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D4.1 Analysis of initiatives relevant for the GEOSS S&T objectives

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Executive Summary

The definition of a general methodology for a sustainable contribution to GEO/GEOSS through the implementation of a System-of-System (re-) engineering process is one of the objectives of the EGIDA Project in order to consolidate the results of the actions carried out in support of the STC Road Map. This is indicated as the *EGIDA Methodology*.

This methodology should be based on the lessons learned from the initiatives and projects already contributing, in different ways, to the building of advanced infrastructures as direct or indirect part to GEO/GEOSS. The objective of this deliverable is to analyze a significant subset of initiatives as a preliminary step toward the design of the EGIDA Methodology.

Since the EGIDA Methodology will focus on national/regional contributions, and since EGIDA Project is part of a more general effort of the European Commission to contribute to the building of GEOSS, two different kinds of initiatives are considered: a) National/regional initiatives addressing GEO/GEOSS contribution through the mobilization of resources from different funding sources; b) European Projects co-funded by the EC and explicitly contributing to capacity building for GEO/GEOSS in a direct or indirect way (e.g. through either INSPIRE or GMES initiatives).

Due to the EGIDA project structure and effort allocation, in comparison with the great amount of existing initiatives that at least in a minor way are contributing to GEOSS, an exhaustive analysis was clearly unfeasible. Therefore a significant set of initiatives has been selected and analyzed. The selection criteria were chosen in order to have no major bias in the analysis outcomes.

The analysis outcomes show some interesting commonalities and differences in the approaches adopted by national/regional initiatives and by European projects. They are summarized in the following table:



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Activity	National/Regional Initiatives	European Projects
General approach	mainly bottom-up actions, sometimes including a top-down component	combination of bottom-up and top-down actions
Coordination with other initiatives (GMES, INSPIRE, ...)	directly addressed when relevant	usually delegated to the EC coordination level (including the outcomes and follow-up of specific EC projects like GIGAS)
Stakeholders engagement	focused on resource providers and funding agencies	focused on resource providers and users
Contributions to GEO/GEOSS	Registration of GEOSS components/services; liaison with persons involved in GEO; participation of experts involved in GEO	from simple registration of GEOSS components/services to direct participation in the GEO tasks
Infrastructure geographic coverage	from local (including sub-national) to regional level	from regional to global level
Relevance of data sharing issue	medium to high	low to medium
Methodological approach for capacity building	use-cases	use-cases
Service delivery Architecture	discovery, view, access hierarchical, sometimes conceived as a SoS	discovery, view, access self-contained system, sometimes as a contribution to a wider SoS
Support to users/providers	help-desk when a central coordination exists	development of guidelines
Standard awareness Technology adoption	high re-use of existing; open-source;	medium to high re-use of existing; open source; development/extension of tools

They provided useful hints on different topics that the EGIDA Methodology should address, including issues related to Organization, Networking and Capacity Building. The selected initiatives are able to provide interesting practices on those issues, which might be part of the future EGIDA Methodology.



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Acronyms and Abbreviations

Abbreviation	Name
EC	European Commission
EU	European Union
FP7	Seventh Framework Programme
GEO	Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GMES	Global Monitoring for Environment and Security
INSPIRE	Infrastructure for Spatial Information in Europe
MS	Member State
SDI	Spatial Data Infrastructure
SEIS	Shared Environmental Information System
WP	Work Package
T	Task
ST-09-02	GEO Task ST-09-02: Promoting Awareness and Benefits of GEO



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Analysis of initiatives relevant for the GEOSS S&T objectives (EGIDA WP4)

1. Introduction

The objective of the present deliverable is to provide an analysis of initiatives relevant for the GEOSS S&T objectives which could be considered as valuable input for the definition of the EGIDA Methodology. As stated in the EGIDA DoW, *"the EGIDA Methodology will describe a sustainable approach for implementing a (re-)engineering process for the S&T national infrastructures and systems (e.g. observatories, data systems, processing services, modelling systems, etc.) and contribute to the GEO System of Systems (SoS) and to the other relevant European initiative based on a SoS approach (e.g. INSPIRE, GMES, SEIS)."*

The EGIDA Methodology is preliminarily defined as *a general methodological approach, which can be adopted by national/regional S&T communities, for a sustainable contribution to the GEOSS through the mobilization of resources made available from the participation in national, European and international initiatives and projects.*

Due to the focus on *national/regional S&T communities* and on the *mobilization of resources made available from the participation in national, European and international initiatives and projects*, this deliverable pays particular attention to: a) on-going or planned initiatives at national/regional level funded in the context of projects and programmes at different levels; b) European projects and programmes (in particular funded in the context of the EC Framework Programmes) addressing the contribution to GEO/GEOSS.



2. Methodological approach

The methodological approach followed for the realization of this deliverable consists in the selection, analysis and discussion of relevant initiatives. This general process is repeated for two different sets of initiatives:

- a) National/regional initiatives addressing GEO/GEOSS contribution through the mobilization of resources from different funding sources;
- b) European Projects co-funded by the EC and explicitly contributing to capacity building for GEO/GEOSS in a direct or indirect way (e.g. through either INSPIRE or GMES initiatives);

For each of them the following steps were carried out:

- 1. Selection of relevant initiatives;
- 2. Analysis of relevant initiatives in order to find commonalities and differences;

Selection of relevant initiatives

The different characteristics of the initiatives selected in the two categories (national/regional initiatives vs. European projects) affect the selection and analysis processes. National/regional initiatives have a limited geographical scope, but are often focused on the capacity building issue. On the other side European Projects may have a wider geographical scope - from regional (trans-national), to pan-European and even global - but they may have a more general objective (research, service provision) and capacity building is often just one of the building blocks of a wider process. However there are several points-of-contact, usually when a European project is a primary source of funds to design and deploy a data sharing infrastructure at regional level. This is the reason why national/regional initiatives include initiatives funded through a EC project, and on the other side some of the relevant European projects may be focused on a geographical region.



Analysis of relevant initiatives

The analysis of the selected initiatives aims to identify **common approaches, needs and perceived obstacles** in building a data sharing infrastructure effectively contributing to the GEOSS. These points are considered the basis for the definition of the EGIDA Methodology.

Contributions to GEO is evaluated in respect of the following GEO Strategic Targets Building Blocks [GEO-ST]:

Acronym	GEO Strategic Target	Description
AR	Architecture	Achieve sustained operation, continuity and interoperability of existing and new systems that provide essential environmental observations and information, including the GEOSS Common Infrastructure (GCI) that facilitates access to, and use of, these observations and information.
DM	Data Management	Provide a shared, easily accessible, timely, sustained stream of comprehensive data of documented quality, as well as metadata and information products, for informed decision making
CB	Capacity Building	Enhance the coordination of efforts to strengthen individual, institutional and infrastructure capacities, particularly in developing countries, to produce and use Earth observations and derived information products.
ST	Science and Technology	Ensure full interaction and engagement of relevant science and technology communities such that GEOSS advances through integration of innovations in Earth observation science and technology, enabling the research community to fully benefit from GEOSS accomplishments.
UE	User Engagement	Ensure critical user information needs for decision making are recognized and met through Earth observations
SBA	GEOSS Societal	Provide timely, quality long-term global information as a basis for sound decision making, and enhance delivery of benefits to society in



Benefit Areas (SBA)	the following initial areas: Agriculture, Biodiversity, Climate, Disasters, Ecosystems, Health, Water, Weather
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Since this deliverable focuses on the SoS (re-)engineering process the building blocks **AR**, **DM** and **CB** are considered of particular importance.

A final discussion tries to summarize the results and define the baseground for the definition of the EGIDA Methodology as a collection of practices.

In order to avoid duplication of efforts, the EGIDA tasks T4.1 "Analysis of National Initiatives" and T4.2 "Analysis of European Initiatives and Projects/outreach to FP7 programs" leveraged on the work performed in the STC activities and specifically on the actions performed in the EGIDA Work Packages 2 ("Support of GEO Task ST-09-01") and 3 ("Support of GEO Task ST-09-02") in support of the STC Roadmap implementation.



3. Analysis of national/regional initiatives

3.1. Selection of relevant initiatives

The EGIDA Task T3.4 “Show GEOSS at work” (supporting the Roadmap Activity 2d) has addressed the identification of compelling examples showing GEOSS operations, with particular reference to initiatives with a strong national/regional component. As described in the deliverable D3.4 “Process for the identification of examples showing GEOSS at work”, T3.4 put in place an identification process in four steps:

1. Collection of the proposals from the candidate GEO STC Compelling Examples
2. Collection of works in the frame of existing national and European networks (e.g. EIONET, FP7, European and National Networks).
3. Suggestions within the EGIDA Consortium.
4. Collection of some GEO national implementations.

The identification was finalized to the organization of a specific workshop in order to collect more information and to start a discussion about the involvement of national/regional S&T communities in the implementation of GEOSS.

The selection process allowed to identify and analyze a set of relevant initiatives, as described:

Step 1) In 2010 the GEO Task ST-09-02 launched an outreach activity of the GEO Science and Technology Committee (STC), aiming to compile a set of Compelling Examples (CEs) that demonstrate the value of GEOSS for Science and Technology (S&T) communities.

As part of the EGIDA Task T3.4, ISPRA started a selection of national/regional initiatives contributions to the GEOSS, starting from the list of candidate STC Compelling Examples



and selecting those involving national/regional communities even if they were not selected as GEO STC Compelling Examples. Seven of them were selected as possible relevant national/regional initiatives, however, only three of them were available to participate in the Workshop.

Step 2) Other initiatives were selected by ISPRA using, as information source, the existing collaborations within the Italian National GEO, FP7 projects, Interreg-III initiatives. Six of them were available to participate in the Workshop.

Step 3) During the preparation of the EGIDA proposal, it was decided to analyze existing initiatives, which already involve national S/T communities, that are considered of particular importance, such as GIIDA (Integrated and Interoperable Management of Environmental Data), SINAnet (Italian National Environmental System and Monitoring Network), UK-EOF (UK - Environmental Observation Framework) and DAEM (Data and Applications for Environmental Modelling). At this stage a preliminary analysis was performed to know which is the current status of these initiatives. It was communicated that currently DAEM is not able to provide results because the project is still on its inception phase. Therefore only GIIDA, SINAnet and UK-EOF were added to the set of initiatives. All the three initiatives were available to participate in the workshop.

Step 4) Finally, it was decided to include different GEO National Implementation in the analysis. Italy and UK were able to participate in the Workshop; German GEO implementation (GEO-D) was also willing to contribute, but was not able to participate in the workshop.

Selected initiatives

The final set of selected national/regional initiatives is shown in Table 1. It only includes the initiatives selected through the process described above, that were able to participate in the workshop organized by ISPRA. This choice is due to the fact that the workshop was the opportunity for a deep analysis and discussion of the initiatives. Therefore only the



initiatives presented in that occasion can be considered relevant for the overall analysis described in the present deliverable.

	Title	Brief description
1	Geo-wiki.org: Crowdsourcing to improve Landcover Validation	The Geo-Wiki Project is a global network of volunteers who wish to help improve the quality of global land cover maps via available web mapping tools. Inputs are recorded in a database, along with uploaded photos, to be used in the future for the creation of a new and improved global land cover map.
2	Italian EO SoS: An Italian S&T infrastructure for contributing to the GEOSS	The proposed example builds on the results of a (re-) engineering process applied to some existing Italian national-level infrastructures, in order to build a system of systems (SoS) conceived for a coordinated and sustainable contribution to the GEOSS.
3	OneGeology: Harmonization of geological data across Europe	The OneGeology-Europe project delivered a web accessible, semantically and technically interoperable geological dataset, with "progress towards harmonisation", for the whole of Europe at 1:1 million scale. This project has been based on the individual geological datasets, held by each of the European geological surveys, which considerably differ with respect to their contents, description and geometry. To obtain a web-accessible, interoperable geological spatial dataset for the whole of Europe at 1:1 million scale based on existing data held by the pan-European Geological Surveys, was necessary to insure interoperability among geological data providers across Europe. One of the elements of the eContentPlus project OneGeology-Europe was the development of a Code of Practice on access and licensing for the participating geological surveys. This Code of Practice provided guidelines for implementing an access policy that is adaptable to the circumstances and national requirements of the geological surveys, and at the same time user-friendly for interested data users. The access policy contained practical and organizational measures and model licences.
6	Interoperability of	Interoperability between data quality of the soil and waters



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	water and soil data quality. Ideas by the Italian approach	represents a level of complexity much higher than other sectors of the environment because increasing in complexity when considering environmental components together with social and economic aspects. In this contribute will be presented some ideas and suggestions developed in the GIIDA's case study with the aim to evidentiate the interoperative approach to build an appropriate and integrated database in these issues.
7	Lessons learned in the IDE-UNIVERS project	IDE-UNIVERS was a research project aiming at creating a thematic Spatial Data Infrastructure (SDI) to encourage access, exchange and interoperability of the huge quantity of information with a geographic reference produced by Universities and Research Centers within their projects and activities. The Project, coordinated by the Secretaria de Telecomunicacions i Societat de la Informació (STSI) of the Catalan Regional Government (Generalitat de Catalunya) in Spain was funded with the contribution of the European Commission - Interreg III B MEDOCC Program. IDE-Univers started from September 2006 and ended in 2008.
8	Italy and the GEO carbon tasks	Italy (particularly University of Tuscia and the Euro-Mediterranean Centre for Climate Change) is actively contributing to the carbon tasks of the GEOWork Plan, mainly through the participation as coordinator or partner, in European projects. Some highlights will be presented.
9	The Earthquake Environmental Effects catalogue: "in situ" validation of seismic hazard assessment	The Geological Survey of Italy - ISPRA is coordinating a global initiative in the frame of INQUA (International Union for Quaternary Research) aimed at building a global catalogue of Earthquake Environmental Effects, integrating the observations from recent events with descriptions from historical earthquakes and from paleoseismic investigations.
10	UK-EOF: a collaborative UK partnership for coordinating sustained efforts on measuring the	The UK-Environmental Observation Framework (UK-EOF) strives to change the way the UK perceives, values, archives and uses information from observation activities by working across public departments and agencies, the voluntary sector, industry and academia. The UK-EOF will be a self contained 5 year programme of Living With Environmental Change (LWEC), funded by the major



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	environment. What, why, achievements so far and what's next	sponsors of environmental observations in the UK and delivered via a series of workstreams.
11	GEO National Implementations: UKGEO	A collaborative partnership for assessing UK GEO activities, strengths, weaknesses and priorities; using this to develop a UK GEO strategy; coordinating existing and new UK GEO inputs; building a UK GEO community; and pursuing opportunities for this community to contribute to and benefit from GEO in the future.
12	GEO National Implementations: GEO Italy	The GEO Italy is coordinated by the Italian Ministry of Environment to improve the national coordination between various types of GEO stakeholders (EO providers, users) and R&D institutions (ASI, CNR, DigitPA, ISPRA, ENEA). GEO Italy also acts to improve communication among different scale stakeholders (Central and Regional Administrations) and to links national experiences accrued in European initiatives with GEOSS. GEO Italy contributes to GEOSS GCI by sharing its own EO achievements and federating its environmental information systems developed by national institutions (CNR-GIIDA, ISPRA-SINANet) in line with SEIS Principles and INSPIRE implementation.
13	The Global Mercury Observation System (GMOS) contribute to the Health SBA of GEOSS.	GMOS is aimed to establish a Global Observation System for Mercury able to provide ambient concentrations and deposition fluxes of mercury species around the world, by combining observations from permanent ground-based stations, and from oceanographic and tropospheric measurement campaigns. The developed interoperable tools will allow to share datasets and models output data produced by GMOS, for the purposes of research and policy development and implementation as well as at enabling societal benefits of Earth observations, including advances in scientific understanding in the nine Societal Benefit Areas (SBA) established in GEOSS.
14	Role of EIONET in the global processes of Earth	Eionet plays a crucial role in providing its expertise, technical know-how and support to the European Environment Agency in its coordination role of the in-situ component and new coordination



	Observation	role of the GIO Land service in the framework of the GMES programme. Together with EIONET, EEA involves stakeholders, users and service providers in the process of assessment of policy demands to build up operational framework for in-situ data access needed for the GMES services. By providing an input into the progress of the GMES programme, Eionet and EEA also contribute to the main priorities of the GEOSS.
15	GIIDA: Gestione Integrata e Interoperabile dei Dati Ambientali del CNR	GIIDA is a interdepartmental project of the National Research Council of Italy which targets the definition and development of a shared multidisciplinary infrastructure for the management, processing and analysis of environmental data. It is composed of work groups related to air quality, seas and marine resources, natural and anthropic risk, climate change, water and soil quality, biodiversity and combined infrastructures between Research Institutes and Public Administrations.
16	SINANet: Rete del Sistema Informativo Nazionale Ambientale	Sinanet is the Environmental Information and Monitoring System and represents the EIONet National Focal Point (NFP) the EEA in Italy. NFP is in charge of cooperation with the EEA and the NRCs (National Reference Centers) and organises national coordination of activities related to the EEA strategy. Data and information of European relevance are managed to support the business processes of the European Environmental Information System and building on a shared information infrastructure to create national repositories (REPORTNET). Through SINANet, ISPRA act as Coordination Structure for INSPIRE implementation to support the National Contact Point (Ministry for Environment, Land and Sea).

Table 1 Selected national/regional initiatives

A brief description is available for any initiative submitted as candidate Compelling Example. While it was useful for a preliminary decision whether to include it in the set of relevant national/regional initiatives or not, it was not sufficient for analyzing and evaluating it with the aim of defining possible (good) practices in the implementation of GEOSS. Extensive description is instead available through official documents for the



initiatives funded in the context of European projects (FP, and Interreg), for other national-level initiatives such as GIIDA, SINAnet and UK-EOF, and for the GEO National Implementations. However in order to have a description more focused on the experiences, and lessons learned in the implementation of GEOSS, a Workshop was considered useful.

Then, for all the selected initiatives, the provided points-of-contact have been invited to present their experience in a Workshop held in Rome on the 18th-19th of April 2011, organized by ISPRA. During the Workshop the selected initiatives had the opportunity to give a presentation of their activities with particular reference to GEO/GEOSS and to participate in a discussion.

3.2. Analysis of the selected initiatives

The selected initiatives were analysed in order to identify commonalities, differences, successes and failures in the approaches followed by the national/regional initiatives. A preliminary analysis was carried out in the T3.4 as an outcome of the Workshop in Rome, resorting to the discussion held in the context of the Workshop itself, and to the answers to a questionnaire submitted after it. Starting from the results of this preliminary analysis, that are collected and presented in the deliverable D3.4, a further analysis has been carried out in the T4.1 in order to have a main focus about the future definition of a general methodology (the EGIDA Methodology).

The analysis aims to provide suggestions on the Contributions to GEO and adopted methodologies and processes.

3.3. Contributions to GEO



The analysis started from the commonalities described in the deliverable D3.4 taking into account the relevant targets:

Commonalities (from D3.4)	most relevant Strategic Targets
Cataloguing	AR, CB
Active proposals by GEOSS stakeholder	methodology
Interaction between top-down/bottom-up processes	methodology
Overview/cataloguing of national activities	methodology
Conveying GEOSS activities in existing networks	CB
Alignment of ongoing project to GEOSS	CB
Presence/promotion of guidelines on data sharing	DM
Data policy implementation	DM
Efforts on changing culture on data sharing	DM, methodology
Effort on ICT knowledge transfer and support	ST
Catalysing resources from existing project to contribute to GEOSS	CB
Potentiality to contribute to the national GEO-portal implementation	CB, DM, AR
Participation on coordinated national GEO community	UE, ST
Links to policy makers	UE
Existing international links with relevant initiatives	CB
Establishment of focal point at sub-national level	CB, AR
Periodic questionnaires	methodology
Promoting the use of GEOSS data	UE, ST

Architecture

Concerning the "Architecture" Strategic Target, the list of national/regional initiatives showed commonalities concerning the adoption of catalogues, the possible contribution to a GEO-national portal, and the establishment of sub-national focal points.



This suggests that a hierarchical structure including different levels, as required, from sub-national, to national, and regional level is often considered the preferable architectural approach for contributing to the GEOSS. This model is also supported by SEIS (Shared Environmental Information System for Europe) communication on streaming data and information flow. This is justified by the focus on national/regional initiatives that are initiatives with a clear geographical scope. By an architectural point-of-view, this fits well with the System of Systems Engineering approach adopted by the GEOSS, aiming to make different autonomous systems interoperable through a minimal set of agreements. The national and regional initiatives showed a general awareness about the specifications adopted in GEOSS either directly or indirectly (e.g. through the adoption of specifications from other initiatives contributing to GEOSS like INSPIRE or GMES). One open issue concerns the replication of contributions in case resources are to be made available to more than one different systems contributing to GEOSS. It is also interesting to note that in some cases (in particular the Italian EO SoS case) the realization of a SoS was addressed to make different national levels infrastructures interoperable.

Moreover, the provision of a metadata catalog seems a simple first step, quite easy to implement. The following step, addressing data access, seems harder to be achieved without a clear data policy definition and enforcement, as demonstrated by the relevance of data sharing issues (see Data Management section).

Concerning the identification of effective national coordination mechanisms across both observation-provider and observation-user communities, this is addressed only by those initiatives that have a clear national coverage. Obviously it is part of the objective of GEO national initiatives, but also national-level initiatives that have a top-down governance component, generally address this issue. For example UK-EOF, and GIIDA (limiting to the CNR resources);

Concerning the coordination at national, regional and global levels for linking and enhancing Earth observing and information systems, this is considered in the scope of



existing or planned GEO National implementations, while single national/regional initiatives do not usually address this objective. However some initiatives aims explicitly to participate in national GEO communities.

Long-term access is hampered by two main obstacles: a) the difficulty of involve S&T communities without an obligation or reward, b) lack of funding.

Capacity Building

National/regional initiatives show relevant actions on Capacity Building.

As said above a metadata catalogue is often one of the first actions. The need to centralise the metadata indexing arises, first to discover resources at national level and, secondly, as an intermediate step toward GEOSS to provide the harmonised national contribution. At European level the National INSPIRE Directive implementation can help to supply this need on the basis of the mandatory creation of environmental metadata across Europe.

Moreover national/regional initiatives consider the implementation of a national GEO portal/web page a necessary step to help capacity building also in terms of resource inventory and gap analysis.

Significant effort is dedicated to coordinate on-going initiatives that may contribute to GEOSS. The existence of different initiatives on data sharing (e.g. GMES, SEIS, INSPIRE in Europe) is perceived as a possible source for duplication of efforts and this is the reason why national GEOSS Stakeholders stress the coordination of on-going projects and programmes to be aligned with GEOSS or to build GEOSS upon those initiatives.

Considering that many of the resources existing/stored/collected at the subnational level are hidden to GEOSS because of a) not being conducted within institutional activities, b) the lack of ICT knowledge to share environmental data/information, and c) the self-governed condition of subnational authorities that can delineate their own monitoring



activities, environmental products and data policy, the establishment of GEO Focal Points at the sub-governmental level could improve the amount of data available for feeding the GCI and to improve national datasets.

Data Management

The main concern about Data Management is the existence of a clear resource sharing policy. In particular it is important to consider the sub-national level, in particular for countries with a federal governmental structure. A user friendly guideline on data sharing appears to be the best starting point to implement data/information national policy .

3.3.1. Adopted methodologies and processes

The selected national/regional initiatives show many interesting contributions towards a definition of an effective methodology for a sustainable contribution to GEOSS.

The main point appears to be the effectiveness of combined top-down and bottom-up actions. National/regional initiatives were often born with a strong bottom-up component, but where it is complemented by a top-down activity, relevant benefits are achieved. The top-down component implemented with a some sort of coordination activity helps to perform actions at higher level, including the definition of data policies, collection of existing resources, gap analysis and so on.

An important methodological action is the overview/cataloguing of national activities. It is considered a fundamental step to build an effective contribution to GEOSS. It helps to highlight the on-going activities that, especially at sub-national level, may remain hidden, and to make a gap analysis possible. The cataloguing of national activities and the gap analysis are essential for an effective mobilization of resources, allowing to focus on what is really needed, and avoiding duplication of efforts.



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Periodic questionnaires are considered important in order to monitor the progress in the activities and also to understand to what extent the efforts made are contributing to the SBAs.



4. Analysis of European initiatives

4.1. Selection of relevant initiatives

The selection of relevant initiatives has started from the collection of relevant FP7 projects from two main sources:

a) the preliminary version of “Catalogue of EU funded projects in Environmental research” provided by the EC.

This preliminary version is intended to be disseminated at the Information day on the Work Programme 2012, which will be held in Brussels on 17 June 2011. It includes the outcome of the calls WP2011 with the exception of the projects resulting from the calls FP7-OCEAN-2011 and FP7-ENV-2011-ECO-INNOVATION Two stages, which will be added later. In total 337 projects selected by the Directorate Environment of the Directorate-General for Research and Innovation are briefly presented in a thematic structure, which is covering the research areas of Climate Change, Environment and Health, Natural Hazards, Natural Resources Management, Biodiversity, Land and Urban Management, Marine Environment, Environmental Technologies including Cultural Heritage, Earth Observation, Assessment Tools for Sustainable Development, and Horizontal and dissemination actions.

b) The list of FP6-FP7 GEO related projects published on the Web by the EC.¹

From this preliminary list it was performed an initial selection choosing projects mentioning a contribution to either GEO, GEOSS, INSPIRE or GMES in the description. INSPIRE and GMES were included since they are EU contribution to the GEOSS, therefore European projects contributing to one of them are also indirectly contributing to GEO/GEOSS.

¹http://ec.europa.eu/research/environment/index_en.cfm?section=geo&pg=fp6-fp7-projects



This preliminary selection left us with 32 projects. Table 1 summarizes the projects with their acronym, relationship with GEOSS, building blocks addressed, funding scheme, research area and project temporal extension.

The identification of the main building blocks addressed is based on both the call the project was responding to [Ollier 2011] and the available project description.

	Acronym	Supporting sentences	Building Blocks	Funding Scheme	Research Area	
1	CarboChange	Observations and model results will merge into GEOSS/GEO through links with the European coordination action COCOS and will prepare the marine branch of the European Research Infrastructure ICOS.	SBA	CP	Climate Change	2011-03-01 2015-02-28
2	HerePlus	HEREPLUS will produce the above mentioned risk maps starting from preexistent environmental and health data, by development of new epidemiological and statistical approach, also in support for the implementation of Global Earth Observation System of Systems (GEOSS) initiative and the Environment and Health Action Plan.	SBA	CSA	Environment and health	2008-09-01 2011-05-31
3	Hermione	HERMIONE will enhance the education and public perception of the deep-ocean issues also through some of the major EU aquaria. These actions, together with GEOSS databases that will be made available, will create a platform for discussion between a range of stakeholders, and contribute to EU environmental policies.	SBA	CP	Marine Environment	2009-04-01 2012-03-31



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4	COCOS	it will contribute to an effective monitoring of the carbon cycle at global level as recommended by GEO	SBA	CSA	Earth Observation	2008-05-01 2011-10-31
5	EuroGEOSS	EuroGEOSS demonstrates the added value to the scientific community and society of making existing systems and applications interoperable and used within the GEOSS and INSPIRE frameworks.	AR, DM, CB, ST	CP	Earth Observation	2009-05-01 2012-04-30
6	GEOCARBON	this project aims at designing, addressing the climate targets of the Group on Earth Observations (GEO) toward building a Global Earth Observation System of Systems (GEOSS) for carbon Strengthen the effectiveness of the European (and global) participation in the GEO system.	SBA CB, UE	CP	Earth Observation	end 2011
7	HYPOX	Our work will contribute to GEOSS tasks in the water, climate, ecosystem and biodiversity work plans, and comply to GEOSS standards by sharing of observations and products with common standards and adaptation to user needs using a state of the art world data centre.	SBA, CB	CP	Earth Observation	2009-04-01 2012-03-31
8	EUGENE	The EUGENE project aims at improving cooperation among European institutions active in the domain of Earth observations and intensifying the coordination of contributions from national and European programmes to building GEOSS.	UE	CSA	Earth Observation	2009-10-01 2011-09-30
9	GEOVIQUA	GEOVIQUA will extend the GEOSS infrastructure by adding well-defined data quality indicators and quality-enabled search and visualisation tools	AR	CP	Earth Observation	2011-02-01 2014-01-31
10	EUROSITES	The work we propose addresses directly and explicitly the vision of	SBA,	CP	Earth Obser	2008-



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		GEOSS	CB	vation	04-01 2011-03-31
11	E-SOTER	GEOSS plans a global Earth Observation System and, within this framework, the e-SOTER project addresses the felt need for a global soil and terrain database.	SBA, CB	CP	Earth Observation 2008-09-01 2012-02-29
12	ACOBAR	ACOBAR will contribute to filling gaps in the global ocean observing system and thereby support the development of GEOSS.	SBA, CB	CP	Earth Observation 2008-10-01 2012-09-30
13	ENERGEO	By developing a distributed system based on the recommendations of the GEO-Architecture and Data Committee global collection and dissemination of data relating to the effect of energy use on the environment will be supported. By including members of the Energy-Community of Practice of GEO, sustained contribution of the GEO-tasks EN-07-02 and EN-07-3 will be realised.	SBA, CB	CP	Earth Observation 2009-11-01 2013-10-31
14	EO2HEAVEN	EO2HEAVEN will specify and implement the SII as an open architecture based upon international standards and adaptive geospatial Web services in alignment with the large-scale initiatives INSPIRE and GMES.	SBA, CB	CP	Earth Observation 2010-02-01 2013-01-31
15	GFG2	Exploring GNSS (global navigation satellite systems) applications for Global Environmental Earth Observation and GEOSS (Global Earth Observation Systems of Systems)	ST	CSA	Earth Observation 2011-01-01 2013-12-31



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16	GMOS	The overarching goal of GMOS is to support the achievement of goals set by the GEO / GEOSS, and specifically of the GEO Task HE-09-02d	SBA, CB	CP	Earth Observation	2010-11-01 2015-10-31
17	GEOOWOW		AR, DM, ST, SBA	CP	Earth Observation	2011-09-01 2014-08-31
18	DEVCOCAST	The DevCoCast project aims at involving Developing Countries in the GEONETCast initiative.	CB	CSA	Earth Observation	2008-05-01 2011-04-30
19	AEGOS	evaluation of the input of Interoperability and interdisciplinary in support of GEOSS , (...), a geoscience contribution to GEOSS, in the context of INSPIRE	CB AR	CSA	Earth Observation	2008-12-01 2011-05-31
20	ENVIROGRIDS	EnviroGRIDS will build an ultramodern Grid enabled Spatial Data Infrastructure (GSDI) that will become one component 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)	CB, AR, SBA	CP	Earth Observation	2009-04-01 2013-03-31
21	GEONetCAB	to create the conditions for the improvement and increase of the GEO capacity building activities and framework, with special emphasis on developing countries, new EU member states (and EU neighbouring states) and climate monitoring and will serve the bigger goal of improved effectiveness and efficiency of GEO capacity building for application in the GEO societal benefit areas.	CB, SBA	CSA	Earth Observation	2009-11-01 2012-10-31



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22	SEOCA	GEO capacity building initiative in Central Asia	CB	CSA	Earth Observation	2010-03-01 2012-02-29
23	BALKANGEON ET	a great number of Balkan countries are still not members of GEO. This project aims to identify existing EO-data providers and users in the wider Balkan region, to determine their status, potentials and needs, and to coordinate EO players by establishing proper interfaces and networking between them.	CB, ST	CSA	Earth Observation	2010-11-01 2013-10-31
24	OBSERVE	OBSERVE project has the ultimate goal to raise awareness and establish firm links with the regional decision making bodies on the importance of a mutual and enhanced EO application network on environmental monitoring according to the principles of the GEO.	CB, UE, ST, DM	CSA	Earth Observation	2010-11-01 2012-10-30
25	MEDINA	Data availability to all parties will be ensured through the GEOSS Common Infrastructure (GCI). Existing software components for data access, processing and modelling will be adapted to requirements gathered within MEDINA and integrated in the GCI. MEDINA will exploit the GCI capabilities populating its registries and complying with the GEOSS Data Sharing Principles.	CB, ST, DM	CP	Earth Observation	2011-?-? 2014-?-?
26	PEGASO	Implementating a Spatial Data Infrastructure (SDI), following INSPIRE Directive, to organize local geonodes and standardize spatial data to support information sharing	CB, DM	CP	Marine Environment	2010-02-01 2014-01-31
27	THOR	The project will contribute to Global Monitoring for Environment and Security (GMES)	DM	CP	Climate Change	2008-12-01 2012-11-30



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28	GREENSEAS (GMES)	The heart of the GreenSeas concept is establishing a 'core' service following the open and free data access policy implemented in the Global Monitoring for Environment and Security (GMES) programme	DM, CB, SBA	CP	Marine Environment	2011-01-01 2013-12-31
29	MIAVITA	Integrated information system (data organisation and transfers, communications) taking advantage of GEONETCast initiative Results will be achieved with help from local scientists and stakeholders in Africa	CB, UE, SBA	CP	Natural Hazards	2008-10-01 2012-09-30
30	AGRICAB	AGRICAB aims to strengthen Earth Observation (EO) capacities in Africa by building on the open data sharing through GEONETCast, connecting the available satellite and other data with predictive models in order to facilitate integration in agriculture and forestry planning and management processes.	CB, UE, SBA	CP	Earth Observation	
31	EBONE	EBONE is a European contribution on terrestrial monitoring to GEO BON, the Group on Earth Observations Biodiversity Observation Network	CB, DM, SBA	CP		2008-04-01 2012-03-31
32	CEOP-AEGIS		CB, SBA	CB		2008-05-01 2012-04-30

Taking into account the main building block we have the following distribution:

SBA	AR	CB	UE	DM	ST
12	3	13	1	2	1



The prevalence of activities concerning Capacity Building and SBAs depends mainly on the structure of the Calls issued by the European Commission in the last years. They were mainly focused on the development of observatories and data sharing infrastructures for applications covering one or more GEO SBAs. (see Table 2).

Year	Objective
2007	Coverage of several GEO Societal Benefits Areas by involving the European S&T Community (Carbon Cycle, Biodiversity, Ocean Interior, Soil, Water)
2008	Research supporting the Initial GEOSS Information System in relation with Europe's development of INSPIRE
2009	Emerging observing systems (Environment and Health, Sustainable exploitation of mineral resources) / Further structuring the European approach in GEO
2010	New tasks introduced in the 2009-2011 GEO Work Plan (Global Mercury Observing System, promoting GEO in S&T Community) links between GEO and new technologies (data visualisation, GNSS, reanalysis)
2011	Strong emphasis on Capacity Building (EO for agri and forestry in Africa, Monitoring of Med African coastal zone) , Data sharing (GOOS, atmospheric hazards, water management) Global Observation systems (Carbon)

Table 2 - EC Calls in the Environment Theme (from [Ollier 2011])

In order to maintain the analysis feasible we selected a further subset of initiatives basing on two criteria: theme(s) covered and project typology and status.

Theme selection criterium

Since the focus of this deliverable is on how the EC co-funded initiatives address the infrastructures building and deployment they have been selected the projects with a main



contribution on the building blocks AR, CB, and DM. Actually, the present analysis is also interested in Science&Technology and User Engagement topics but with a specific reference to the methodology adopted by each single initiative. Instead, the EC projects on ST and UE themes are dedicated initiatives encompassing the single projects and therefore usually implemented as Coordination and Support Action.

Project typology criterium

Since the focus of this deliverable is on how the EC co-funded initiatives address the infrastructures building and deployment we selected the projects with a funding scheme of Collaboration Project, which are targeted to the system implementations. Instead we did not consider Coordination and Support Actions that, as their names imply, are focused either on coordinating other projects' actions or supporting one or more of them.

Project status criterium

While many projects aim to provide contribution to the relevant building blocks, the structure of the contribution becomes usually clear during the course of the project. Indeed the design and development of the infrastructures depends on the user requirements that are often collected and discussed in the first months of the projects. Therefore we decided to considered only projects that, basing on the available public documentation, already had, at the moment of the deliverable writing, a clear contribution for our analysis.

Applying the previous three criteria left us with seven relevant initiatives. Another project SeaDataNet funded by the EC in the Research Infrastructure theme, was proposed for analysis and it was included as an example of a project co-funded by the EC, and specifically targeted to build a pan-European information infrastructure. Table 3 summarizes the projects included in the analysis.

Project Acronym	Project Name
HYPOX	In situ monitoring of oxygen depletion in hypoxic ecosystems



EuroGEOSS	An European approach to GEOSS
EO2Heaven	Earth Observation and Environmental Modelling for the Mitigation of Health Risks
EnviroGRIDS	Building Capacity for a Black Sea Catchment Observation and Assessment System supporting Sustainable Development
ENERGEO	Energy Observation for monitoring and assessment of the environmental impact of energy use
PEGASO	People for Ecosystem Based Governance in Assessing Sustainable Development of Ocean and Coast
EBONE	European Biodiversity Observation Network
SeaDataNet	Pan-European infrastructure for marine and ocean data management

Table 3 - List of European projects included in the analysis

4.2. Analysis of Initiatives

In the following sections the selected initiatives are described and analyzed in order to highlight:

- the specific objectives relevant for GEO/GEOSS. This helps to understand the type of contribution expected.
- how the project is structured concerning capacity building, architecture and data management.
- the outcomes of the projects in terms of contribution to GEO/GEOSS, capacity building, architecture and data management.
- the relevant issues of methodology adopted.



4.2.1. HYPOX

Objective

HYPOX aims to improve the capacity to monitor oxygen depletion globally, by implementing reliable long-term sensors to different platforms for in situ monitoring; and locally by training and implementing competence around the Black Sea. Hypox work explicitly aims to contribute to GEOSS tasks in the water, climate, ecosystem and biodiversity work plans, and comply to GEOSS standards by sharing of observations and products with common standards and adaptation to user needs using a state of the art world data centre.

Structure

A specific Work Package (WP5) is dedicated to “Knowledge base on oxygen depletion: Data sharing, standardization and interoperability according to GEOSS”. The implementation of the data infrastructure will be carried out with regard to the EU directive INSPIRE and the recently formed plan of the Group on Earth Observations (GEO) for a Global Earth Observations System of Systems (GEOSS). The HYPOX data portal will participate in the GEOSS Clearinghouse by supporting corresponding workflows and protocols.

Another Work Package (WP1) is dedicated to “Improving and integrating in situ observation capacities of oxygen depletion” and it helps WP5 to develop standardization of metadata and products for data sharing.

Outcomes

Hypox addresses the following components in the development of a data infrastructure:



- Legacy data inventory: the inventory collects past monitoring data, existing data bases for the selected HYPOX sites, links to projects / institutions dealing with investigations of e.g., eutrophication, hypoxia, climate change. It is based on panMetaWorks².
- Catalog: Hypox provides a data catalog based on the PANGAEA[®] Framework for Metadata Portals (panFMP)³
- Data Portal: Hypox provides a data portal at the address <http://dataportals.pangaea.de/hypox/>. It is based on panFMP tool and provides search capabilities and data news feeds. Data are also accessible through PANGAEA⁴ data portal.
- Data policy: Hypox has developed a data policy that clarifies roles and responsibilities during data management, identify the key international initiatives and programmes as well as the relevant standards and protocols to interact with GEOSS [HY-1].
- GEOSS registration: The HYPOX Oxygen depletion monitoring system is registered as component in the GEOSS registry.

²panMetaWorks is a collaborative, metadata based data and information exchange platform for science. Researchers can use panMetaWorks to collect and share a variety of information sources such as documents, webpages as well as citations. And of course, panMetaworks can be used to initially upload and describe data which is intended to be later on archived at PANGAEA. Thus, it helps to collect metadata needed for archiving purposes and is therefore also a helpful tool for data curators. [<http://wiki.pangaea.de/wiki/Panmetaworks>]

³panFMP is a generic and flexible framework for building geoscientific metadata portals independent of content standards for metadata and protocols. Data providers can be harvested with commonly used protocols (e.g., Open Archives Initiative Protocol for Metadata Harvesting) and metadata standards like Dublin Core, DIF, or ISO 19115. The new Java-based portal software supports any XML encoding and makes metadata searchable through Apache Lucene [<http://www.panfmp.org/>]

⁴The information system PANGAEA is operated as an Open Access library aimed at archiving, publishing and distributing georeferenced data from earth system research. The system guarantees long-term availability of its content through a commitment of the operating institutions. Most of the data are freely available and can be used under the terms of the license mentioned on the data set description. A few password protected data sets are under moratorium from ongoing projects. The description of each data set is always visible and includes the principle investigator (PI) who may be asked for access. [<http://www.pangaea.de/about/>]



Methodology

1. preliminary policy definition
2. re-use of existing open-source software tools
3. adoption of standards
4. provision of basic geospatial services

References

[HY-1] Deliverable 5.1 "HYPOX data management plan and policy and catalogue of relevant legacy data sets"

[HY-2] Huber R., "WP5: Data portal/technology (Data content Data delivery)" HYPOX 1st Annual Meeting

4.2.2. EuroGEOSS

Objective

EuroGEOSS demonstrates the added value to the scientific community and society of making existing systems and applications interoperable and used within the GEOSS and INSPIRE frameworks. The project builds an initial operating capacity for a European Environment Earth Observation System in the three strategic areas of Drought, Forestry and Biodiversity. It then undertakes the research necessary to develop this further into an advanced operating capacity that provides access not just to data but also to analytical models made understandable and useable by scientists from different disciplinary domains.

This concept of inter-disciplinary interoperability requires research in advanced modelling from multi-scale heterogeneous data sources, expressing models as workflows of geo-processing components reusable by other communities, and ability to use natural language to interface with the models.



Structure

A specific Work Package (WP2) is dedicated to the “Multidisciplinary Interoperability”. It will undertake the research necessary to develop this further into an advanced operating capacity that provides access not just to data but also to other resources such as environmental models made accessible and useable for different disciplinary domains. The concept of Multi-disciplinary Interoperability requires research in advanced modelling services using multi-scale heterogeneous data sources, and expressing environmental models as geo-processing workflows. Advanced searching strategies and natural language query support will be investigated to improve the interaction with multi-disciplinary resources.

Contributions

- Catalog: EuroGEOSS provides discovery capabilities through the EuroGEOSS Brokering framework⁵. It includes a discovery broker based on the open source GI-cat component which is able to access, harmonize and query metadata expressed in different formats and encodings. It supports both distributed queries and metadata harvesting approaches.
- Data access: EuroGEOSS provides harmonized access capabilities through the EuroGEOSS Brokering framework. It includes an access broker based on the open source GI-axe component which is able to access and transform data published through different access services and with different formats, encodings. It supports data transformations provided by external services in order to harmonize data sets on the same Grid Environment (Coordinate Reference System, format, resolution, etc.).
- GEOSS registering: The EuroGEOSS Broker is a registered service in the GEOSS registry.

⁵ <http://217.108.210.73/broker/>



Methodology

1. lowering entry barriers for providers: the concept of EuroGeoss broker aims to move the burden of implementing interoperability arrangements from the data providers to the infrastructure.
2. provision of basic geospatial services: catalog
3. provision of advanced geospatial services: brokered discovery and access; transformations
4. extension of existing open-source tools: development of the EuroGEOSS broker framework;
5. Participation in AIP

References

[EG-1] EuroGEOSS project Web Site; <http://www.eurogeoss.eu>

4.2.3. EO2Heaven

Objective

EO2HEAVEN contributes to a better understanding of the complex relationships between environmental changes and their impact on human health. The project will monitor changes induced by human activities, with emphasis on atmospheric, river, lake and coastal marine pollution.

The results of the project will directly address current goals of GEOSS (Global Earth Observation System of Systems) such that the resulting system will be integrated into the GEOSS infrastructure after successful validation already during the course of the project [EH-1].

Structure

A specific Work Package (WP4) is dedicated to the "Architecture of Spatial Information Infrastructure" [EH-1].



Outcomes

- Observation data access: EO2HEAVEN developed use-cases based on the SWE architecture implemented with open-source tools: 52°North SOS, GRASS GIS; WMS/WMS client
- Processing services: EO2HEAVEN developed use-cases implementing processing with open-source tools: 52°North WPS
- Client: EO2HEAVEN implemented a lightweight providing: search of metadata records in OGC compatible catalogues; visualization of images served through Web Map Services (WMS); visualization of images with time dimension served through (WMS-T); visualization of vectorial layers served through Web Feature Services (WFS); visualization of observations in the form of maps and time series (SOS)⁶

Methodology

1. provision of basic geospatial services: catalog, observations
2. provision of advanced geospatial services: processing
3. Compliance with GEOSS, GMES, INSPIRE, SEIS
4. Participation in GEOSS AIP

References

[EH-1] EO2Heaven Project Web Site; <http://www.eo2heaven.org>

[EH-2] Jirka S., Wiemann S., Brauner J., Jürrens E.H. "Linking Sensor Web Enablement and Web Processing Technology for Health-Environment Studies"; ISW Workshop, AGILE 2011, Utrecht, 18th April 2011

⁶ <http://eo2heaven.atosorigin.es:8080/eo2heaven-webclient/> (the client is password protected)



4.2.4. ENVIROGRIDS

Objective

The enviroGRIDS project is contributing to the Global Earth Observation System of Systems (GEOSS) by promoting the use of web-based services to share and process large amounts of key environmental information in the Black Sea catchment.

Structure

A specific Work Package (WP2) is dedicated to the "Spatial Data Infrastructure (SDI)". 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.

Outcomes

- Geoportal: EnviroGRIDS deployed the enviroGRIDS Uniform Resource Management (URM) geoportal⁷. It is a place which allows users to search, view, examine and share spatial and non-spatial data. Geoportal is based on interoperability standards (OGC, W3C, OASIS, ISO) which are connected to other resources on web and helps to create distributed structure of information and knowledge based on spatial localisation [EN-1].
- Guidelines: EnviroGRIDS organized the workshop "Bringing GEOSS services into practice" aiming at teaching participants how to install, configure and deploy a set of open source software to publish and share data and metadata through the Global Earth Observation System of Systems (GEOSS) using OGC web services & ISO standards. Guidelines cover the

⁷ <http://www.envirogrids.cz>



following topics: introduction on Spatial Data Infrastructures; tutorial on OGC web services for data & metadata; registering services into GEOSS; using enviroGRIDS URM geoportal [EG-1].

- GEOSS registration: The enviroGRIDS system and the “enviroGRIDS - Bringing GEOSS services into practice” guidelines are registered as component in the GEOSS registry.

Methodology

1. lower entry barrier for providers through guidelines and tutorials
2. provision of basic geospatial services (through the geoportal)
3. re-use of open source tools
4. harmonization of architectures (i.e. grids and web infrastructures)

References

[EG-1] “GEOSS in practice - tutorial” in “Bringing GEOSS Services into Practice” Workshop

4.2.5. ENERGEIO

Objective

The main objective of the EnerGEO project is to develop a global observation strategy for monitoring and prediction the impact of the exploitation of energy resources on the environment and to demonstrate this strategy for a variety of energy resources.

Structure

A specific Work Package (WP2) is dedicated to “Global Observation Systems” addressing A review about the existing and foreseen GEOSS system. A second Work Package (WP3) is dedicated to “System Engineering” and it aims to develop and design the hardware and software architecture of the system based on the WP1 requirements. Main focus will be



laid upon the interoperability of the system and will consider the GEOSS architecture requirements

Outcomes

- Geoportal: the ENERGEO Geoportal⁸ allows to search, browse and download data. It is based on the ESRI Geoportal software tool.
- GEOSS registration: the ENERGEO Geoportal is registered in the GEOSS registry.

Methodology

1. provision of basic geospatial services (through a geoportal)

References

[EN-1] ENERGEO Project Web site; <http://www.energeo-project.eu/>

4.2.6. PEGASO

Objective

The main objective of PEGASO is to build on existing capacities and develop common novel approaches to support integrated policies for the coastal, marine and maritime realms of the Mediterranean and Black Sea Basins in ways that are consistent with and relevant to the implementation of the ICZM Protocol for the Mediterranean [PE-1].

Structure

A specific Work Package (WP3) is dedicated to build in collaboration a spatial data infrastructure (SDI) for the Mediterranean and the Black Sea. Supporting and creating local geonodes, in order to deliver a Mediterranean and Black Sea harmonised sets of data, accessible through an Internet viewer [PE-1].

⁸<http://energeo.researchstudio.at/energeo/catalog/main/home.page>



Outcomes

- Geoportal: A geoportal allows to publish, view and access data
- SDI: The Pegaso SDI allows to publish data from different providers, view data, access data, other geoservices, catalogue of metadata

Methodology

1. Provision of basic geospatial services

References

[PE-1] Pegaso Project Web Site; [http:// http://www.pegasoproject.eu/](http://www.pegasoproject.eu/)

4.2.7. EBONE

Objective

The European Biodiversity Observation Network (EBONE) is a European contribution on terrestrial monitoring to GEO BON, the Group on Earth Observations Biodiversity Observation Network. The key challenge of the EBONE project is the development of a cost effective system of biodiversity data collection at regional, national and European levels.

Structure

A specific Work Package (WP7) is dedicated to the "Database management" aiming to provide a data management system, which allows to store standardised parameters and methods for the EUROPEAN Biodiversity monitoring network. This includes the following tasks: a) to determine essential operational core services, b) to determine relevant data flows and data according to INSPIRE and GEO data sharing principles, c) to provide a database for the collected field test data, and d) to design data architecture and technical tools for needed services.



Outcomes

- Data Warehouse for biodiversity and ecological data sets
- Services for data mining and data access
- Data entry tools for the field collection campaign

Methodology

1. Data models and encodings harmonization
2. Adoption of data warehouse approach
3. Provision of basic geospatial services
4. Participation to GEOSS task as the European contribution on terrestrial monitoring to GEO BON

References

[EB-1] EBONE Project Web Site; [http:// www.ebone.wur.nl/UK/](http://www.ebone.wur.nl/UK/)

[EB-2] Peterseil J., Blankman, D., Gaigalas, G., Magagna, B., Schentz, H., Vanacker, S., Vanhercke, L., van der Werf, B.; "D7.1: Technical Specification Ver 1.0", 2010-03-30

4.2.8. SeaDataNet

Objective

SeaDataNet is an Integrated Infrastructure Initiative of the EU Sixth Framework Programme. It has developed an efficient distributed Marine Data Management Infrastructure for the management of large and diverse sets of data deriving from in situ and remote observation of the seas and oceans.

Structure

The three Joint Research Activities, JRA1 ("Standards development"), JRA2 ("Technical development of the interoperable system"), JRA3 ("Portable Data Management software") are dedicated to design, develop, install and maintain the common software components of the system, and make recommendations for its further evolution and sustainability.



Outcomes

- Central User Register and single-sign-on AAA Services: the Common Data Index (CDI) service gives users a highly detailed insight in the availability and geographical spreading of marine data sets, that are managed by the SeaDataNet data centres. Moreover it provides a unique interface for requesting access, and if granted, for downloading data sets from the distributed data centres across Europe⁹
- Metadata Editor: SeaDataNet provides the MIKADO software tool which enables data centres to prepare XML metadata files for the SeaDataNet directories EDMED, CSR, EDMERP, CDI and EDIOS.

Methodology

1. Data models and encodings harmonization
2. Adoption of data shopping, tracking and download approach
3. Provision of basic geospatial services

References

[SDN-1] SeaDataNet Project Web Site; <http://www.seadatanet.org>

[SDN-2] Schaap, D. M. A., "SeaDataNet - A possible building block for GEOSS", 5th GEO European Projects Workshop, London, 8-9 February 2011

⁹ http://seadatanet.maris2.nl/v_cdi_v2/search.asp



5. Discussion

European projects and national/regional initiatives (including those mainly funded through the participation in European projects) presents some commonalities and differences. Table 4 provide a comparison of some relevant issues.

	National/regional initiatives	European Projects
Geographical scope	sub-national, national, regional	supranational, regional, pan-European, global
Duration	undefined	3-4 years
Funding sources	variable (including none and multiple sources)	relevant EC co-funding
Objectives	focused on capacity building	capacity building is part of a wider objective

Table 4 - Comparison of national/regional initiatives and European projects contributing to GEO/GEOSS

In order to summarize the results of the analysis of relevant initiatives we consider the following main aspects:

- Organization: how the different initiatives organize their works to implement and maintain their SoSE process, including the contribution to GEO;
- Networking: how the different initiatives address and engage the stakeholders;
- Capacity Building: how the different initiatives implement the SoS approach;



5.1. Organization

The D3.4 already highlighted how two different approaches are usually adopted and often combined in national/regional initiatives for a better contribution to GEO/GEOSS. The bottom-up actions coming from different sources (e.g. projects funded with a specific objective) are often complemented with top-down actions defined by some sort of coordination body. This allows to achieve better results on many issues, in particular where uncoordinated bottom-up activities can be ineffective. (*"On the matter of a) catalysing resources, b) standardisation of procedures and c) data and information harmonisation, during the workshop it was highlighted by the participants that the most proficient cases are characterised by a combined top-down and bottom-up approach."* [EGIDA D3.4])

European projects appear to share this issue. Globally they are part of a top-down process with the European Commission guiding the European GEO contribution through the preparation of calls, evaluation and negotiation of proposals, monitoring and finally reviewing the projects implementation. Moreover individually they have always a top-down component related to the project coordination activities. However this component can have more or less impact in the capacity building actions. Obviously the top-down impact is stronger in project explicitly related to the GEO tasks.

The main points where the top-down approach can provide benefits appear to be:

- data policy definition
- standard adoption and contribution
- knowledge transfer
- contribution to GEO

The presence of a top-down component poses the governance problem that is how the initiatives organise their central coordination and how the capacity building activities are organised. European projects typically have a management structure, often assisted by technical bodies and/or advisory boards which are in charge of the coordination actions. As demonstrated by the projects selected for this deliverable, many of them specifically



dedicate one or more packages to the capacity building, infrastructure and interoperability issues. These packages often provide the space where coordinated activities take place (e.g. EuroGEOSS).

National/regional initiatives provide their top-down component through a coordination body. This can be provided at different levels. For example UK-EOF, which is an agreement between public sector funders of environmental observations is governed by the UK-EOF Management Group; GIIDA which is an initiative involving Italian CNR Institutes is coordinated at CNR departmental level through a technical coordination group; SINAnet is managed by ISPRA which is the institutional body for the coordination of such an initiative.

The coordination with other relevant initiatives on data sharing (such as GMES, INSPIRE, SEIS in Europe) is perceived as an important topic at national/regional level. For European projects this is partially solved by the existence of a coordination of actions at EC level. Moreover some specific actions were carried out [Nativi 2011]:

- a liaison group among GMES, INSPIRE and GEOSS for interoperability, promoted by the FP GIGAS Project (GEOSS, INSPIRE and GMES an Action in Support);
- a communication platform, interoperability workshops (CEN TC287, OGC), and the GEO SIF European Team;
- Exploit and nurture the knowledge base, the network, and sustain shaping activities (CEN TC287, OGC);

CEN/TC 287 proposed as key-actor to foster use of and maintain outcome of GIGAS and other projects including valuable Technical Notes that otherwise would be outdated in less than two years. CEN/TC 287 processes guarantee transparent and open approach. Resources needed to do analyses could come from EU co-funded projects that address interoperability issues and the GEO SIF ET. Newly identified requirements or issues and proposed actions to be forwarded by CEN/TC 287 to OGC-ISO/TC 211-CEN/TC 287 requirements registry (GEO SIF ET if appropriate) [Smits 2010]



5.2. Networking

Networking initiatives aim to the identification and engagement of the different stakeholders: providers, users, funding agencies, coordination with other relevant initiatives (including GEO/GEOSS).

National/regional initiatives often address this issue at different level. In particular funds are considered one of the main obstacles for a sustainable contribution. Therefore possible funding agencies are generally identified and addressed, such as national funding agencies, and EC through the participation in the Framework Programme and other initiatives. European projects have a different focus. They have well-defined funds and objectives, therefore networking activities are more focused on the identification of stakeholders with particular attention to resource providers. The strategy is different according to the type of project. If the project has regional focus, all the relevant providers are addressed, while if the project has a pan-European focus a subset of relevant providers are considered, often to deploy specific use-cases.

Coordination with GEO/GEOSS activities is achieved through different means:

1. contribution to GEO/GEOSS (e.g. registration of GEOSS components/services)
2. liaison (e.g. advisory board, expert groups) with persons involved in GEO (e.g. GEO committee members, GEO task co-leaders)
3. participation of persons involved in GEO in the project, including GEO National;
4. direct participation in the GEO tasks;

Method #1 is the simplest one since it is just the provision of resources to GEOSS without any other interaction. Methods #2 and #3 are usually adopted by national/regional initiatives. National representatives in committees and tasks often act as contact-points or experts. Whenever a GEO National is present, it is the natural liaison between national/regional initiatives and GEO activities. Method #4 is difficult for national/regional initiatives for many reasons, in particular for the voluntary nature of participation in GEO/GEOSS tasks.



On the other hand European projects often adopt method #4 since they may be funded in answer to specific EC calls requesting the participation in related GEO tasks.

5.3. Architecture

The design of a system architecture for a data sharing infrastructure, is usually one of the main issues for both national/regional initiatives and European projects. Several issues are considered:

- Business process related issues including use-case definition, data policy, etc.,
- Service delivery,
- Engineering issues, including SoSE implementation,
- Technology issues including re-use of existing solutions and tools,
- Support and knowledge transfer

Concerning business process related issues, the lack of a clear data policy is perceived as one of the main possible obstacles to data sharing. While the provision of metadata is not considered critical, data provision is often dependant on specific IPR, licenses and research conditions. For this reason many national/regional initiatives and European projects dedicate specific efforts to the data policy definition. Here the top-down component appears fundamental in order to coordinate the activity involving domain experts, different actors in the provision chain, and experts in GEO/GEOSS and INSPIRE activities in the context of data sharing (GEOSS Data Sharing Principles, INSPIRE Data Sharing guidelines).

As a methodological approach the definition of use-cases and user scenarios is usual both for user requirements definition and for evaluation and test.

Service delivery is often the primary concern in many national/regional initiatives and European Projects. Data catalogs are usually the first service deployed. Normally providers have no major concern about metadata sharing. On the contrary there is often interest to inform about availability of data sets. Data viewing through mapping services is also often provided along with the metadata catalog. Direct data access is often limited



by the need of a clear data policy. When the data policy is agreed data access is often easily provided. More advanced services, such as metadata and data harmonization, model access, etc. are provided only by initiatives explicitly dedicated to the architecture development (e.g. EuroGEOSS). Security services are provided to enforce data policy, but they are often simple authentication and authorization services not tailored for geospatial data. In some cases the e-Commerce paradigm (order and download) can be followed (e.g. SeaDataNet). A few initiatives have considered specifically the topic of geospatial security, but without implementing it at the moment (e.g. GIIDA).

Engineering is another issue addressed by many initiatives. There are many different approaches:

- Some initiatives aim to define their own infrastructure, collecting the available resources in a single centralized or distributed information system. This system may become a component of a wider SoS, such as registering it in the GEOSS registry or in the INSPIRE infrastructure at national level. This approach seems to be typical of SBA focused initiatives and projects.
- Other initiatives build their system following a SoS approach: resources already available from existing systems are not replicated, and they are simply registered in an inventory/catalog. Some initiatives explicitly consider the SoS approach also for newly built systems. Their subsystems are encouraged to participate to a wider SoS (e.g. GIIDA, EuroGEOSS, SINAnet)
- Finally, there are initiatives that are explicitly finalized to build a SoS (e.g. Italian SoS).

Support is considered one important issue by many initiatives. They usually recognize that lacks of IT knowledge by domain experts acting as resource providers, may be a relevant barrier. Therefore many initiatives carry out actions to lower the providers entry barrier. Knowledge transfer is one option, providing direct support with workshops, help-desk, guidelines (e.g. EnviroGRIDS). Advanced architectural solutions are another options to move the harmonization tasks from providers to the infrastructures (e.g. EuroGEOSS). Some initiatives have also the possibility to outsource the resource provision from local nodes to the central infrastructure (eg. GIIDA).



Technology issues are addressed by the majority of initiatives. Standardization is widely recognized as the primary mean of addressing interoperability. OGC standards are widely known and adopted with particular reference to OGC CSW for discovery and OGC WMS for mapping. ISO 19115 for metadata is usually adopted, in particular with the INSPIRE profile. There is usually more variety in data models and formats. For data access services, international standards like OGC WFS and OGC WCS are often complemented by community standards and interoperability agreements (e.g. GBIF, CDI).

It is quite common to perform a technology review to collect possible contribution (e.g. EnviroGrids). The decision between make/buy approaches is usually towards re-use of open-source tools, with possible development of extensions. European projects more commonly develop tools. Some initiatives make use of existing platforms (e.g. PANGAEA).

Table 5 summarizes the comparison of National/Regional initiatives and European Projects, to highlight commonalities and differences in the approach for contributing to GEOSS.

Activity	National/Regional Initiatives	European Projects
General approach	mainly bottom-up actions, sometimes including a top-down component	combination of bottom-up and top-down actions
Coordination with other initiatives (GMES, INSPIRE, ...)	directly addressed when relevant	usually delegated to the EC coordination level (including the outcomes and follow-up of specific EC projects like GIGAS)
Stakeholders engagement	focused on resource providers and funding agencies	focused on resource providers and users
Contributions to GEO/GEOSS	Registration of GEOSS components/services; liaison with persons involved in GEO; participation of	from simple registration of GEOSS components/services to direct participation in the GEO tasks



EGIDA, Coordinating Earth and Environmental cross-disciplinary projects to promote GEOSS

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	experts involved in GEO	
Infrastructure geographic coverage	from local (including sub-national) to regional level	from regional to global level
Relevance of data sharing issue	medium to high	low to medium
Methodological approach for capacity building	use-cases	use-cases
Service delivery	discovery, view, access	discovery, view, access
Architecture	hierarchical, sometimes conceived as a SoS	self-contained system, sometimes as a contribution to a wider SoS
Support to users/providers	help-desk when a central coordination exists	development of guidelines
Standard awareness	high	medium to high
Technology adoption	re-use of existing; open-source;	re-use of existing; open source; development/extension of tools

Table 5 - Summary of analysis of National/Regional initiatives vs. European Projects



6. General References

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