

SEVENTH FRAMEWORK PROGRAMME

ICT PPP

Future Internet

ENVIROFI

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

FP7-284898

Collaborative project

Frequently Asked Questions

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1 About this Document

1.1 What is it about?

This document explains the vision, the objectives and the planned activities of European research project ENVIROFI. In order to keep the presentation clear and concise, the content is presented in the format of Frequently Asked Questions (FAQs).

1.2 Who should read it?

This document is aimed at stakeholders from the environmental usage area and the Future Internet area, including:

- Members of environmental observation communities, in particular:
 - EGU
 - Euro-SIF
 - GEO/GEOSS AIP
 - G-OWS
 - GIIDA
 - INSPIRE
 - GMES
 - ISO TC/211
 - OGC
 - CEN TC287
 - SEIS
 - GBIF
 - DOPA.
- Providers of experimental infrastructures and data owners relevant to ENVIROFI research areas.
- Members of the European Future Internet research community, especially the core platform project **FI-WARE**, the Support Action projects **CONCORD** and **INFINITY**, and the **use case projects** in the FI-PPP.

2 The Project

2.1 What is ENVIROFI?

ENVIROFI is a co-funded research project within the Future Internet Public Private Partnership (FI-PPP) programme of the EU's Seventh Framework Programme (FP7). The project is dedicated to the environmental usage area of the Future Internet. It will explore environmental enablers and provide environmental sector requirements to FI-WARE, the FI-PPP core platform project. Thus, ENVIROFI will lay the foundation for an environmental observation web.

The project has a duration of 24 months; it started on 1 April 2011 and ends on 31 March 2013.

2.2 What is the vision driving ENVIROFI?

ENVIROFI's vision is to establish an Environmental Observation Web in which all environmental data, whether from sensors, citizens, or models, are available anytime anywhere through the Internet in a standardised, usable format.

We envisage a system with dynamic understanding of the Earth's atmospheric, marine and terrestrial spheres for the benefit of all European citizens.

2.3 How will the world/Europe be different when ENVIROFI is completed?

At the end of the project, European environmental observation data will be less fragmented and more integrated, particularly in the marine, terrestrial and atmospheric usage domains. This will be done through specifications and prototypes of interoperable geospatial environmental enablers that will operate in a multi-style service-oriented architecture. Furthermore, the environmental applications shall be able to profit from improved availability and standardisation of cloud services, cloud-aware large data processing capabilities, improved access to the Internet of Things, and other advanced capabilities developed within FI-PPP.

Finally, the integration of environmental enablers in the Future Internet shall encourage the use of environmental data and services in applications from other usage areas, eventually leading to an "envirofied" (environmentally enabled) Internet.

2.4 Who are the consortium partners?

The ENVIROFI consortium comprises 14 organisations from 8 European countries. Partners complement each other in terms of the skills and scope required to achieve the project objectives:

- Industrial partners:
 - Atos Origin (Spain) - *Project Coordinator*
 - Eurescom (Germany)
- Academia:
 - University Of Southampton IT Innovation Centre (United Kingdom)
 - Aalto University (Finland)
- Environmental agencies:
 - Environment Agency Austria (Austria)

- Research:
 - JRC – Joint Research Centre of the European Commission (Belgium)
 - Fraunhofer IOSB – Institute Of Optronics, System Technologies And Image Exploitation (Germany)
 - AIT Austrian Institute Of Technology (Austria)
 - CNR National Research Council Of Italy (Italy)
 - NILU Norwegian Institute For Air Research (Norway)
 - Stiftelsen SINTEF (Norway)
 - Marine Institute (Ireland)
- SMEs:
 - UBIMET (Austria)
 - InTune Networks (Ireland)

2.5 Where do I find further information about ENVIROFI?

Further information about the project is available on the ENVIROFI website at:

- <http://www.envirofi.eu>

You can also follow us on Twitter to receive updates on our activities:

- <http://twitter.com/envirofi> (@envirofi)

3 The Programme

3.1 What is FI-PPP?

The Future Internet Public-Private-Partnership (FI-PPP) is a research programme that is co-funded by the European Commission's Information Society and Media Directorate General within the ICT work programme of the Seventh Framework Programme (FP7). The FI-PPP programme is based on strong co-operation among its research projects, and offers the opportunity to develop the initial ideas into products tested in large scale trials for most successful consortia. The programme is performed in three phases from 2011 to 2015.

The FI-PPP addresses some of the key societal challenges stated in the Digital Agenda for Europe, in particular Europe's competitiveness in Future Internet technologies and systems, and a need to make public service infrastructures and business processes significantly smarter (i.e. more intelligent, more efficient, more sustainable) through tighter integration with Internet networking and computing capabilities.

More information on the FI-PPP is available at:

- http://ec.europa.eu/information_society/activities/foi/lead/fipp/index_en.htm

3.2 What is the role of ENVIROFI in the FI-PPP programme?

ENVIROFI is one of eight use case projects within the public-private partnership programme on the Internet of the Future (FI-PPP). These projects will define scenarios from different usage areas to be tested in experimental trials in a later programme phase. In addition, these projects will define their use-case specific requirements in order for the core platform to support these requirements. The core platform is developed by the FI-WARE project, which runs for three years.

The overall FI-PPP programme coordination, complementary to the administrative procedures of the European Commission, is done by the CONCORD Support Action, which runs for five years. In addition, ENVIROFI will also work closely together with INFINITY, another Support Action within the FI-PPP programme whose task it is to identify experimental infrastructures that can be used for later trials, and to maintain this information in a web-based repository.

3.3 Which other usage areas are targeted within the FI-PPP?

There are other seven Usage Areas targeted by dedicated projects within the FI-PPP, including:

- FINEST: Future Internet enabled optimisation of transport and logistics business networks
 - Coordinator: Kuehne + Nagel Management AG
- INSTANT MOBILITY: In the Instant Mobility vision, every journey and every transport movement is part of a fully connected and self-optimising ecosystem
 - Coordinator: Thales
- SMART AGRIFOOD: Smart food and agribusiness: Future Internet for safe and healthy food from farm to fork
 - Coordinator: DLO
- FINSENY: Future Internet for smart energy: foster Europe's leadership in ICT solutions for smart energy, e.g. in smart buildings and electric mobility
 - Coordinator: Nokia Siemens Networks

- SafeCity: Future Internet applied to public safety in Smart Cities: To ensure people feel safe in their surroundings
 - Coordinator: Isdefe
- OUTSMART: Provisioning of urban/regional smart services and business models enabled by the Future Internet: water and sewage, waste management, environment and transport.
 - Coordinator: France Telecom
- FI-CONTENT: Future media Internet for large-scale content experimentation e.g. in gaming, edutainment & culture, professionally and user generated content
 - Coordinator: Technicolor

3.4 What are Generic Enablers?

In the FI-PPP context, “Enablers” are reusable pieces of software specified and developed in one of the FI-PPP projects. The part of such software that is usage-area agnostic is considered “Generic Enabler” (GE). The GEs are primarily developed by FI-WARE.

The current work plan foresees development of GEs facilitating the usage of cloud computing, interfacing with the Internet of Things, interacting with networks and network devices, various business-enabling services, as well as services for authentication, authorization, and trust management. However, FI-WARE’s work plan also foresees the development of intelligent services for event and data processing, semantic annotation, multimedia data analysis, social network analysis, and mobility analysis. Actual development shall be driven by requirements from eight usage area projects and other stakeholders.

3.5 What are Environmental Enablers?

ENVIROFI intends to specify, and at least partially implement, several complex environmental applications. One such application could, for instance, be focused on collecting, quality assuring and processing biodiversity observations. While clearly very specialized, this application features several functions which are common to other applications within the environmental usage area, for example: “human observation collection”, “sensor observation collection”, “observation planning”, “observation storage”, “observation publishing & access”, “observation discovery”, “observation annotation”, and “quality/uncertainty assertion”.

The part of application functionality which is common to many environmental applications, but not required by other usage areas, shall be implemented as environmental enablers.

Unfortunately, it is not always easy to clearly define which of these functions are specific to the environmental usage area and which should be considered generic enablers. Currently, all of the services based on OGC/ISO 191 for geospatial data analysis, processing and presentation are considered environmental enablers, while semantic annotation and analysis as well as the various processing services are considered Generic Enablers. The discussions on requirements for GEs and on definitions of generic and specific enablers are ongoing at the FI-PPP architectural board. A much clearer distinction is expected to be available after the first round of requirements consolidation in the first quarter of 2012.

4 The Challenge

4.1 What are the grand societal challenges ENVIROFI helps to address?

By preparing the grounds for an Environmental Observation Web, ENVIROFI will give environmental agencies and policy makers the data needed for tackling the following grand societal challenges:

- Climate change
- Environmental degradation
- Sustainable growth.

Thus, the project helps achieve the goals of the EU's Europe 2020 Strategy, which includes goals of smart, sustainable, and Inclusive growth.

4.2 Why are the existing technologies not adequate?

So far, no standardised Europe-wide, cross-domain and web-enabled solution for capturing, storing, processing and visualizing the avalanche of observation sources exists.

Reasons for this unsatisfactory situation can be traced back both to shortcomings of the available technology, and to the parallel evolution of information systems and data models across geographic and usage areas.

Thanks to the diversity of stakeholders and strong involvement of the key ICT industry players, the FI-PPP is in the position to address both issues and: (1) develop advanced technical solutions beyond the reach of environmental area alone; as well as (2) help establishing the observation-related and geospatial standards in usage areas currently relying on non-standard and proprietary solutions.

4.3 What are the main challenges on the way to realising the ENVIROFI vision?

Current environmental observations and services available are only used to a very limited degree.

In order to succeed, ENVIROFI has to assure the existing environmental resources can be used in cross-domain applications, while at the same time assuring the environmental applications can profit from FI developments.

The key challenge for ENVIROFI is therefore to assure the FI architecture is compatible with standards, best practices as well as existing and upcoming infrastructures of the environmental usage area. In order to overcome this challenge, the ENVIROFI team has to (1) understand the needs and architectural constraints of FI-Ware and of the other usage area projects; (2) share knowledge with all FI-PPP participants on generic standards and best practices which were developed within the environmental usage area; and (3) inform the environmental usage area community of the advanced functionality developed within the FI-PPP.. An additional challenge is the introduction of volunteered geographic information (VGI) and information from low-quality sensors as additional sources of observations.

These community-generated environmental observations represent a wealth of information which is currently unused and therefore in need of integration with other fragmented data and information sources, traditionally managed by research and educational institutions and industries.

4.4 How will integration of the different use case projects within the FI-PPP be achieved?

The FI-PPP programme is based on mechanism designed for the full integration of the use case projects. A common approach will be ensured through an FI-PPP architecture board and other coordination mechanism established by the programme facilitation support action CONCORD.

5 The Solution

5.1 Which specific usage areas will the project address?

ENVIROFI works on three use cases: biodiversity, human/environment interaction, and collaborative usage of marine data:

- Bringing Biodiversity into the Future Internet
 - Enabled biodiversity surveys with advanced ontologies
 - Analysis, quality assurance and dissemination of biodiversity data
- Personal Information System for air pollutants, allergens and meteorological conditions
 - Enhance human to environment interaction
 - Atmospheric conditions and pollution in “the palm of your hand”
- Collaborative Usage of Marine Data Assets
 - Assess needs of key marine user communities
 - Selection of representative marine use cases for further trial: leisure and tourism, ocean energy devices, aquaculture, oil spill alert

5.2 In which areas will the project go beyond the state of the art?

ENVIROFI will progress in several areas beyond the state of the art, including

- Multi-Style Service Oriented Architecture
- Intelligent context-aware information retrieval
- Data fusion, modelling and uncertainty propagation
- Scalability and robustness of ENVIROFI services
- Privacy and Trust in Environmental Usage Area

All these advances will help in providing the basis for web-enabled aggregation and analysis of environmental observation data.

5.3 Which technologies will the project use?

ENVIROFI primarily builds on the Sensor Web Enablement and other relevant standards of the Open Geospatial Consortium. These standards are to a large extent technology-independent and foresee porting to various technology platforms. Depending on the service, up to three platforms may be supported today: OGC-specific variant of web service bindings, W3C web services with SOAP bindings, and the RESTful implementations of the services. A similar situation can be also observed at the level of events where OASIS WS-Notification appears to be the current technology of choice for new developments. Finally, various competing technologies exist at the level of hardware sensors, mobile sensor platforms, ad-hoc sensor networks and more generally within the Internet of Things area.

Based on previous experiences from decades of environmental information system developments, as well as on the theoretical work performed by ORCHESTRA project, the ENVIROFI team will follow a pragmatic technology-related strategy and: (1) define the environmental enablers in a technology-independent manner; (2) perform mapping to one or more technology platform(s) of choice. The actual choice of technologies shall be aligned both with FI-Ware and with the ongoing developments of the environmental usage area.

5.4 What is the role of experimental infrastructures in the project?

The project will need experimental infrastructures, particularly in the envisaged phase 2, in order to validate the results of the use case scenarios and prove the robustness and security of ENVIROFI's technological solutions.

5.5 Which stakeholders does the project need to achieve its planned results?

- Members of environmental observation communities, in particular:
 - EGU
 - Euro-SIF
 - GEO/GEOSS AIP
 - G-OWS
 - GIIDA
 - INSPIRE
 - GMES
 - ISO TC/211
 - OGC
 - CEN TC287
 - SEIS
 - GBIF
 - DOPA.
- Providers of experimental infrastructures in the research areas of ENVIROFI.

5.6 Which standards bodies are relevant and will be targeted by ENVIROFI?

The project will particularly target the following standards bodies:

- OGC
- CEN
- ISO (e.g. TC/211)
- OMG
- W3C
- OASIS.

Sensor and sensor network technology as well as open geospatial standards are at the very heart of the environmental domain. Organizations such as the International Organization for Standardization (ISO), European Committee for Standardization (CEN), and the Open Geospatial Consortium (OGC), already issue related documents and define the interplay with related geospatial and common ICT technologies. The geospatial service model of ISO Technical Committee (TC) 211 and the OGC Reference Model provide two widely used cases as a foundation for environmental services.

The achievements from the geospatial domain are similar, but yet slightly different from common Web standards and specification languages, such as SoaML of the Object Management Group (OMG). Connections exist between geospatial standardization organizations and wider ICT-related standardization bodies (including World Wide Web Consortium (W3C) and Organization for the Advancement of Structured Information Standards (OASIS).

6 Expected Impact

6.1 How will ENVIROFI help shape the Future Internet?

By providing sector-specific requirements from the environmental data sector, ENVIROFI will help the core platform of the FI-PPP (FI-WARE project) shape the Future Internet in a way that reflects the requirements of different usage areas and makes the Future Internet both functionally rich and at the same time robust and secure.

6.2 How will ENVIROFI help set up a European observation web?

The research results of ENVIROFI will provide the basis for the set-up of a European observation web. The project will do this particularly through:

- identifying and implementing environmental enablers to operate in a multi-style service oriented architecture;
- implementing reusable knowledge management services (semantics, meta-information enrichment, fusion and modelling services) for the marine, land and atmospheric usage domains and beyond; and
- providing on-demand integrated information to large, diverse communities and industries operating in the environment energy and leisure market sectors.

6.3 How will ENVIROFI and the FI-PPP achieve an integrated service infrastructure?

ENVIROFI will deploy environmental data fusion services under a structured state of the art data fusion framework which will enable the automated integration of fragmented observation data sources and interoperable services

ENVIROFI will, thus, provide the basis for the creation of new complementary service chains with integrated communication functionalities for multi-sector industries (leisure, aquaculture, ICT and knowledge based).