15	**IHE**	RTD + OTH	90	225'000	3'000				20'000	240'960	491'960	397'390	6.4%
16	**ICPDR**	RTD + OTH	24	108'000	10'000	1'200	2'000		12'000	78'720	21'920	181'040	2.9%
17	**ITU**	RTD	60	125'400	6'700	6'000	4'500		22'000	121'140	327'540	246'780	4.0%
18	**INHGA**	RTD	36	58'000	32'000	4'000	2'000		12'000	21'200	129'200	97'400	1.6%
19	**ONU**	RTD	60	85'500	18'000	1'200	2'000		12'000	70'020	188'720	142'040	2.3%
20	**SPSU**	RTD + OTH	24	67'200	15'000	1'200	3'000	140'000	12'000	117'720	456'920	360'960	5.8%
21	**SORESMA**	RTD + OTH	36	255'368		43'000	8'000	10'000	25'000	38'937	414'042	371'537	6.0%
22	**TNU**	RTD	36	43'200	8'000	1'500	2'000		15'600	40'980	112'280	83'960	1.3%
23	**UAB**	RTD	44	170'800					20'000	114'480	305'280	233'100	3.7%
24	**USRIEP**	RTD	66	94'050	22'230	2'000	2'000		12'000	26'056	158'336	119'252	1.9%
25	**UTC**	RTD + OTH	104	276'500	18'750	900	2'000		15'000	186'690	499'840	375'380	6.0%
26	**VITUKI**	RTD	42	106'400	12'000		3'000		12'000	29'120	177'720	134'040	2.2%
		Total	**1'252**	**€ 3'904'299**	**€ 262'680**	**€ 89'816**	**€ 54'600**	**€ 496'496**	**€ 366'600**	**€ 2'381'228**	**€ 7'708'868**	**€ 6'222'574**	100.0%
				50.6%	**3.4%**	**1.2%**	**0.7%**	**6.4%**	**4.8%**	**30.9%**	**100.0%**	**80.7%**	

B2.4.2 Equipment resources

As stated above, the project will necessitate less than 3.5% of investment in equipment as all partners will make available their existing infrastructure. The requested equipment is justified in order to construct a new pipeline of analysis with compatible, dedicated equipment, supporting large data storage capacity. The project coordinator will also reinforce its Spatial Data Infrastructure (SDI) to manage a large data storage capacity and run geoprocessing services.

B2.4.3 Other major financial resources

The other financial resources of the project will mainly serve for travel expenses by the different partners. As the core of the project is centred on Geneva, several partners are in nearby countries and the schedule of the project meetings are relatively separated in time, the cost of travelling will be kept to its minimum. Furthermore, the coordination of the project will greatly encourage regular video conference meetings among partners especially within work packages and for distant Project Management Board meetings.

B3 Potential Impacts

B3.1 Strategic impact

Summary Box

The EnviroGRIDS @ Black Sea Catchment is expected to make a strong impact in the Black Sea Catchment and beyond through the following main actions and initiatives:

- EnviroGRIDS will fill the gap between large amount of available data and geoprocessing capacity by the use of Grid technology.
- EnviroGRIDS is already planning on becoming a Foundation during or after the life span of the project to expand the use of its technology in other environmental conditions and in different regions.
- EnviroGRIDS is built to stay and will be able to rely on the UNEP/GRID infrastructure in the following decade. The EnviroGRIDS @ Black Sea Catchment system will be mirrored in the different national data centres on a voluntary basis.
- The large effort on capacity building will guarantee the transfer of expertise to a very large audience
- The Observation System and Dissemination work packages will be strongly based on end-users and stakeholder involvement.
- The most important deliverables of the project and the web portals will translated into local languages

EnviroGRIDS will exemplify the benefits of Observation Systems by optimising the management of natural resources in order to limit environmental degradation and related threats on human lives, infrastructure and the environment. It will allow the EU to take the lead in its analytical capacity for translating complex environmental problems into sustainable policies and accessible information. By using the best available ICT technology and the most powerful analytical tools, EnviroGRIDS will enable existing European programmes such as INSPIRE, and international ones such as GEOSS to fully exploit their potential. The objective is to lead the World towards a sustainable global economy, by planning for a cleaner, safer and healthier environment. EnviroGRIDS will make the best use of available data to predict the outcomes of several scenarios in order to best manage the environment and its resources. It will place Information and Technology in the centre of modern decision making by building a single information space open to a wide range of end users (Fig. 3).

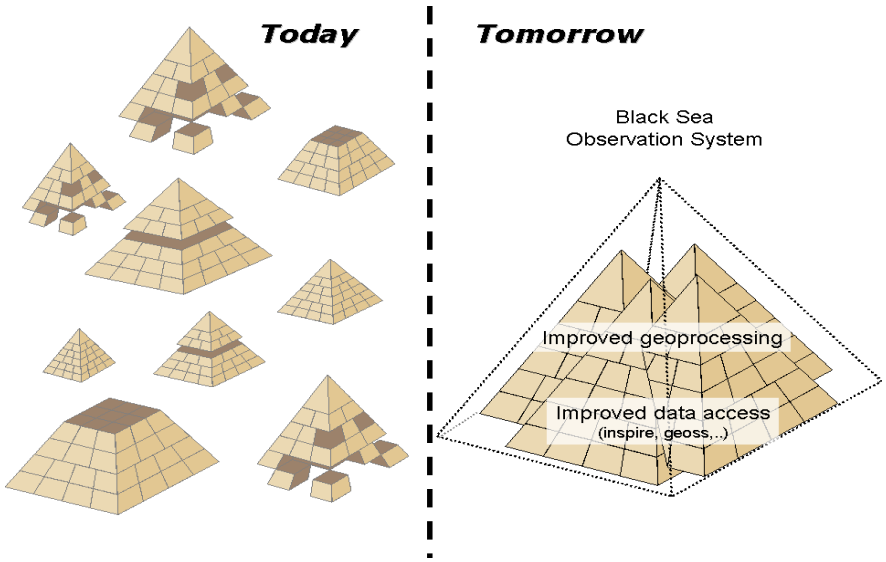


Figure 3. Information pyramids today and tomorrow, when the combined effort of data standardisation, improved data access and geo-processing will create an integrated observation system for the Black Sea catchment (fig. derived from Overton et al. 2002).

B3.1.1 Impact on the competitiveness of the applicants

Direct applications and market prospects

EnviroGRIDS is promoting several innovative applications and ICT solutions in environmental monitoring and management. The generic approach adopted in the conception of this project will ultimately result in a truly powerful way of translating existing data into useful information. This is opening a wide range of new market opportunities in environment management and societal planning. EnviroGRIDS will bring new geo-processing capacities at local, national, regional and international level.

Potentially patentable ideas

The creation of such a generic approach to analyse key environmental issues with the best available technology and to make available its results through state of the art information technology is certainly going to become a necessity in the very near future. With Google Earth people have started to view the world with a new perspective. With the Internet, information that used to be very difficult to obtain is now readily accessible to any interested person, and thus it allows independent thinking in the sense that persons are able to have their own independent opinion on a particular issue or set of issues. Bringing the best scientific knowledge in the eyes of decision-makers and voters is therefore genuinely crucial to the success of the proposal. Initiatives such as GapMinder are certainly showing the way to an improved access and visualisation of publicly funded data. EnviroGRIDS could certainly build on this idea by using spatially explicit data, models and predictions, first in the Black Sea Catchment, and eventually at the global scale. EnviroGRIDS aims at becoming a non-profit Foundation with very similar objectives as the GapMinder one:

> "The object of the GapMinder Foundation shall be to promote sustainable global development and achievement of the United Nations Millennium Development Goals by increased use and understanding of statistics and other information about social, economic and environmental development at local, national and global levels"

Note that the GapMinder main visualisation package is now incorporated in Google as a tool: http://tools.google.com/gapminder. This is why it is believed that the ideas contained in EnviroGRIDS have a huge potential to be of interest to a very wide range of stakeholders. In order to attain these objectives, EnviroGRIDS would then institutionalize its relationships with its interested partners such as GEO, UNEP, WMO, UNESCO, JRC, ESA, EEA and signed a Memorandum of Understanding with EGEE. It would then look at additional partners to continue developing the concept.

On a totally different level, beneficiaries to the project will be encouraged to make available their elements of software under open source licence agreements.

Benefits and competitive advantages

EnviroGRIDS will strongly reinforce the research capacities of its partners and will certainly become a landmark in this area of research. By gathering partners of excellence in several key areas such as climate, land cover and demographic scenarios, water resources, sensors, SDI, GRIDS, e-Learning, sustainability indicators and observation systems, EnviroGRIDS will create a unique collaborative network that will enable its beneficiaries to improve their own activities and envisage new research horizons.

By improving its management of the environment and associated natural resources as soon as possible, Europe will place itself in a much more competitive position when time will come to be accountable for the excesses of the 20th century. It will make possible an integrated vision of territorial cohesion linking economic competitiveness, social cohesion and environmental sustainability, as requested by EU territorial agenda or UN millennium objectives.

Economic justification

In its review of the impact of climate change on the Economy, Sir Nicholas Stern concludes that am investment of 1% of global gross domestic product (GDP) per annum would required in order to avoid the most negative impacts of climatic change; on the other hand, taking no action could result in damage costs that may represent over 20% of global GDP. According to the "Stern Report", climatic change could become the greatest economical threat and widest-ranging market failure ever seen. The report states for instance that:

> "…our actions over the coming few decades could create risks of major disruption to economic and social activity, later in this century and in the next, on a scale similar to those associated with the great wars and the economic depression of the first half of the 20th century."

On another topic, the development of such a SDI and associated analytical capacity is justified by strong economies of scale. We like to think that building SDIs and ICT in general is not just about "working harder", but more especially about "working smarter". As many initiatives exists to make available spatial and environmental data at the European and global scales, none have really started to address the problem of data analyses taking advantage of recent computer facilities such as EGEE.

B3.1.2 Strategy for impact achievement

The principle strategy for impact achievement in the Black Sea Catchment was to get the Black Sea Commission and International Commission for the Protection of the Danube River as full partners in the project. This will allow the project to beneficiate from an existing large network of potential end-users and national authorities. In return these commissions will be able to used the results of the EnviroGRIDS project to accomplish their mission

As true impact will be possible only through the involvement of major economical players, EnviroGRIDS envisages collaborating in the future with large companies that would be able to support the system and would benefit from the information generated by EnviroGRIDS. Such companies could include insurance and reinsurance companies, banks and major food and other industrial enterprises.

The consortium will also seek to publish the results of its research in the best possible journals in order to improve its international scientific recognition.

B3.1.3 European dimension

European problems to be solved

The ideal role of EnviroGRIDS is to serve specifically the Global Earth Observation group to bring analytical power to enable GEO to fulfil its objectives of achieving numerous societal benefits such as:

- Reducing loss of life and property from natural and human-induced disasters
- Understanding environmental factors affecting human health and well-being
- Improving management of energy resources
- Understanding, assessing, predicting, mitigating, and adapting to climate variability and change

- Improving water resource management through better understanding of the water cycle
- Improving weather information, forecasting and warning
- Improving the management and protection of terrestrial, coastal and marine ecosystems
- Supporting sustainable agriculture and combating desertification
- Understanding, monitoring and conserving biodiversity.

The EnviroGRIDS @ Black Sea Catchment project will directly address problems such as:

- River catchment management
- Past, present, short term and long term assessment of:

Flood impacts on population, agriculture and infrastructure
Water quality impacts on health and biodiversity
Drinking water availability
Impacts of expected changes in climate, land cover and demography

Effects on transnational co-operation

EnviroGRIDS will strongly reinforce international cooperation by developing its activity on the EGEE system that is certainly one of the finest examples of international cooperation using ICT solutions. The project will build upon this reputation to bring this technology in action for addressing key environmental issues such as water resources.

With 26 partners from 14 European countries (AU, BE, BU, RO, UA, CZ, IT, CH, NL, HU, SP, GE, TU, RU), plus 1 non-European countries (China/Japan), this project will already have a strong international dimension. Furthermore, the direct or indirect involvement of several international organisations (UNESCO, UNEP, CERN, EEA) will enhance the chances of the project to be implemented in many international circles in the years to come.

The main topics addressed in this project, namely freshwater and marine resources specifically require transnational solutions and implementations through a river and sea basin approach that typically knows no political barriers. Furthermore, EnviroGRIDS in this first phase will prepare to expand its application to the rest of the world where the access to water resources is likely to be the source of many political and social problems. A project like EnviroGRIDS has therefore an important role to play in the sound political resolution of potential geopolitical conflicts of the XXIth century.

Implementation and evolution of EU policies

EnviroGRIDS will significantly contribute to the development of the Water Framework Directive and the Action Plan on Environment and Health, by translating data at large spatial scales into useful information addressing specific aspects of European regulations.

For instance, key legislation such as the Water Framework Directive, the Urban Wastewater Treatment and Nitrates Directives, the Bathing and Drinking Water Directives need baseline information for a better implementation. At the same time, there are also new water policy areas at Community level that are still under development and negotiation, e.g., the Flood Risk Management Directive or the Water Scarcity and Droughts aspect, that will also need data and tools for their implementation.

In 2003, the European Commission also adopted a relevant Strategy on Environment and Health, with the aim of reducing diseases caused by environmental factors. This strategy led to the European Environment and Health Action Plan 2004-2010 that relies on an Integrated Information System on Environment and Health to render the assessment of the environmental impact on human health more efficient. Once again, EnviroGRIDS will ensure that it is bringing valuable information into this system.

From a technological point of view, EnviroGRIDS will serve as benchmark to the new and ambitious Directive on Infrastructure for Spatial Information in the European Community (INSPIRE). The initiative will create a European spatial information infrastructure that delivers spatial information services. These services will improve the access to geographical information from a wide range of sources, from the local level to the global level, for a variety of uses. EnviroGRIDS will help INSPIRE to reach its audience of policy-makers, planners and managers at European, national and local levels, as well as the citizens and their

organisations. All services created by EnviroGRIDS will be examples of such interlinked integration of information to improve decision-making and the dissemination of knowledge.

Improvement of European social and economic cohesion

In its last report on Economic and social cohesion, the European Commission recognises the new challenges that Europes cohesion will face in the next 20-30 years. Demography, climatic change, social exclusion or energy issues will raise important new questions on their combined impact on European policy. The long-term purpose of this report as well as EnviroGRIDS is to stimulate the reflection on the future of Europe and to promote greater economic, social and territorial cohesion. If EnviroGRIDS can contribute to this debate in Europe, it will then be able to stimulate the same crucial interrogations in the rest of the world.

B3.1.4 Contribution to Community societal objectives

Quality of life

By caring about its environment, a given society is making the choice of a better quality of life. In a time where short-term economic returns dominate the world economic policies, it is crucial to defend the interest of the environment as strongly and significantly as possible in order to preserve the quality of life that most people see in conservation of nature.

Quality of life is also about education and EnviroGRIDS will certainly put a lot of effort into its last work package on dissemination of knowledge through e-Learning, higher education programs, newsletters, websites and innovative visualisation tools. The UNESCO Institute for Hydrological Education will certainly be a crucial beneficiary in order to foster the success of this part of the project.

Quality of life is also more and more about access to scientifically-based useful information, where preconceived ideas and ideology are replaced by facts. With the Internet revolution, the world is slowly realising that it has access to all sorts of information that need a great deal of education to sort and interpret correctly. This information is certainly the best guarantee that our societies have to preserve their democracy, as proven regularly by the counter example in authoritarian countries where the access to Internet is carefully controlled.

Health and safety

Water quality and access is still a central health problem in most parts of the world, as well as in several parts of Europe. With the expected environmental changes ahead, it is likely that these problems will become even more critical. This is why EnviroGRIDS can bring valuable information on where and when problem of water scarcity and quality could occur in the future. The basic idea is to allow the vulnerable populations to adapt well in advance to the increasing problem by adopting adaptive strategies as soon as possible.

Another major issue related to water is the assessment of flood risks. EnviroGRIDS will not compete with the existing European Flood Alert System (EFAS) for short-term advance-warning. It will rather look at long term problems and solutions through the analysis of scenarios of climatic change, demographic growth and land cover changes through to 2050.

Employment

By managing the environment we will preserve the quality of life and keep our regions attractive to live in. The attractiveness of a good standard of living will soon be as important as economical competitiveness. Regions that will manage to develop their economy while preserving their environment will have competitive advantages in the future, and will therefore more likely create new employment opportunities.

EnviroGRIDS will also bring insights on the possible past, present, short and long term impacts of water quantity and related extreme flood and drought events on agriculture and infrastructure. In this respect, EnviroGRIDS will identify regions where investments are facing increasing risks and will allow adapting to them as soon as possible.

In addition, and for obvious reasons, this project will provide employment to many scientists across the beneficiary institutions. It will also allow them to improve their capacity to train a new generation of young scientists through a wide range of dissemination methods. People that will have the chance to work within this project will certainly stimulate the diffusion of ICT to inform about crucial environmental problems at

all levels of society. In a world that is increasingly dominated by information technology and environmental problems, there will certainly be a need for enhanced competence in this area.

Environment

The strongest influence of the EnviroGRIDS will certainly be on environmental issues. As proposed in section 3.1.1.2 on patentable ideas, the aim of the leaders of this consortium is to promote the creation of a Foundation that will use and develop the collaborative management system of EnviroGRIDS to address more and more issues. Indeed, we strongly believe that we will have access to more and better information on the state of the environment so that tools capable of integrating and analysing them will become absolutely crucial. EnviroGRIDS will place itself in a very favourable position to address all sorts of environmental issues and bring the Black Sea Catchment Observation System to the heart of future modern decision-making processes.

Gender issues

Many of the institutions involved in the EnviroGRIDS project have gender monitoring activities at the institutional level as part of their commitment to gender equality, as for example the "Bureau de l'Egalité" (Office for Equal Rights between men and women) at the University of Geneva. Initiatives to encourage gender equality are generally well anchored within beneficiary institutes. A gender committee will be set up to promote the role of women at all levels within the project. It will be responsible for ensuring that gender equality is applied within the work packages and at the Management Board level. The committee will consist of 3 members elected by all female project beneficiaries on an annual basis, with the possibility of re-election. Recruitment of young, talented female researchers will be encouraged in EnviroGRIDS. Job advertisements will state the projects commitment to gender equality and will explicitly encourage women to apply.

This committee aims at ensuring gender equitability, defining specific women needs and proposing appropriate solutions (mobility, meetings) and actions to the Coordination and Management team and the Project Management Board. It is composed of 4 members (2 females, 2 males) elected amongst partners. The Gender Dimension Committee will meet at least once a year. It can invite the Manager or representatives from the other Committees. Decisions will be undertaken on a simple majority basis.

B3.1.5 Other relevant European and international research

In the introduction we mentioned already that the Black Sea has a long history of observation systems with for instance the regional Black Sea Global Ocean Observing System (BS-GOOS[23]) funded by UNESCO and run by the Black Sea Commission. The European Commission funded in the fifth framework a project called Regional Capacity Building and Networking Programme to Upgrade Monitoring and Forecasting Activity in the Black Sea Basin (ARENA)[24]. Another recent European project is the Black Sea Scene[25] that aims at establishing a network of organisations around the Black Sea to improve data exchange and use. Let us cite also here the SESAME[26] project that is studying the impact of expected changes such as climate on both the Mediterranean and Black Sea. Finally, the UNDP, GEF and UNOPS co-funded the Black Sea Ecosystem Recovery Project (BSERP) that aimed at reinforcing the Black Sea Commission and the cooperation between the countries, as well as assessing the environmental status and trend of the Black Sea. EnviroGRIDS strive to pursue the efforts of these earlier projects through its partners that participated to many of them.

Partners from Western Europe are also participating to relevant projects. IHE has built very constructive relationships with the implementation of the Water Directives through participation in projects such as Harmoni-CA, SWITCH and FloodSite. Almost all partners have already participated to European projects in their respective area of expertise and have therefore built their network of collaborations. Among other projects, several partners participate for instance in the FP6 FloodSite project. The UNIGE: C3i and GRID

[23] http://www.ims.metu.edu.tr/Black_Sea_GOOS
[24] http://www.arena-blacksea.net
[25] http://www.blackseascene.net
[26] http://www.sesame-ip.eu

partners are collaborating presently on another FP7 project (ACQWA) that has been accepted under the Environment and Climate Change theme.

B3.1.6 Influence of external factors

One of the key issues that EnviroGRIDS will face remains the data access and availability. Even though countries are signing agreements such as INSPIRE and GEOSS, in reality, a major obstacle to the development of Observation Systems is still the difficulty in accessing data paradoxically generated through public funds. EnviroGRIDS will not be able to change the world of data but will certainly become vocal in encouraging access to publicly-funded data.

Another difficulty for EnviroGRIDS beyond this first project will be its capacity to maintain the consortium in place, especially the important institutional partnerships between European and international organisations, as well as the access to the analytical capacities of EGEE; these resources seem to be almost infinite to environmentalists used to work on much simpler systems, but they could also become an obstacle if they are perceived as being too complicated.

The sustainability of EnviroGRIDS will be based on the consolidation of its partnerships with EGEE, GEO and other international organisations such UNEP, UNDP, WMO, WHO, WCO. All these organisations have central activities in Geneva.

B3.2 Plan for the use and dissemination of foreground

Summary Box

The EnviroGRIDS @ Black Sea Catchment project

- EnviroGRIDS objectives match perfectly those of the Black Sea Commission, enabling it to become a central piece of information system in the region.
- EnviroGRIDS will guarantee the protection of data that is uses according to the following data categories: a) publicly available, b) available to project partners only, c) privately owned by beneficiary, d) privately owned by third party and used with specific agreement.
- EnviroGRIDS results will them be publicly available in order to be used in the Black Sea Catchment Observation System that will act as a service within GEOSS

B3.2.1 Exploitation and dissemination plan for use of project results

The EnviroGRIDS objectives include the disseminations of its results at different levels (from general public to advanced researchers), the exchange of data within the consortium and also with other researchers not directly involved with the project. A further aim is to open up areas of education and training on methodologies, models, and concepts developed within the EnviroGRIDS project. This will provide state-of-the-art material for graduate students and advanced researchers alike, and stimulate exchanges of students, researchers and stakeholders between the various partners.

The dissemination of the EnviroGRIDS results will greatly improved by a close collaboration with the Black Sea Commission that is sharing EnviroGRIDS objectives (see attached letter of support).

Industrial and commercial routes for exploitation

Through its future non-profit Foundation EnviroGRIDS envisages to search for new opportunities to attract funding for instance from insurances and investment risk analyses, food and industrial enterprises. As the world is realizing that preserving the environment will cost much less than trying to fix it, several important financial organisations will need to be informed as scientifically as possible about the future outcomes of environmental issues and their resources. The aim here is rather to save than to make money.

Validation of the technology

EnviroGRIDS is bringing several proves of concept through the numerous application in WP5 on the impacts of climate, land cover and demographic changes on several Societal Benefit Areas.

Another way to validate our approach will be to confront it to students of master and doctorate levels in the different educational programmes organized by several of our partners. (IHE, UNIGE, UAB)

Dissemination of results and technology transfer

The EnviroGRIDS system will be brought to public through websites, flyers and newsletters as a first step, but by important additional actions to actively bring the results to the end users. Linkages with other networks of applied and fundamental research will be actively sought at the very beginning of the project and organised in the best efficient way. Common software and databases are likely to be exchange between EnviroGRIDS and other research project, with better performance for all.

Technology transfer will be made by the different partners that are active in local, regional and national projects. The WP7 on dissemination will also provide several workshops on different themes that local end-users will be able to follow.

Dissemination to educational programmes

To ensure a long term impact, several training material based on the newest and most advanced e-learning technologies will be produced and be freely distributed that can be integrated in educational programmes at

primary, secondary and high level. The project will also contribute to capacity building through supporting scholarships and exchanges programmes of students at PhD and post-doctoral level.

Dissemination to scientific community

The main vector of dissemination and exposure of the EnviroGRIDS research will be though publications in high-impact peer-reviewed journals and presentations at international conferences. These activities will be guided mostly by the academic and research partners of the consortium.

We intend to organize EnviroGRIDS workshops for scientists that will enable improved exchange of information, methodologies, and results. Selected papers from such workshops may be invited for a peer-reviewed journal or book series. In addition, the organisation of sessions at international conferences will push forward the scientific visibility of the project results internationally.

EnviroGRIDS WP7 will organise regular workshops involving scientists, stakeholders and other end-users that are engaged in, or bounded by, the problems addressed by the project.

Dissemination to public

Information towards European citizens is seen as a key task in the proposal that will a central activity in both WP6 and WP7. EnviroGRIDS will inform the citizens by means of attractive presentations using video and animation technologies. Special attention will be given to communicate the EnviroGRIDS results by using popular channels such as TV, radio, YouTube and GoogleEarth.

One on the main objectives of EnviroGRIDS is indeed to use ICT to bring the best scientific information on very important environmental issues in the eyes of citizens in a way that they can understand, assimilate and interact with. Efforts of WP6 on do-it-yourself toolkit, web-based observation system and ICT for citizen tasks are all oriented toward this crucial issue.

The project website and web-based discussion groups will help ensure the visibility of the project and provide the most essential general information to the public at large.

Dissemination to national and regional authorities

An important end-user group is the national authorities responsible for themes of EnviroGRIDS. Although a vulnerability and sustainability assessment of the Black Sea catchment requires a transboundary approach, it will be the national authorities that have the legislative power and institutional frameworks to effectively implement actions that improve the sustainability and vulnerability of societal benefits. The data and outcomes obtained through this project furthermore, will be(come) key instruments for national decision-makers. The involvement of the regional intergovernmental body, the Black Sea Commission (see letter of support in section 5), is of further crucial importance as they can harmonize the policies of the Black Sea countries and can furthermore influence the national authorities to follow a transboundary approach.

B3.2.2 Management of knowledge and intellectual property

The issue of Intellectual Property Rights will be governed by the appropriate EU, United Nations and national regulations pertaining to intellectual property in the individual beneficiary countries.

In conformance with the rules for participation for FP7, a minimum set of basic principles concerning ownership of knowledge and access rights are fixed. The intellectual property rights (IPR) provisions distinguish between two basic types:

- Knowledge: all kind of intellectual property generated during the contract that did not exist before.
- Pre-existing know-how: intellectual property owned by the partners before the start of the project (“background”) or created outside project during its duration (“sideground”).

Ownership resides with beneficiaries generating the knowledge. Transfer of ownership has to be announced to the rest of the beneficiaries and the European Commission. A beneficiary may exclude pieces of pre-existing know-how from the obligation to grant access rights to the other beneficiaries.

A major source of concern in a project like EnviroGRIDS is data ownership. We propose therefore to distinguish for types of datasets: a) publicly available, b) available to project partners only, c) owned by

partners, d) privately owned by third party and used with specific agreement. However, the outputs of EnviroGRIDS models should be made publicly available even if some of the source data is not. An intellectual property task was set up in the WP1 to deal with issues related to IP.

B4 Ethical Issues

The main ethical issue that the project will face is certainly on data protection. As stated above we propose to solve this issue by asking the partners to specify the type of every datasets that they use. A general agreement on data used will be signed by all partners at the start of the project.

B5 References

Abbaspour, K.C., Yang J., Maximov I., Siber R., Bogner K, Mieleitner J., Zobrist J., and Srinivasan R., 2007. Spatially-distributed modelling of hydrology and water quality in the pre-alpine/alpine Thur watershed using SWAT. Journal of Hydrology, 333: 413-430.

Alkoy, S., Dogru, A.O., Basaraner, M., Sahin, U., Ulugtekin, N., Seker, D.Z.(2007b). Determination of the Epidemiological Aspects of Air Pollution by Utilising GIS in Istanbul, 14th International Symposium on Environmental Pollution and its Impact on Life in the Mediterranean Region (MESAEP 2007), October 10-14, Sevilla, Spain.

Alkoy, S., Ulugtekin, N., Dogru, A.O. (2007a). Monitoring Vaccination Coverage in Istanbul Using The Lot Quality Assurance Sampling and Geographic Information System, The Journal of International Medical Research Vol.35:2.

Arbačiauskas K, Semenchenko VP, Grabowski M, Leuven RSEW, Paunović M, Son MO, Csányi B, Gumuliauskaitė S, Konopacka A, Nehring S, van der Velde G, Vezhnovetz V, Panov VE. 2008. Assessment of biocontamination of benthic macroinvertebrate communities in European inland waterways. *Aquatic Invasions* 3:211–230.

Arnold, J.G., Srinivasan, R., Muttiah, R.S., Allen, P.M., 1999. Continental scale simulation of the hydrologic balance. J. Am. Water Resour. Assoc. 35: 1037-1051.

Bektas, F., Goksel, C. (2005). Remote sensing and GIS integration for land cover analysis, a case study: Bozcaada Island , Water Science and Technology , Vol 51 (11), pp.239-244.

Beniston, M., Stephenson, D. B., Christensen, O. B., Ferro, C. A. T., Frei, C., Goyette, S., Halsnaes, K., Holt, T., Jylhä, K., Koffi, B., Palutikoff, J., Schöll, R., Semmler, T., and Woth, K., 2007: Future extreme events in European climate; an exploration of Regional Climate Model projections. Climatic Change, 81: 71-95.

Beven, K., Binley A., 1992. The Future of Distributed Models - Model Calibration and Uncertainty Prediction. Hydrological Processes, 6: 279-298.

Brack W., Apitz S.E., Borchardt D., Brils J., Cardoso A.C., Foekema E.M., van Gils J., Jansen S., Harris B, Hein M., Heise S., Hellsten S., Gert-Jan de Maagd P., Müller D., Panov V.E., Posthuma L., Quevauviller P., Verdonschot P.F.M. and von der Ohe P.C. 2009. Towards a holistic and risk-based management of European river basins. Proceedings of international conference "Risk Assessment in European River Basins", 12-14 November 2007, Leipzig, Germany. Integrated Environmental Assessment and Management (in press)

CEC., 2000. 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. Page 327.

CEC., 2007. Directive 2007/2/EC of the European Parliament and of the Council Establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) Page 14.

Christensen, J.H., Carter T., Giorgi F., 2002: PRUDENCE Employs New Methods to Assess European Climate Change, EOS, Vol. 83, p. 147.

Dao, H., Eckert D., 2003. La modélisation de la distribution des populations à l'échelle mondiale : l'exemple de la Russie, Actes de la Conférence Francophone ESRI 2003, Issy-les-Moulineaux, France, http://www.esrifrance.fr/actu/SIG2003/Communication/gridhydao/grid_esri.htm.

Deichmann, U., 1996a. A review of spatial population database design and modeling, paper prepared for the UNEP/CGIAR Initiative on the Use of GIS in Agricultural Research, National Center for Geographic Information and Analysis, Santa Barbara.

Deichmann, U., 1996b. Asia medium resolution population database documentation. Database documentation and digital database prepared in collaboration with UNEP/GRID-Geneva for the UNEP/CGIAR Initiative on Use of GIS in Agricultural Research, NCGIA, Santa Barbara, http://na.unep.net/globalpop/asia/.

Dilks, C.F., Dunn, S.M. and Ferrier, R.C., 2003. Benchmarking models for the Water Framework Directive: evaluation of SWAT for use in the Ythan catchment, UK., SWAT Conference, Bari, Italy, 1-4 July, 2003.

Eisenreich, S., 2005. Climate Change and the European Water Dimension; A report to the European Water Directors. Page 253. European Communities 2005, EUR21553 EN.

EPA, 2007. Climate Change - Health and Environmental Effects, EPA Report, available at http://www.epa.gov/climatechange/effects/health.html.

EU Best Practices on Flood Prevention, Protection and Mitigation and EU Communication on flood risk management, COM(2004)472

EurAqua (2004) Towards a European Drought Policy. Discussion document prepared by the EurAqua network of Europe's leading freshwater research organisations, November 2004.

Floods Directive (2007) The European Directive on the Assessment and Management of Flood Risks (2007/60/EC of 23 October 2007) (the Floods Directive)

Galil BS, Nehring S, Panov VE (2007) Waterways as invasion highways – Impact of climate change and globalization. In: Nentwig W: Biological Invasions. Ecological Studies Nr. 193, Springer, Berlin: 59-74

Gassman, P.W., Reyes, M.R. and Arnold, J.G., 2005. Review of peer-reviewed literature on the SWAT model. In Proc. 3rd International SWAT Conf., July 13-15, 2005, Zurich, Switzerland.

GEMS/Water, 2007. Water Quality Outlook. Page 16. UNEP.

GEO 2007-2009. Work Plan: http://earthobservations.org/docs/WP0709.v4.pdf

GEO, 2005. The Global Earth Observation System of Systems (GEOSS) 10-Year Implementation Plan.

GEO, 2007. The first 100 steps to GEOSS.

GEOSS Implementation plan: http://earthobservations.org

GIWA 2005a. Global International Waters Assessment Eutrophication in the Black Sea region; Impact assessment and Causal chain analysis.

GIWA 2005b. Global International Waters Assessment Transboundary Waters in the Black Sea-Danube region.

Goksel, C., Mercan, D. E., Kapdasli, S., Bektas, F., Seker,D.Z. (2004). Definition Of Sensitive Areas In A Lakeshore By Using Remote Sensing And GIS. Fresenius Environmental Bulletin, Volume 13(9).

Goksel, C., Seker, D. Z., Kapdasli, S. (2003). Prediction of Lagoon's Natural Conditions Using Satellite Data and GIS. Journal Environmental Science and Health. Vol A.38.Number 8, ,1669-1681.

Gosain, A.K., Rao, S., Basuray, D., 2006. Climate change impact assessment on hydrology of Indian river basins. Curr. Sci. 90: 346-353.

GWSP, 2005. The Global Water System Project: Science Framework and Implementation Activities. Earth System Science Partnership.

Hewitt, C.D., 2005: The ENSEMBLES Project: Providing ensemble-based predictions of climate changes and their impacts. Published article appears in the EGGS newsletter, 13, 22-25. http://www.the-eggs.org/?issueSel=24

ICPDR (2004) Action Programme for Sustainable Flood Protection in the Danube River Basin (ICPDR, 2004)]

IISD, 2006. Conceptual Framework for Integrated Vulnerability Assessment and Adaptation in the Lake Balaton Project. Winnipeg: IISD.

INSPIRE Directive : http://inspire.jrc.it/directive/l_10820070425en00010014.pdf

IPCC, 2007a. Climate Change 2007 - Impacts, Adaptation and Vulnerability - Contribution of Working Group II to the Fourth Assessment Report of the IPCC.

IPCC, 2007b. Climate Change 2007 - Mitigation of Climate Change - Contribution of Working Group III to the Fourth Assessment Report of the IPCC.

IPCC, 2007c. Climate Change 2007 - The Physical Science Basis - Contribution of Working Group I to the Fourth Assessment Report of the IPCC.

Kyriakidis, P. C., Schneider, P. and Goodchild, M. F., 2005. Improving spatial data interoperability using geostatistical support-to-support interpolation, Proceedings, Geocomputation 2005, Ann Arbor, Michigan, August 13, 2005.

Laprise, R., D. Caya, M. Giguère, G. Bergeron, H. Côté, J.-P. Blanchet, G. J. Boer and McFarlane N., 1998. Climate and Climate Change in Western Canada as Simulated by the Canadian Regional Climate Model. Atmos.-Ocean, 36: 119-167.

Lehmann, A., J. M. Overton, and J. R. Leathwick. 2002. GRASP: Generalized regression analysis and spatial predictions. Ecological Modelling 157:187-205.

Liu, G., J.R. Williams, Zehnder A.J.B. and Yang H., 2007. GEPIC - modelling wheat yield and crop water productivity with high resolution on a global scale. Agricultural Systems, 94: 478-493.

Maggini, R., A. Lehmann, N. E. Zimmermann, and A. Guisan. 2006. Improving generalized regression analysis for the spatial prediction of forest communities. Journal of Biogeography 33:1729-1749.

Mennis, J. and Hultgren, T., 2006. Intelligent dasymetric mapping and its application to areal interpolation. Cartography and Geographic Information Science, 33: 179-194.

OGC - Spatial Data Infrastructure and Standards: http://ogcuser.opengeospatial.org/node/102

OpenGIS® Specifications (Standards) : http://www.opengeospatial.org/standards/, OGC Reference Model, Reference number: OGC 03-040. , http://www.opengeospatial.org/ogc

Overton, J. M., R. T. T. Stephens, J. R. Leathwick, and A. Lehmann. 2002. Information pyramids for informed biodiversity conservation. Biodiversity and Conservation 11:2093-2116.

Panov V. E. 2004. Internet-based information resources on aquatic alien species relevant to the Ponto-Caspian Region. In: H.J. Dumont, T.A. Shiganova and U. Niermann (eds), Aquatic Invasions in the Black, Caspian, and Mediterranean Seas, Kluwer Academic Publishers, 257-269.

Panov V., and S. Gollasch. 2004. Informational resources on aquatic alien species in Europe on the internet: present developments and future perspectives. In: Vanden Berghe E., M. Brown, M.J. Costello, C. Heip, S. Levitus and P. Pissierssens (Eds). Proceedings of "The Colour of Ocean Data" Symposium, Brussels, 25-27 November 2002, IOC Workshop Report 188 (UNESCO, Paris). X + 308 pp. (p. 115-124).

Panov V., and Gollasch S. 2006. Aquatic Invasions – the new European journal of applied research on biological invasions in aquatic ecosystems. Aquatic Invasions 1: 1-3

Panov V.E., N.V. Rodionova, P.V. Bolshagin and E.A.Bychek. 2007. Invasion biology of Ponto-Caspian onychopod cladocerans (Crustacea: Cladocera: Onychopoda). Hydrobiologia 590: 3-14

Panov V.E, Dgebuadze YY, Shiganova TA, Filippov AA and Minchin D. 2007. A risk assessment of biological invasions: inland waterways of Europe – the northern invasion corridor case study. In: F. Gherardi (ed) Biological Invaders in Inland Waters: Profiles, Distribution and Threats. Invading Nature - Springer Series in Invasion Ecology, Vol. 2: 639–656

Panov V.E., Alexandrov B, Arbaciauskas K, Binimelis R, Copp G.H, Gozlan RE, Grabowski M, Lucy F, Lueven R.S.E.W., Monterroso I, Nehring S, Paunović M, Rodriguez-Labajos B, Semenchenko V, and Son MO. 2008a. Protocols for risk assessment of aquatic invasive species introductions via European inland waterways. EC FP6 Integrated Project ALARM Deliverable D 4.1.3.11. to the EC FP6 Integrated Project ALARM, 31 pp.

Panov V.E, Gollasch S, Alexandrov B, Arbaciauskas K, Grabowski M, Lucy F, Minchin D, Olenin S, Paunović M, Son M. 2008b. New electronic journal "Aquatic Invasions": an important part of the developing European early warning system on aquatic invasive species. Deliverable D 5.1.7 (The second volume of "Aquatic Invasions") to the EC FP6 Integrated Project ALARM, 8 pp.

PCU (1999). Strategic Action Plan for the Danube River Basin 1995-2005 – Revision 1999. Danube Pollution Reduction Programme, Programme Co-ordination Unit.

Piontkovski S.A., and S.Hameed. 2002. Precursors of copepod abundance in the Gulf of Maine in atmospheric centers of action and sea surface temperature**.** Global Atmosph. Ocean Syst., 8: 283-291.

Ribera P., R.Garcia, H.F.Diaz, L.Gimeno, and E.Hernandez. 2000. Trends and interannual oscillations in the main sea-level surface pressure patterns over the Mediterranean, 1955-1990. Geophys.Res.Let., 27, 8: 1143-1146.

Schuol, J., Abbaspour K.C., Srinivasan B., and Yang H., 2007. Modelling Blue and Green Water Availability in Africa at monthly intervals and subbasin level. Water Resources Research. In review.

Seker, D.Z., Goksel, C., Kapdasli,S., Musaoglu, N., Kaya, S. (2003). Investigation of Coastal Morphological changes due to river basin characteristics by means of Remote Sensing and GIS techniques. Water Science and Technology ,Vol 48 (10) ,pp 135-142.

Tobler, W.A., 1979. Smooth Pycnophylactic Interpolation for Geographical Regions, J. American Statistical Association, 74: 519-529.

Tsimplis M., and S. Josey. 2001. Forcing of the Mediterranean Sea by atmospheric oscillations over the North Atlantic. Geophys.Res. Let., 28,5: 803-806.

Turner, B.L. II et al., 2003. A framework for vulnerability analysis in sustainability science. Proceedings of the National Academy of Science 100(14): 8074-8079. < http://www.pnas.org/cgi/reprint/100/14/8074>

Ulugtekin, N., Alkoy, S., Seker, D.Z. (2007a). Use of Geographic Information Systems in an Epidemiological Study of Measles in Istanbul. The Journal of International Medical Research Vol.35:1. pp:150-154.

Ulugtekin, N., Alkoy, S., Seker, D.Z., Goksel, C. (2006). Use of GIS in Epidemiology: A Case Study in Istanbul. Journal of Environmental Science and Health, Part A, 41. pp: 2013-2026. Taylor&Francis.

Ulugtekin, N., Bektas, F., Dogru, A.O. Goksel, C., Alaton, A.I., Orhon, D. (2007b). The Use Of Remote Sensing And GIS Technologies For Evaluation Of Turkish River Basins: A Case Study Of Marmara River Basin And Istanbul. International Conference on Environment: Survival and Sustainability. 19-24 February 2007, Nicosia-Northern Cyprus (CD).

Ulugtekin, N., Bektas, F., Dogru, A.O., Goksel, C., Alaton, I., Orhon, D. (2005). The Use of Remote Sensing and GIS Technologies for Comprehensive Wastewater Management, 31. International Symposium on Remote Sensing of Environment, Global Monitoring for Sustainability and Security, 20-24 June, Saint Petersburg, Russia (CD).

UN, 2006. Water a shared responsibility- The United Nations World Water Development Report 2. Page 601. UNESCO and Berghahn Books.

UNEP, 2002. Global Environment Outlook 3

UN-Water, 2005. Water hazard risks.

van Griensven, A. and Meixner T., 2006. Methods to quantify and identify the sources of uncertainty for river basin water quality models. Water Science and Technology, 53: 51-59.

van Griensven, A., Di Luzio, M., Vandenberghe, V., Goethals, P., Breuer, L., Meixner, T., Arnold, J. and Srinivasan, R., 2006. Environmental and Ecological Hydroinformatics to support Water Framework Directive for River Basin Management (in Europe), J. Hydroinformatics, 8: 239-252.

Vrugt, J.A., Gupta, H.V., Bouten, W. and Sorooshian, S., 2003. A Shuffled Complex Evolution Metropolis algorithm for optimization and uncertainty assessment of hydrologic model parameters. Water Resources Research, 39.

WHO (2003). Climate change and human health: risks and responses, editors: A.J., McMichael [et al.] Geneva.

WHO (2006). Challenges in Global Immunization and the Global Immunization Vision and Strategy 2006 – 2015. Wkly Epidemical Rec; 81: 190 – 195.

TO DO LIST:

- Include CRS4 and IHE in the gridification task
- Include Soresma in Flood analyses
- Include Quality control by IISD + Commissions
- Describe conference fees
- Verify fig numbering
- Verify governance system and naming
- Verify justification of budget
- Verify man months
- Verify man months per task
- Verify Milestones

NEXT TIME TO DO LIST:

- Include UNIGE in the GSDI task, add connections to SEE-GRID-SCI, EGEE, ...
- Describe how we will use the EGEE, who is doing what
- Describe better data collection, water Q & Q
- Describe better spatial resolution for raster datasets
- Describe better GRID-SDI-GEO integration (see Italians work)
- Add the policy makers layers
- Include BSC and ICPDR as end users everywhere
- Add task with Land and Water eCognition (UNIGE+ITU + Geographics)
- Add links to real time data
- Include more reference to EU policies (water, Oceans, Black Sea Synergies...)
- Include a task on watershed management plan
- Improve references
- Improve SDI integration in Commissions systems
- Add videos
- Add project plaquette
- Transform as much as possible tasks into geoservices
- Simplify text where possible
- Rework objectives in function of BS Greening and Synergy
- Seek agreements with other projects on data use (BS Scene,...)
- WP co-coordinators
- Change from Black Sea Basin to Black Sea Catchment
- Improve flow chart and timing with MindJet