**SEVENTH FRAMEWORK PROGRAMME**

**ICT PPP**

**Future Internet**


# The Environmental Observation Web and its Service Applications within the Future Internet

FP7-284898

Collaborative project

## D6.2.1 Report on Community Consultation I

**EC-JRC**

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## Glossary

The glossary of terms used in this deliverable can be found in the public document "ENVIROFI_Glossary.pdf" available at: http://www.envirofi.eu/

## Abbreviations and Acronyms

| Term | Explanation |
|---|---|
| AB | Advisory Board |
| CEN | European Committee for Standardization |
| CNR | Consiglio Nazionale delle Ricerche (Italian National Research Council) |
| EEA | European Environmental Agency |
| EGU | European Geosciences Union |
| ENVIROFI | The Environmental Observation Web and its Service Applications within the Future Internet |
| ESSI | Earth & Space Science Informatics division of the EGU |
| FI | Future Internet |
| FI-PPP | Future Internet Public-Private Partnership Programme |
| GEM | Global Environmental Monitoring |
| GIIDA | Integrated and Interoperable Management of Environmental Data |
| ICT | Information and Communication Technology |
| INSPIRE | Infrastructure for Spatial Information in the European Community |
| ISO | International Standardisation Organization |
| JRC | Joint Research Centre |
| OASIS | Organization for the Advancement of Structured Information Standards |
| OGC | Open Geospatial Consortium |
| OMG | Object Management Group |
| RM-OA | Reference Model for the ORCHESTRA Architecture |
| RM-ODP | Reference Model for Open Distributed Processing |
| SEIS | Shared Environmental Information System |
| SensorSA | Sensor Service Architecture |
| SOA | Service Oriented Architecture |
| SoaML | Service Oriented Architecture Modelling language |
| SDI | Spatial Data Infrastructure |
| SWE | Sensor Web Enablement |
| TC | Technical Committee |
| WP | Work Package |

**Table 1.** Abbreviations and Acronyms

## Executive Summary

The deliverable at hand (D6.2.1) reports on the first achievements in respect to the ENVIROFI community consultations. This initial version of the "Report on Community Consultation" document includes the applied strategy for interaction with the ENVIROFI Stakeholder Communities and the project Advisory Board. As it was agreed to postpone the first consolidation workshop (aiming at FI requirements from the Environmental Usage Area) to project month 7, the report at hand (delivered in project month 6) only refers to preliminary projects results, which have not been subject to in-depth consultation. We shall deliver these results subsequently as part of D6.2.2 'Report on Community Consultation II'. However, the consultation report will be made publically available beforehand on the official ENVIROFI project web site.

# 1 Introduction

The three scenarios considered within ENVIROFI (WP1-3) cover important thematic areas of ICT in the environmental sector. Beyond this, the work plan foresees a community consultation and a project-external board of advisors (herewith called the ENVIROFI Advisory Board or simply the Advisory Board), which should revise (i) the FI requirements that have been derived from the ENVIROFI scenarios in collaboration between WP1-3 and WP4; (ii) proposed environmental enablers within the FI coming from WP5; (iii) ENVIROFI conceptual prototypes as developed in WP5; and (iv) the results of the socio-economic analysis that is to be delivered in the scope of WP7.

This task (T6.2) ensures that the proposed Environmental Usage Area developments support the widest range of environmental applications. Based on ENVIROFI project inputs and consultation with other representatives of the ENVIROFI Stakeholder Communities (identified via T6.1), the Advisory Board (also identified via T6.1) should provide feedback to ENVIROFI consortium regarding the four points outlined above. In addition, the Advisory Board and the stakeholder representatives, such as members of other EU-funded projects on environmental informatics or employees of effected SMEs, will be also offered possibilities to propose additional FI requirement and (environmental) enablers for the FI.

The members of the Advisory Board are involved at various stages of the project. They are first contacted for reviewing ENVIROFI requirements for the FI; next for the revision of environmental enablers, and finally for evaluating the ENVIROFI conceptual prototypes as well as the socio-economic analysis. All consultations are implemented in two steps. First, the FI requirements (respectively the environmental enabler specifications, prototypes and analysis results) are made available to the Advisory Board prior to a physical meeting, together with a list of questions to answer. Based on these answers and guided by the ENVIROFI consortium, presentations and discussions are held in a workshop between ENVIROFI project members, the Advisory Board and other representatives of the ENVIROFI Stakeholder Communities. These workshops are co-located with internal project meetings, in order to easily involve experts of the ENVIROFI consortium itself, and ideally also with major events of the ICT for Environment or FI community in Europe.

It is the goal of task T6.2 to organize the workshops and all related communications. Results of this task provide advice concerning the requirements and specifications of WP4 and WP5 as well as concerning the development of the phase 2 implementation plan in WP7. Through the public workshops, this activity also contributes to awareness rising and exploitation (see also WP7).

The deliverable at hand (D6.2.1) reports on the first achievements in respect to the ENVIROFI community consultations. This initial version of the "Report on Community Consultation" document was intended to include (i) the applied strategy for interaction with the ENVIROFI Stakeholder Communities and (ii) the results of the first community consultation (interviews, first workshop, etc) with a list of FI requirements form the Environmental Usage Area and potential additional scenarios.

In agreement with the Project Officer, the ENVIROFI consortium decided to align the first stakeholder consultation workshop with the 25th EnviroInfo conference (October 5-7, 2011), i.e. in project month 7. This international conference is a major event in the Environmental Usage Area: it covers the complete field of processing environmental information prepared and distributed with cutting edge ICT technologies. Furthermore, it attracts both scientists and professional users of environmental information systems. EnviroInfo therefore provides a rare opportunity for broad discussions of the FI requirements that have been derived from the ENVIROFI scenarios. Since D6.2.1 needs to be delivered in project month 6, the results of the first consultations shall be formally reported as annex to D6.2.2 ‘Report on Community Consultation II’, which is scheduled for month 14 of the project (May 2012). As these results will be available earlier, we will make this annex already publically available via the ENVIROFI project web page in October 2011.

The remainder of this document is structured as follows:

- Section 2 briefly presents the ENVIROFI stakeholder communities and introduces the role and shape of the project’s Advisory Board.
- The overall consultation strategy for the project is outlined thereafter in section 3.
- Section 4 summarizes all ENVIROFI related consultation activities that have been carried out

until today (20/09/2011). Notably, this includes actions, which have been performed prior to the project kick-off. Explicit results are listed in the next section (section 2), before we conclude the deliverable and present an outlook for future work, to be carried out in ENVIROFI Task T6.2.

Later deliverables of task T6.2 (i.e. D6.2.1 and D6.2.3) will follow a similar structure.

## 2 Overview of ENVIROFI Stakeholders and the Project Advisory Board

A list of ENVIROFI stakeholders has been established within the scope of D6.1.2 [01 - ENVIROFI Consortium]. All related information shall be kept up to date using a project internal wiki [02 - ENVIROFI Consortium]. In summary, at project month 4 (July 2011), 29 candidate stakeholders have been identified by a project internal consultation. Most of these (26 out of 29) represent organizations and communities, which have multiple members from academia, the public sector and industry. In general, users and technology providers are highly represented (Figure 1).

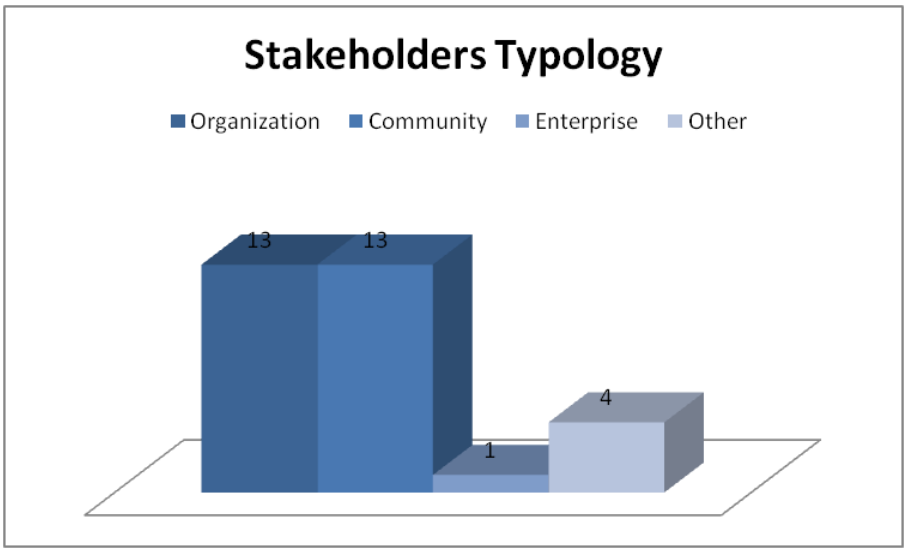


**Figure 1.** Typology of the ENVIROFI candidate stakeholders (taken from [01 - ENVIROFI Consortium])

At this stage, we mainly identified users from the three environmental spheres that are targeted within the ENVIROFI project (biodiversity (WP1), atmosphere (WP2) and marine (WP3)). At this stage, we identified most communities (14) on global level, closely followed by European focused groups (12), whereas only few (3) national initiatives have been listed (Figure 2). Stakeholder records are now maintained as part of Task T6.3 and further analyses are ongoing.

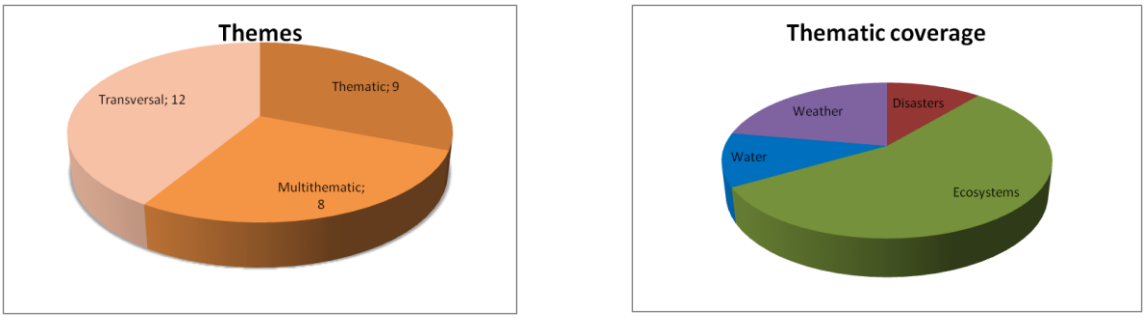


**Figure 2.** Themes addressed by the ENVIROFI candidate stakeholders (taken from [01 - ENVIROFI Consortium])

It is our aim to involve representatives of the above mentioned communities in the ENVIROFI consultations. This includes sending surveys and event invitations to the wider communities and closer interactions with a close set of contact persons (see also below). These contact persons, which build the ENVIROFI Advisory Board (AB), may represent more than one stakeholder community. The members of the AB are listed in Annex A. Most members have agreed on their participation and have already been invited to a first consultation workshop (see also below).

At this stage, the AB consists of 10 people, which leaves us with the possibility to extend it with up to 5 persons. If we feel at any stage that the AB should be enlarged in order to better reflect the growing ENVIROFI stakeholder communities, we may decide for inviting more experts.

*European Environmental Agency (EEA*): In addition to the advice and feedback provided by the EEA as a member of the project's Advisory Board (Stefan Jensen Head of Group, Information Services at EEA, see also Annex A), regular interactions should be scheduled in the framework of WP6 with the EEA to exchange experience and lessons learned from the project implementation on the one hand, and the EEA's work in relation to the SENSE project[1], the use of cloud computing, and other related work of relevance to the project (e.g. activities at the EEA related to the Shared Environmental Information System (SEIS) implementation plan). This interaction will take place in the framework of WP6. This has been already discussed with Jensen who offered to be also the interface to other EEA colleagues, e.g. working on citizen science.

[1] Additional information is available from: https://svn.eionet.europa.eu/projects/Zope/wiki/SENSE.

# 3 ENVIROFI Consultation Strategy

Stakeholder consultations already have a history with ENVIROFI, starting from the consortium building and the proposal writing (see also below). Within the project itself, we will follow continuous consultation activities involving (i) those departments of stakeholder organizations, which are part of the project consortium; (ii) other departments of these organizations; (iii) members of the ENVIROFI Advisory Board; and (iv) other stakeholders, which have been identified throughout Task T6.1, T6.3 or WP7 activities (Figure 3). Major consultation will be carried out in respect to the ENVIROFI FI requirements, environmental enablers for the FI, and the projects conceptual prototypes. These will be to large part carried out in three ENVIROFI project workshops.

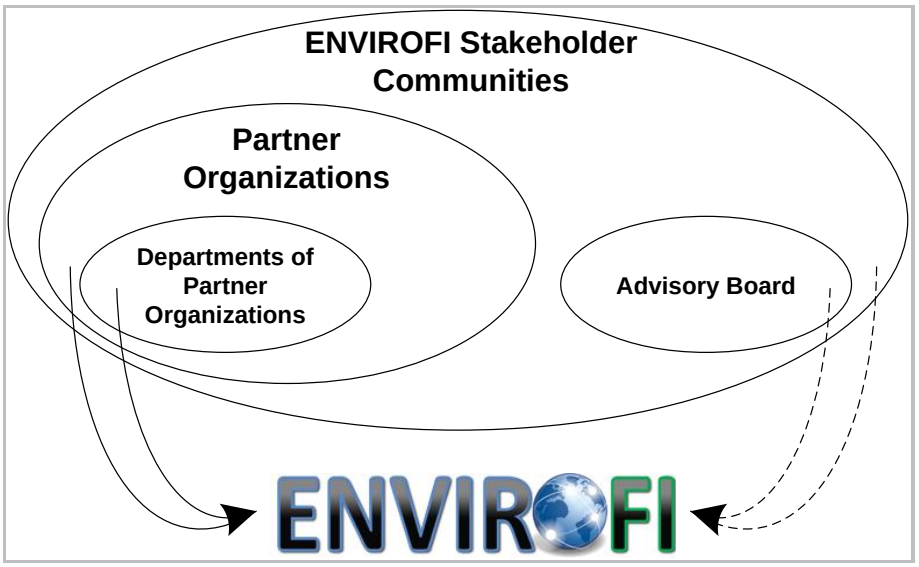


**Figure 3.** Overview of ENVIROFI consultation activities; dashed lines indicate project external inputs

## 3.1 Consultation Techniques

The above mentioned consultation can be carried out in multiple ways. In a nutshell, we consider the following techniques (modified from D6.1.1 [03 - ENVIROFI Consortium]):

- Analysis of existing work: in ENVIROFI the outcomes of existing initiatives, projects, programmes and forum activities were collected through either available publications or through direct link with participants. This approach is often made easy by the fact that the proposal partners already participate in many of the relevant initiatives. A Component Survey has been issued to the partners to collect information about possible contributions to the ENVIROFI architecture (from architectural styles to available technologies). The status of this work has already been reported on in deliverable D6.1.2 [01 - ENVIROFI Consortium]. The produced information is maintained in a Wiki, which is available from [02 - ENVIROFI Consortium]. This activity is carried out in task T6.3 (see also deliverable D6.3.1 [04 - ENVIROFI Consortium]).
- Interviews: this is a "traditional" means of eliciting requirements in “one on one meetings”. It is the primary technique to be adopted for acquiring knowledge from domain experts. Interviews can be formal (following a predefined list of questions) or informal (such as discussions with experts about the interesting domain). In ENVIROFI several discussions with experts provided hints and suggestions about user requirements. The interviews shall be carried out while meeting members of the ENVIROFI Advisory Board, but also to follow up spontaneous discussions at conferences, workshops and similar events with other interested experts. Interview summaries are made available to WP6 for consideration in the Task T6.2 deliverables.

- Surveys: complement the interviews with a second “traditional" mean of eliciting requirements, this time in a multi-stakeholder consultation. It is the secondary technique to be adopted for domain experts, or when partners’ domain knowledge requirements sources are addressed. Surveys can be formal (following a list of questions with pre-define answers), or semi-formal (following a list of questions with answers in free-text; still, guidance on the style of the text might be given). Project internal surveys on the above mentioned stakeholder communities and technical components have already been carried out in the context of Task T6.1 and reported in Deliverable D6.1.2 [01 - ENVIROFI Consortium]. We describe ongoing and planned additional surveys below.
- Reviews: selected project-external experts (in our case representatives of the ENVIROFI Advisory Board) may get access to project deliverables or other material, such as intermediate use case descriptions of Future Internet requirements, prior to publishing. They may be requested to quality review the provided material in terms of technical soundness and completeness with respect to a given scope. We foresee doing this with central project deliverables, but also with component requirements, enabler specifications, and conceptual prototypes. Again, more details are given below.
- Open group discussions: in contrast to interviews or reviews, which both address consultations with individuals, open group discussions allow for more creativity and dialog between groups of participants. Those can be any combination of stakeholder representatives and ENVIROFI consortium members. Such discussions can happen during dedicated conference/workshop sessions, such as the once planned for October 2011 (see also below), but also online, in web meetings or discussion forums.
- Joint Paper Writing: another form of actively integrating stakeholder representatives is joint paper writing. Here, a group of representatives is for example requested to provide a position paper on project relevant fields. This activity can either be carried out be a completely external group, or in cooperation with a facilitator or editor from the ENVIROFI project. As an additional benefit, if submitted to a workshop, conference or journal, external (usually anonymous) reviewers ensure overall quality and soundness. Apart from writing ENVIROFI related papers with co-authors outside the consortium (see also below and WP7 deliverables, i.e. dissemination plan [05 - ENVIROFI Consortium]), we will at least aim at a white paper about the Environmental Usage Area of the Future Internet, which will be co-authored by members of the ENVIROFI Advisory Board and WP6 partners.

Certainly, not all of the above can be applied to the identified consultation topics. The matrix below (Table 2) summarizes which techniques will be applied in order to consolidate the particular fields of interest.

| | **Analysis of existing work** | **Interviews** | **Surveys** | **Reviews** | **Open group discussions** | **Joint paper writing** |
|---|---|---|---|---|---|---|
| FI requirements | X | X | X | | X | X |
| Environmental enablers | | X | | X | X | X |
| Conceptual prototypes | | | | X | | |
| Socio-economic analysis | X | X | | | X | |

**Table 2.** Foreseen consultation techniques per topic

The consultation strategy presented here may be updated during the progress of the project. Later deliverables of Task T6.2, i.e. deliverables D6.2.2 and D6.2.3 shall provide updates if required.

## 3.2 The Role of the Advisory Board

The ENVIROFI Advisory Board shall play an essential role for the final validation and potential extension of ENVIROFI requirements for the Future internet (FI), environmental enabler specifications, ENVIROFI conceptual prototypes as well as the socio-economic analysis. It may also suggest experimentation services and sites for phase two of the Future Internet – Public Private Partnership (FI-PPP) programme. A number of relevant stakeholders in the field of environmental applications (biodiversity, air and water quality, other fields of earth observations), ICT for environment (Sensor Web, Model Web, Event Driven Architectures), and standardization (including ISO and OGC) have already supported the development of the proposal and agreed to participate in this board.

This Board shall be composed of a maximum of 15 persons representing relevant organizations in ICT for Environment and related fields. At the time of writing this deliverable, the Board consists of 12 persons. Up to three additional board members may therefore be invited during the project execution.

The main activities of this Board shall be to:

- answer questions (as questionnaires or in interviews) on ENVIROFI scenarios, FI requirements, enablers and the socio economic analysis for the Environmental Usage Area in the FI, as well as on ENVIROFI conceptual prototypes;
- actively participate in ENVIROFI consultations, i.e. reviewing, ranking and extending proposed FI scenarios, requirements, environmental enablers, etc.;
- prepare for and attend ENVIROFI project workshops and other events and review as external advisers;
- propose additional experimentation services and sites for phase two of the FI-PPP; and
- encourage the potential interactions of ENVIROFI with other projects, initiatives or activities not identified previously by the project Consortium.

The current members of the ENVIROFI AB are listed in Annex A.

# 4 Summary of Consultation Activities

As mentioned before, ENVIROFI project occurred as a result of stakeholder consultation. Related activities started in early 2010, were carried on along with the project negotiation phase and have been performed starting in parallel with the project kick-off in early April 2011. In this section we summaries these activities in chronological order and we present an outlook to the currently foreseen consultation events during the project lifetime.

## 4.1 Pre-ENVIROFI Activities

Three major events lead to the project proposal and the work program as it has been accepted for funding within the FI-PPP. These were:

- *The organization of and participation at the '**Future Sensor Web and Its Applications Workshop' held at Ispra, Italy in January 2010***. The Institute for Environment and Sustainability (IES) of the JRC and the European Environment Agency (EEA) jointly organized a workshop on "The Future Sensor Web and its Applications" on 28-29 Jan'10 in Ispra, Italy. The purpose of the meeting was to review the current state of the art in Sensor Web technologies and develop a platform with the research community and industrial partners for future projects addressing the issues identified. This workshop is one of a series of actions designed to enable the 'Digital Earth' vision. Because the information on the state of the environment is often too static or updated too slowly, the plan is to make this information more dynamic by exploiting the web-enablement of the many sensors monitoring the environment (e.g. on air and water quality, noise, etc.), an approach known as 'crowd sourcing'. One way to achieve this and contribute to the Digital Earth vision is to further involve citizens in environmental monitoring. They can provide information on the state of the environment they live in, by actively monitoring it and uploading this information via the World Wide Web and Web 2.0 social network application2.
- *The participation at the '**2nd FI PPP usage area workshop 2010' held in Brussels, Belgium in June 2010***. This workshop built on the conclusions of the 1st FI-PPP Usage Area Workshop, held in March 2010 and enabled a broader discussion on the needs of the Usage areas and their requirements on the Future Internet. The workshop addressed the need to achieve an appropriate balance in the Future Internet Public-Private Partnership between provider "technology push" and user "application pull". Members of the ENVIROFI consortium contributed in form of two position papers [06 - Berre & Bodsberg] and [07 - Schade]3 and participated in the discussions.
- *The organization of and participation in the '**1st Environmental Information Systems and Services Infrastructures and Platforms (ENVIP) workshop' held in Bonn, Germany in October 2010***. This workshop aimed to tackle the research problems as well as practical experiences around frameworks, methods, concepts, models, languages and technologies that enable enhanced environmental service infrastructures and platforms. Environmental Information Systems are migrating towards being provided as Software as a Service (SaaS) and will benefit from the utilization and specialization of emerging Infrastructures as a Service (IaaS) and Platforms as a Service (PaaS) as this is emerging under the umbrellas of Cloud and Grid computing as well as the evolution of the Future Internet4. It was the first workshops of a planned series, which will be continued later this year (2011), see also section 4.3.

[2] Additional information is available from: http://inspire-forum.jrc.ec.europa.eu/pg/groups/9265/the-future-sensor-web/.

[3] Additional information is available from: http://initiative.future-internet.eu/events/2nd-usage-area-workshop.html.

[4] Additional information is available from: http://ifgi.uni-muenster.de/~pajoma/persistent/ENVIP10/ and http://www.envip.eu/.

## 4.2 Completed ENVIROFI Consultation Activities

This section provides an overview of each type of consultation activities, which has already been carried out prior to the project kick-off and during the first months of the ENVIROFI execution. The analysis of existing work primarily took place during the first four months of the project (as Task T6.1) and will now be carried on as a technology watch within the scope of Task T6.3.

### 4.2.1 Analysis of Existing Work

Existing work has been extensively analyzed in terms of technical dimensions in WP6 (task T6,1), see especially deliverables D6.1.1 [03 - ENVIROFI Consortium] and D6.1.2 [02 - ENVIROFI Consortium]. This analysis focused on available technical components for implementing environmental enablers for the FI and on the basic architectural elements for information infrastructures within the Environmental Usage Area.

The thematic WPs (WP1, WP2 and WP3) complement the analysis mentioned above by outlining the state of play in their initial deliverables (D1.1 [08 - ENVIROFI Consortium], D2.1 [09 - ENVIROFI Consortium] and D3.1 [10 - ENVIROFI Consortium] respectively). Pointers to existing work on terrestrial biodiversity, atmospheric conditions and marine assets has been provided in order to relate the ENVIROFI scenarios and use cases to wider efforts within the related user communities.

### 4.2.2 Interviews

The project dissemination (as reported on in the context of WP7) provides a first action on stakeholder engagements. In addition, first immediate user feedback was retrieved in group discussions and individual takes that followed the various presentations of the ENVIROFI project aims and our first results. The visited major workshops and conferences of the ENVIROFI stakeholder communities included the following:

- at EGU, the Future Internet Public-Private-Partnership programme was presented to European Geosciences Community, with invitation to actively participate in FI-PPP work. No formal interviews were conducted. The informal discussion with EGU participants revealed the great interest for the FI-PPP programme, as well as for the main topics of ENVIROFI: use of Volunteered Geographic Information in “professional” applications and the Sensor web Enablement standardization. Nevertheless, the level of understanding of the FI-PPP Programme is very low, indicating the need for further education of the EGU community. The critical issues the participants spontaneously mentioned as something they would like to see solved by FI-PPP above all involved the reliability of the underlying internet infrastructures followed by standardization of the Internet of Things service interfaces and data models.
- at the 2011 ISESS conference (the International Symposium on Environmental Software Systems) members of the ENVIROFI consortium submitted a paper, "Environmental Information Systems on the Internet - A need for change" which, as a co-writer, was presented to the conference by the ENVIROFI Work Package 2 leader. The presentation covered both the ENVIROFI project, and the content of the paper itself. It was presented to a wide representation of interests and was warmly received. The paper won first prize in the category "eEnvironment and Cross-border Services in Digital Agenda for Europe". As far as dissemination goes, the paper and the presentation served the project well in providing a good overview of our aims and ambitions to a broad spectrum of industry and research professionals, and highlighted parallels between the Personal Environmental Information System concepts (PEIS) with existing projects already in development.

On top of this, we attended and participated at a series of activities on standardization and interoperability initiatives. For several years, all ENVIROFI partners working in the technological domain have been actively involved in standardization activities at the Open Geospatial Consortium (OGC) which is the major industry-driven standardization body of geospatial information model and services. In addition, OGC has a close to link to the ISO TC211 standardization bodies. AIT, ATOS, Fraunhofer IOSB and JRC started their OGC work in the course of the FP7 ORCHESTRA and SANY projects aiming at providing input to the OGC architectural discussions, e.g. use of the ISO RM-ODP viewpoint approach, inclusion of sensors and models, best-practices examples of how to use the OGC Sensor

Web Enablement standards. This work culminated in getting the Reference Model for the ORCHESTRA Architecture (RM-OA) accepted as OGC best-practices paper [19 - Usländer] and the Specification of the Sensor Service Architecture (SensorSA) accepted as OGC discussion paper [20 - Usländer]. As a consequence, the ENVIROFI partners have been involved in further OGC architectural working group discussion, e.g. Thomas Usländer of Fraunhofer IOSB acted as co-chair of the "services" sub-group of the OGC Architecture working group in 2008-2009. Discussions about the "Future Internet", especially generic enablers, and the consequences for the OGC architectural framework are inherently relevant for OGC as OGC is seeking to adapt their standards quite rapidly to new technologies in order to maintain market acceptance.

Currently, OGC is relying upon standard Internet communication and middleware technology (e.g. TCP/IP, http, SOAP-based Web services, RESTful Web Services) as "generic enablers", enhanced by technologies from OASIS on access control and identity management (e.g. (Geo)XACML, SAML). In the speak of FI-PPP, all their services on top of this platform may be considered "specific enablers" for the geospatial domain with a focus on the environmental, remote sensing, transport and risk and crisis management usage areas. Whenever possible, OGC tries to extract common models and functions into common standards to be re-used by domain-specific standards. Here, on the one hand, the discussion with the future FI-WARE generic enablers will come on the scene as candidates of a future core platform for OGC standards. On the other hand, existing and emerging OGC standards are first class candidates for FI-PPP specific enablers. The ENVIROFI partners are perfectly positioned to lead and facilitate this discussion between OGC and the FI-WARE partners. Further interest of OGC may be the ENVIROFI methodology used to analyze user requirements based upon (geospatial) standards. Having this in mind, ENVIROFI has proposed the OGC Chief Architect as a member of the FI-PPP advisory board. Possibilities to carry out this discussion are the OGC technical committee meetings that are taking place all 3 months. A first start could be made at the OGC TC in Brussels (Nov 28 – Dec 1, 2011).

A third degree of expenditure has been reached by involving also the networks of partner organizations and presenting the project to organizations, such as a presentation given to Stefan Jensen, Head of Group, Information Services, at European Environmental Agency (EEA), who joined to ENVIROFI AB.

### 4.2.3 Surveys

The individual ENVIROFI project partners clearly cover parts of the stakeholder communities. In the first six month of the project, we carried out the preliminary survey among the directly involved divisions (see also section 3). An analysis of the results is provided below (section 5).

### 4.2.4 Reviews

Reviews of project material by ENVIROFI-external experts have not been carried out within this project so far.

### 4.2.5 Open Group Discussions

"Future Internet: Opportunities and Challenges for the Geo-sciences community" EGU town hall meeting on was co-organized by AIT and CNR and in the last moment merged with INSPIRE town hall session in order to avoid overlap in schedule and splitting of the community. The audience primarily consisted of EGU scientists from the Earth & Space Science Informatics (ESSI), which is people with expertise in the application of information science and technologies, including geospatial informatics, to the Earth Science and environmental domains. The discussion revealed the great interest this community for the FI-PPP programme, as well as for some of the main topics of ENVIROFI: use of Volunteered Geographic Information in "professional" applications and the Sensor Web Enablement standardization. Town hall session attendees pointed out both synergies and discrepancies between on-going works at Sensor Web Enablement, development of INSPIRE implementing rules, and the goals of the FI-PPP:

- Environmental Informatics, represented by ENVIROFI and INSPIRE team members and the Geoinformatics feature similar and overlapping use cases, and largely build upon the open standards of the Open Geospatial Consortium.

- So far, the INSPIRE implementation rules mostly postulated the use of OGC Web Map Service and Web Feature Service for serving of the information. However, the JRC representatives confirmed that the Observation and Measurement standard is already considered in the context of Annex II & III data specifications. Accordingly, OGC Sensor Web Enablement (SWE) specifications are considered for upcoming Implementing Rules on INSPIRE services regarding Annex II & III data. Both are in-line with the ideas of the ENVIROFI team.
- A non-negligible portion of the EGU town hall participants use OGC Web Coverage Service (WCS) in addition to, or in place of SWE services – contrary to INSPIRE, where WCS currently is not considered essential part of the architecture. While ENVIROFI considers the SWE as the foundation for observation access, WCS and other access/download services adopted by specific Communities-of-Practice are supported (e.g. through mediation services) according to the multi-style approach.
- The critical issues the participants would like to see solved by FI-PPP above all involve the reliability of the underlying internet infrastructures, followed by standardization of the Internet of Things service interfaces and data models.

### 4.2.6 Joint Paper Writing

EnviroInfo 2011 conference is the most important event for ENVIROFI dissemination and community consultations this year. In addition to representing the most important enviromatics conference in Europe, EnviroInfo has also been chosen as the place where ENVIROFI will organize its first official community consultations.

The most important task at this stage is the establishment of the requirements on, and subsequently the initial specifications of, the generic and specific FI enablers. In order to both improve our own understanding of the FI-Ware project plan and ideas, and improve our presentation of the FI-PPP programme for the ENVIROFI stakeholders, the ENVIROFI team invited the Juanjo Hierro (technical manager of the FI-PPP core platform project FI-Ware) to co-author a “Leveraging the Future Internet for the Environmental Usage Area” paper for this conference.

## 4.3 Ongoing and Planned ENVIROFI Consultation Activities

Whereas the above mentioned activities have been carried out already, we are currently in the process to address more stakeholders and to establish closer relationships.

### 4.3.1 Analysis of Existing Work

As the ICT sector and environmental informatics are topic to rapid and constant technological changes, it was decided to continue the analysis of existing technology components and of possible stakeholders for the Environmental Usage Area of the FI. These activities will be taken over by Task T6.3, as part of the preparation of a Digital Living Lab for the Environmental Usage Area. For the moment, this will include maintenance and extension of the wiki entries in respect to potential stakeholders and technology components (see also [02 - ENVIROFI Consortium]). Updates of the analyses presented in Deliverable D6.2.1 [01 - ENVIROFI Consortium] will be reported on in form of annexes to T6.3 deliverables.

### 4.3.2 Interviews

In order to better exploit the consortium members' internal and external networks of experts we plan to expand the FI related interviews. This should include expert meetings with distinct units of EC-JRC, such as Global Environmental Monitoring (GEM) Unit (in the filed of biodiversity), but also individual interviews with externals, as for example with designated experts on air quality monitoring and citizen science of the EEA. Required first contacts have already been established.

### 4.3.3 Surveys

In addition, the individual ENVIROFI project partners clearly cover parts of the stakeholder communities, too. In the first six month of the project, we started a preliminary survey among the directly involved divisions (see also the questionnaire in section 4.3.5). In addition, we began to expand these to those divisions of ENVIROFI partner organizations, which are not directly involved in the project itself. These may include:

- within EC-JRC the above mentioned GEM unit;
- within CNR the GIIDA Thematic Working Groups: GIIDA (Integrated and Interoperable Management of Environmental Data) is a CNR Programme coordinated by the Department of Earth and Environment aiming to design and develop a multidisciplinary e-infrastructure for the discovery, access, processing and publishing of CNR Earth and Environmental resources. It includes six thematic groups (Biodiversity and Ecosystems; Atmosphere and Climate Change; Air quality; Soil/water quality; Risks; Sea and Marine Resources)

### 4.3.4 Reviews

Considering the collaboration with the Advisory Board, we will use the 1st Advisory Board meeting in October 2011 to ask for reviewers for particular project deliverables (or parts of them). Candidates include:

- D1.2.1 Use Case Requirements Report I: in order to retrieve inputs for D1.2.2.
- D2.2.1 Use Case Requirements Report I: in order to retrieve inputs for D2.2.2.
- D3.2.1 Use Case Requirements Report I: in order to retrieve inputs for D3.2.2.
- D4.1.2 Environmental Requirements II
- D4.2 Environmental Architecture
- D4.3 Definition of Environmental Enablers
- D5.1.2 ENVIROFI component requirements II

- D5.2 Initial specification of the Specific Enablers for Environmental Domain
- D5.3 ENVIROFI data and meta-information specifications
- D7.1.2 Exploitation Plan II, only the socio-economic analysis.
- D7.1.2 Exploitation Plan III, only the socio-economic analysis.

A table that summarizes the final decisions, together with identified reviewers from the ENVIROFI AB will be provided as part of the meeting report (by end of October 2011).

### 4.3.5 Open Group Discussions

Mature group discussions are scheduled for early October 2011, these include:

- The organization of a major conference in the Environmental ICT sector (the EnviroInfo Conference 2011), held in Ispra, Italy in October 2011.
- The organization of the co-located 2nd Environmental Information Systems and Services Infrastructures and Platforms (ENVIP) workshop' held in Ispra, Italy in October 2011.
- The organization of the first consultation meeting with the Advisory Board, together with the two events mentioned above in Ispra, Italy in October 2011.

In order to initiate stakeholder engagement, we are asking the following questions (before any official introduction to the topic):

1. What comes to you mind if you hear 'Future Internet'? What do you expect?
2. Is one or more of the following evolving technologies on the Web important for you daily work with ICT for environment: collaborative tools, video, sensors, large data volumes, and mobile devices? If yes, please explain (briefly) why; ideally including a scenario descriptions (see also box below), such as 'each day, I use my mobile phone to upload pictures of birds with an associated location to birdlife'.
3. In addition to the five technologies mentioned above, which other upcoming development(s) do you expect relevant for your future work on ICT for environment? Please explain briefly why; ideally again including a scenario description (see also box below).

to:

- Each partner organization in ENVIROFI,
- Possible other departments of the organizations involve in ENVIROFI, e.g. the marine sector of SINTEF or the GEM unit of JRC,
- The participants of the ENVIP workshop (prior to the meeting listed above, in order to collect material for the discussion session), and
- The ENVIRFI Advisory Board (prior to the meetings listed above, in order to collect material for the discussion), together with two more detailed questions:
  - Which user requirements do you consider most important for the Environmental Usage Area of the Future Internet? You may solely rank the requirements proposed by the ENVIROFI consortium, but it would be appreciated if you add others (together with a brief description/argumentation).
  - Which (system) components do you consider most important for the Environmental Usage Area of the Future Internet? You may solely rank the components proposed by the ENVIROFI consortium, but it would be appreciated if you add others (together with a brief description/argumentation).

*Scenarios*. While the above mentioned techniques describe ways of stakeholder interaction, *scenarios* are a valuable means for providing context to the elicitation of user requirements. They are typically used to analyze the operation of the system in its intended environment in order and to identify requirements that may not have been formally specified by any of the stakeholders. They provide a framework for questions about user tasks by permitting "what if" and "how is this done" questions to be asked. The most common type of scenario is the use case. In ENVIROFI a detailed template for the elicitation of User Requirement from the ENVIROFI use-cases, was defined as a preparation for WP4 activities, and a tool has been setup to create and edit use-cases (see below). The results are the basis for the collection of User Requirements in the present Sketch of Architecture [03 - ENVIROFI Consortium].

### 4.3.6 Joint Paper Writing

With the October meetings, we will also initiate the AB collaboratively work on a white paper to be submitted to a journal in the ICT for environment sector.

# 5 Summary of Consultation Results

Apart from initiating the actual ENVIROFI proposal, the 'Future Sensor Web and Its Applications' workshop resulted in a high level classification of research fields for the Sensor Web (or better for the Observation Web, as not only physical sensing devices are involved), those can be summarized as follows (see also [11 - Schade & Craglia] and Figure 4):

1. Specifics of basic components: Covers issues of sensor power supply and network coverage for classical physical sensors, the encapsulation of models as services, as well as VGI.
2. Interoperability in a heterogeneous environment: Deals with resource discovery, processing support, service interfacing, generic client development, intermodal operation between heterogeneous types of sensors, as well as reporting of observations and measurements.
3. Event based architecture beyond the Sensor Web: Considers leveraging asynchronous communication even beyond the web of various sensors. In order to enable situation awareness, rules for triggering user-specific notifications have to be equally considered than in-stream processing and process distribution.
4. Fusion of observations with uncertainty analysis: Involves uncertainty, reliability, trust, combining sensors and models, but also the economic value of information from source to consumer. Security mechanisms, brokering, and error-propagation are some of the required tools.
5. Automation of the added value chain: Considers sensor plug-and-play, loosely-coupled and dynamically generated workflows, streaming, and processing standards.
6. Projection of general IT solutions: Includes the projection of digital rights management and access control, mapping user requirements to architectural solutions, user experience and user feedback, as well as augmentation with semantic technologies, such as Linked Data [12 - Bizer, Heath & Berners-Lee].
7. Business models and socio-economic assessment: Addresses the development of appropriate business models for the adoption, deployment, and maintenance of observation webs. These need to be assessed in the light of society and policy making.

For all of the above, compliancy with the relevant European and global programmes/initiatives (e.g. GEO/GEOSS, INSPIRE/SEIS, GMES) and standardization activities (e.g. ISO, OGC, CEN) is strongly desired.

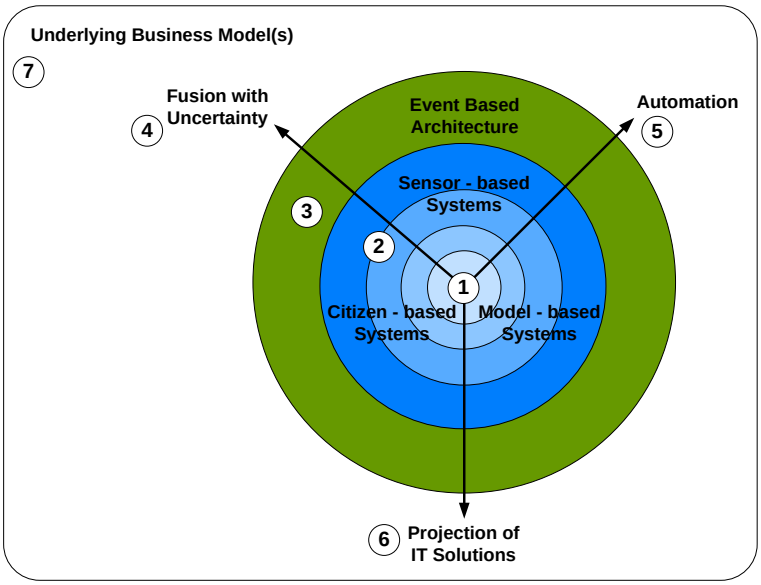


**Figure 4.** Theoretical challenges in Observation Web research [11 - Schade & Craglia]

The technology triangle (sensors-citizen-simulations) has even been carried over into the FI-PPP usage area report, as a general umbrella [13 - Lemke].

Addressing these items in ENVIROFI let us identify a first set of enablers related to the three ENVIROFI thematic areas (see also [14 - ENVIROFI Paper] and D4.1.1 [15 - ENVIROFI Consortium]):

1. Provision of objective, semi-objective and subjective observations by end users.
   - For the biodiversity scenario this shall primarily be generated by user via mobile devices, but observations may also be provided via a web interface.
   - In the air scenario, this shall include data from sensors as well as semi-structured information from individuals such as: "the lake in front of my house is freezing", "I'm sneezing, the pollen concentration must be very high", "it's very cold", or "my eyes are itching".
   - Marine data provision shall be foremost from sensors but supplemented with semi-structured information such as Geo-referenced photos of oil spills, pollution events, weather warnings or subjective water quality assessments.
2. Integration of third-party databases with environmental observations.
   - For the biodiversity scenario this includes both species occurrence observations from other sources as well as data from other domains (for biodiversity modeling it is necessary to include other media such as soil substrate). It requires semantic mechanisms for harmonization due to inconsistencies between local species lists.
   - In the air scenario, the main challenge shall be the integration of air quality data, pollen data and meteorological data as well as subjective information.
   - Marine sensor data on water quality, sea state and weather conditions from a wide variety of sources must be integrated and merged with data stemming from models as well as data from laboratory analysis.
3. Handling of observations with very different uncertainty levels.
   - Biodiversity observations contributed by general users have higher uncertainty levels that the information contributed by experienced scientists. Semantic plausibility checking of biodiversity observations shall provide a second measure of uncertainty. In addition, the uncertainty associated with user-provided observations may be moderated according to users "credibility" as well as crowd-sourcing mechanisms.

- In the air scenario, the sensor information contributed by users has higher uncertainty that the information from quality-assured sources. In addition, the uncertainty associated with user-provided observations may be moderated according to users "credibility".
- Accuracy in marine observations is usually related to the cost of the sensor platform and the requirements of the sensor owners. The broad range of marine Stakeholders have a range of differing needs however the integration of more uncertain sensor systems can be useful in providing a more extensive spatial coverage for the network if the reliability of the sensor nodes can be quantified and assessed on an ongoing basis.

4. Reliable "single sign on" services.
   - For the biodiversity scenario services have to allow for data provision in different levels of accuracy depending on the user. In biodiversity science it is common to provide exact locations of highly protected species only to qualified individuals, for the general public the location is changed and the spatial accuracy is reduced accordingly.
   - The air scenario requires services that permit clean separation of the user's private data (e.g. name, address) form the information solicited to the application.
   - In the marine scenario, a hierarchical system of access is required so that each stakeholder can view information that is most relevant to them in a fast and unfussy way. Some sort of ENVIROFI “passport” to allow users reach the information they require or allow them to update information to the system without cumbersome logons and passwords bearing in mind many of the stakeholders shall be on small mobile devices on the water.
5. Alerting services.
   - The biodiversity scenario requires location aware services providing information on which interesting species are known to be in the user’s vicinity. It could also be a warning that dangerous species such as wolves or bears have entered the area.
   - In the air scenario, these should allow the definition and transmission of application-specific alerts.
   - For the marine cane, accurate location based real-time information on oceanic conditions relevant to the marine leisure sector, early warning forecast for aquaculture industries as well as oil spill alerts and sea state and weather conditions for the Ocean Energy industry.
6. Distributed authorization systems, allowing e.g. the environmental agency to issue digital certificates or smart cards indicating higher level of trust for certain users.
7. Mechanisms allowing the use of such smart cards in conjunction with the smart phones, e.g. near-field communication equipped smart phones.

Such and similar ENVIROFI environmental enablers aim to provide the data access and knowledge management infrastructure of the FI environmental service space. They federate existing (open standard based) technologies, such as Sensor Web Enablement (SWE); as well as according architectural styles, small-scale pilots and trials. The addressed components involve various kinds of things, services, content, and people during their lifecycle (Figure 5). The sensing of living and no-living things of our environment; results of environmental simulations/models and other already available content in a variety of forms; as well as people-contributed observations provide input to value-added processing based on the Future Internet Platform. ENVIROFI will serve the required components to discover, access and process information related to the environment. The ENVIROFI functionalities are offered in such a way that a broad range of different users can benefit from them. The examples on the top of the figure provide a first inside.

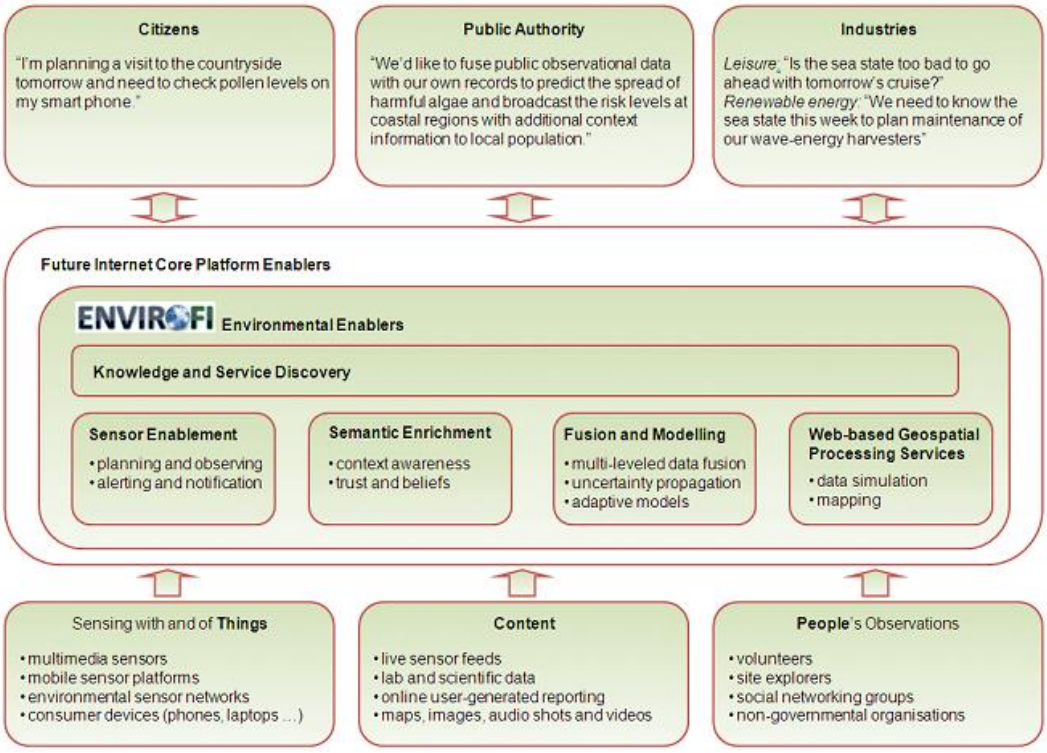


**Figure 5.** ENVIROFI and collaborating stakeholder groups in the Future Internet [14 - ENVIROFI Paper]

These enablers could be mapped to components which have been identified in a recent activity of the European Committee for Standardisation (CEN), Technical Committee (TC) 287 for building a reference model for spatial data infrastructures (SDI) [16 - CEN], see also Figure 6. Notably, the Service Centric View could be applied to any service-oriented system. Only the Data Centric View contains instantiations, which are specific for the geospatial and environmental domains. Likewise, GeoPortals are a specific type of geospatial applications.

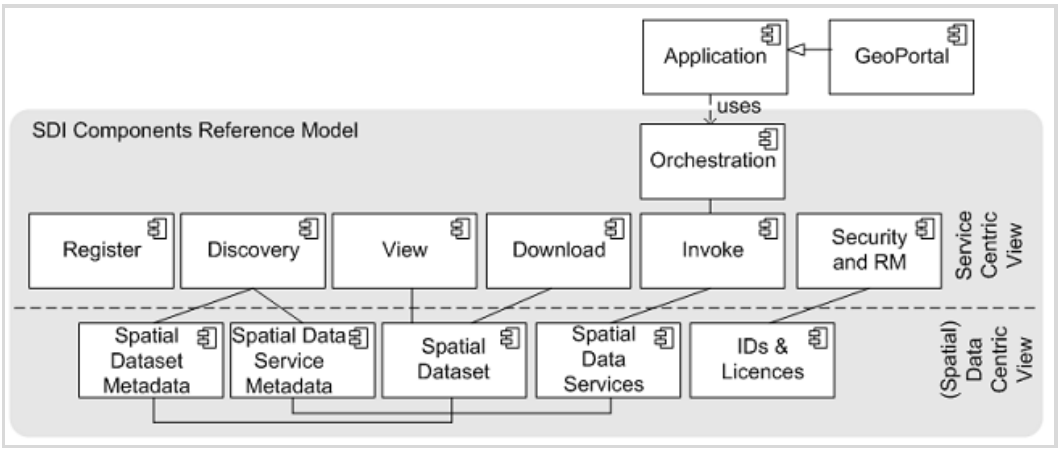


**Figure 6.** Core Components of the SDI Reference Model ([16 - CEN], modified; see also [17 - Berre, Usländer & Schade])

The primary organizing structure is determined by the following generic core life-cycle components (corresponding to the service centric view in the figure above):

- Register: for describing and publishing resources.

- Discovery: for searching for and discovery of resources.
- View: for visualizing of resources.
- Download: for downloading and exchanging resources.
- Invoke: for interacting with resources.
- Orchestration and Composition: for providing aggregated resources including in particular workflows for service composition.
- Security and Rights Management: for managing access rights to resources.

Statements that realistically, such a system (of systems) can only be implemented using a Multi-Style Service Oriented Architecture (SOA) approach [03 - ENVIROFI Consortium, 18] have received positive feedback. In future we will investigate the possibilities to harmonize existing and emerging service meta-models and ontologies of OMG (SoaML) or OASIS (SOA reference models) with ISO/OGC (ISO19119,OGC07-097RM-OA) with the objective of conceptualizing a so-called multi-style SOA; that is a SOA that supports multiple architectural styles and communication patterns such as request/reply messaging, event-driven interactions and resource-oriented services (commonly known as RESTful Web services) following a unified service meta-model (Figure 7). Feedback to the geospatial community, mainly to ISO TC211 and to OGC, has to be included. First actions have been taken and are reported on as ENVIROFI deliverable D6.1.1 [03 - ENVIROFI Consortium]. D6.1.2 [01 - ENVIROFI Consortium] complements this with a technical viewpoint, i.e. by reporting on available technical solutions and with the relations to involved stakeholders.

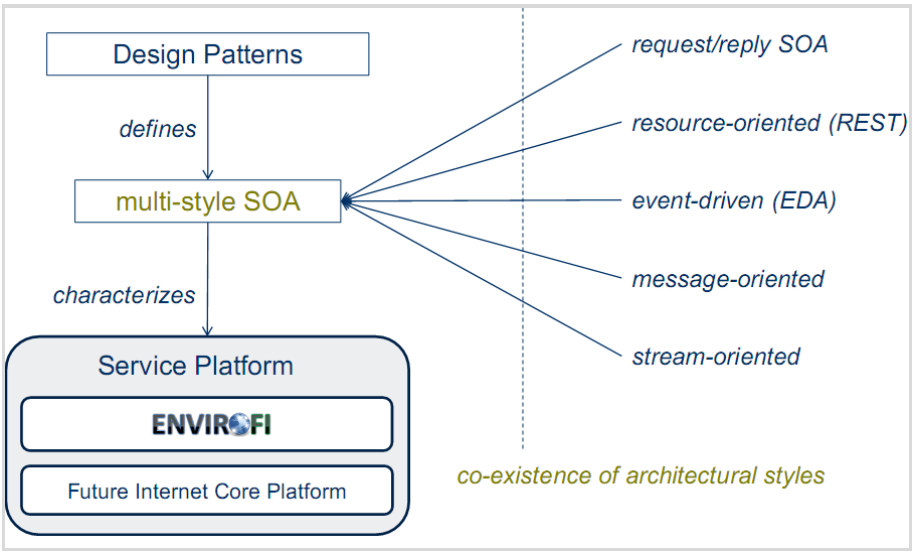


**Figure 7.** Multi-Style SOA overview (see also [03 - ENVIROFI Consortium])

Opposed to the above mentioned efforts, which start to abstract from particular environmental and geospatial applications to wider audiences, we also began to address FI related issues within the environmental informatics community. So far, we initiated the above mentioned survey (Section 4.3.5) project internally. The results will be delivered together with the outcomes of the first stakeholder consultation and advisory board meeting via the ENVIROFI project web page in October 2011, and as annex to D6.2.2 'Report on Community Consultation II', which is scheduled for month 14 of the project (May 2012). From a number of informal conversations with multiple experts, we expect Environmental Usage Area requirements, such as cloud computing for heavy image processing and expensive environmental simulations, licensing of data set and models, cyber-infrastructures for environmental scientists

# 6 Conclusions and Outlook

Summarizing the above, many inputs have already been collected prior to the official project start and within the first six month of the ENVIROFI project. Latter activities were to a major part carried out within the project consortium. In the next project phase, it will be time to retrieve feedback and additional inputs on ENVIROFI Use Cases and FI requirements from the ENVIROFI stakeholder communities.

The implementation of these steps has been prepared. The ENVIROFI Advisory Board has been shaped and invited to a first consultation workshop. Means for discussing with the wider stakeholder community, in this case participants of the ENVIP 2011 workshop have been established. As the 25th EnviroInfo conference provides a unique opportunity, we decided to postpone the delivery of consultation results. In parallel, we will contact the stakeholder networks of the ENVIROFI consortium members in order to retrieve additional inputs.

The complete set of results will be published as soon as possible and will be made available as annexes to deliverable D6.2.2 (in May 2012). That deliverable will also include the activities relating to the second ENVIROFI user consultation workshop, which should address environmental and generic enablers for the FI and will take place in March or April 2012. A good candidate event for co-locating this meeting would be EGU 2012 (April 22-27) in Vienna, Austria. Updates on the consultation strategy will be included in deliverable D6.2.2 if required.

An overview of conducted and planned activities is given in the figure below. The listed items are complemented by the reviews of project deliverables (at due time) by AB members. In addition to the above, we will continue our activities on stakeholder engagement in various standardization bodies (OGC, ISO, CEN, etc.), as well as at expert meetings, workshops and conferences.

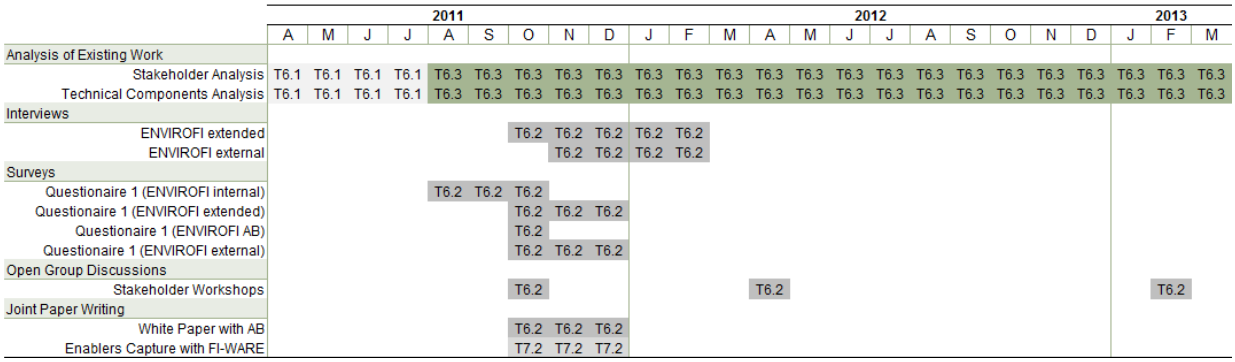


**Figure 8.** Overview of ENVIROFI activities on stakeholder engagement (including associated ENVIROFI Task numbers)

Potentially required infrastructural means for input collection and maintenance are topic to task T6.3. In that context, deliverable 6.3.1 provides first insides.

## References


| | References |
|---|---|
| 01 | ENVIROFI Consortium, 2011. “D6.1.2 – ENVIROFI Stakeholder Communities Description and Technology Review” |
| 02 | ENVIROFI Consortium, 2011. “ENVIROFI Project Wiki Site“. Available at: http://wiki.envirofi.eu/ |
| 03 | ENVIROFI Consortium, 2011. “D6.1.1 – Sketch of the ENVIROFI Architecture” |
| 04 | ENVIROFI Consortium, 2011. “D6.3.1 – ENVIROFI Digital Living Lab I “ |
| 05 | ENVIROFI Consortium, 2011. “D7.2.1 – Dissemination Plan & Report I“ |
| 06 | A.J. Berre and N.R. Bodsberg ,2010. “Future Internet Infrastructure for Environmental Services, Sensors and Content Use cases“. Position paper for 2nd Usage Area Workshop: Future Internet Initiative. |
| 07 | S. Schade (Ed.), 2010. “The Future Internet PPP and its Usage Areas: A Sensor Web for the Environment in Europe“. Position paper for 2nd Usage Area Workshop: Future Internet Initiative. |
| 08 | ENVIROFI Consortium, 2011. “D1.1 – Scenario Description and Use Cases Specification“ |
| 09 | ENVIROFI Consortium, 2011. “D2.1 – Scenario Description and Use Cases Specification “ |
| 10 | ENVIROFI Consortium, 2011. “D3.1 – Scenario Description and Use Cases Specification “ |
| 11 | S. Schade and M. Craglia, 2010. “A Future Sensor Web for the Environment in Europe“. EnviroInfo2010, Cologne/Bonn, Germany. |
| 12 | C. Bizer, T. Heath and T. Berners-Lee, 2009. “Linked Data – The Story So Far“. International Journal on Semantic Web and Information Systems, 5 (3), 1–22. |
| 13 | M. Lemke (Ed.), 2010 “Towards a Future Internet Public-Private Partnership: Second Usage Area Workshop“. Workshop Report. |
| 14 | ENVIROFI Paper. D. Havlik, S. Schade, Z. Sabeur, P. Mazzetti, K. Watson, A. Berre, J. Mon, 2011. “From Sensor to Observation Web with Environmental Enablers in the Future Internet“. Sensors, 11, 3874-3907. |
| 15 | ENVIROFI Consortium, 2011. “D4.1.1 – Environmental Requirements I“ |
| 16 | European Committee for Standardization (CEN), 2011. “TR15449 Geographic information — Spatial data infrastructures — Part 1: Reference model“. Technical Report. |
| 17 | A. Berre, T. Usländer, and S. Schade, 2011. “Identification and Specification of Generic and Specific Enablers of the Future Internet - Illustrated by the Geospatial and Environmental Domain “. Service Wave, Poznan, Poland. |
| 18 | ENVIROFI Paper. S. Schade, P. Mazzetti, Z. Sabeur, D. Havlik, T. Usländer, A. Berre, and J. Mon, 2011. “Towards a Multi-Style Service-Oriented Architecture for Earth Observations“. EGU General Assembly 2011, Vienna, Austria. |
| 19 | Usländer, T. (ed.). Reference Model for the ORCHESTRA Architecture Version 2. OGC Best Practices Document 07-097. http://portal.opengeospatial.org/files/?artifact_id=23286 |
| 20 | Usländer, T. (ed.). “Specification of the Sensor Service Architecture, Version 3.0 (Rev. 3.1)”. OGC Discussion Paper 09-132r1. Deliverable D2.3.4 of the European Integrated Project SANY, FP6-IST-033564, 2009: http://portal.opengeospatial.org/files/?artifact_id=35888 |


**Table 3.** References

## Annex A – ENVIROFI Advisory Board

The table below shows the list of members selected according to the above described criteria (in random order):

| # | Name | Institution | Position / Role |
|---|---|---|---|
| 1 | Hugo de Groof | EC-DG Environment | Chief scientist of EC-DG Environment, Research & Innovation Unit |
| 2 | Geir Endregard *(t.b.c.)* | NAAF | CEO of Norwegian Asthma and Allergi Forbund (NAAF) |
| 3 | Vidar Hepsø | Statoil ASA | Principal Researcher TPD RD NEH HSE and Water management |
| 4 | Stefan Jensen | EEA | Head of Group, Information Services, at European Environmental Agency (EEA) |
| 5 | Simon Jirka | 52north | Senior Developer of 52north |
| 6 | Éamonn Ó Tuama | GBIF | Senior Programme Officer, Inventory, Discovery, Access (IDA), Global Biodiversity Information Facility (GBIF) Secretariat |
| 7 | Olaf Østensen | ISO/TC211 | Chair of ISO/TC211 |
| 8 | George Percivall | OGC | OGC's Chief Architect |
| 9 | Clemens Portele | interactive instruments GmbH | CEO of interactive instruments GmbH |
| 10 | Ingo Simonis | iGSI GmbH | CEO of International Geospatial Services Institute GmbH (iGSI) |
| 11 | Jos Anneveld | AeroVision B.V. | Partner at AeroVision B.V. |

**Table 4.** ENVIROFI Advisory Board - Status of August 15, 2011

# Annex B – Details about the First ENVIROFI Consultation Workshop

## Objectives

This is the first Advisory Board Meeting for the ENVIROFI project.

The main topics of the event will be:

- Introducing the project and its consortium.
- Introduction of the ENVIROFI Advisory Board (AB).
- Discussing about the relation between the Future Internet (FI) and the Environmental Usage Area.
- Providing feedback to the first outcomes of the ENVIROFI project, i.e. project use cases and FI requirements.
- Extending and ranking a list of proposed FI requirements from the Environmental Usage Area.
- Informing about further actions and activities.

## Overall structure

| **06/10/2011** | | |
|---|---|---|
| 09:00 – 10:30 | possibility to attend the EnviroInfo 2011 keynotes | all, together with EnviroInfo participants |
| Coffee Break | | |
| 11:00 – 12:45 | attending the ENVIROFI session of the ENVIP workshop at the EnviroInfo conference | all, together with ENVIP participants |
| Lunch Break | | |
| 13:45 – 15:45 | closed meeting between ENVIROFI representatives and AB members | all |
| Coffee Break | | |

**Table 5.** Overall structure of the agenda

## Detailed planning

| | 06/10/2011 |
|---|---|
| 09:00<br>10:30 | SEIS and Eye On Earth - extending our minds on environmental information<br>*(Prof. Jacqueline McGlade) – 45 min*<br><br>Creating and Sharing Environmental Information with Collaborative Web Technologies<br>*(Prof. Arno Scharl) – 45 min* |
| | Coffee Break |
| 11:00<br>12:45 | Leveraging the FI - PPP for the Environmental Usage Area<br>*(Denis Havlik) - 35 min*<br><br>Presentation of survey results and the relation to the ENVIP portal/wiki<br>*(Sven Schade) - 20 min*<br><br>Open discussion with all participants<br>*(Denis Havlik.) - 45 min*<br><br>Wrap-Up<br>*(Sven Schade) – 5min* |
| | Lunch Break |
| 13:45<br>15:45 | Tour de table<br>*(all) - 10 min*<br><br>Presentation on the role of the AB and expected inputs<br>*(presentation by ENVIROFI partners) - 15 min*<br><br>Feedback and add-ons to the ENVIROFI session<br>*(all) - 10 min*<br><br>Discussions on the later questions in the survey<br>*(analysis and presentation by ENVIROFI partners) - 30 min*<br><br>Open discussion on FI Requirements with the AB<br>*(all) - 40 min*<br><br>Wrap-up and definition of next steps<br>*(Sven Schade) - 15 min* |
| | Coffee Break |

**Table 6.** Draft Agenda for the First ENVIROFI Consultation Workshop