SEVENTH FRAMEWORK PROGRAMME

ICT PPP

Future Internet

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

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Collaborative project

D2.2.1 Use Case Requirements Report I

UBIMET

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FUTURE INTERNET PPP

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v1.0	29/09/2011	Antonio Oliván, Jose Lorenzo (ATOS)	Quality Assessment Final revision & approval

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Glossary

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

Abbreviations and acronyms

Abbreviation / Acronym	Description
AQI	Air Quality Index
CA	Consortium Agreement
DOW	Description of Work
ENVIROFI	The Environmental Observation Web and its Service Applications within the Future Internet
FI	Future Internet
FIA	Future Internet Assembly
FI-PPP	Future Internet Public-Private Partnership Programme
GA	Grant Agreement
GEO	Group on Earth Observation
GEOSS	Global Earth Observation System of Systems
GMES	Global Monitoring for Environment and Security
GPS	The Global Positioning System
GUID	Globally Unique Identifier
PEIS	Personal Environmental Information System
R&D	Research & Development RSS Really Simply Syndication
SME	Small Medium Enterprises
UC	Use Case
UML	Unified Modeling Language
VGI	Volunteered Geographic Information
WP	Work Package

Table 1. Abbreviations and Acronyms

Executive Summary

The atmospheric work package aims at enhancing the human to environment interaction by creating a Personal Environmental Information System (PEIS) for air pollutants and allergens as well as meteorological conditions. It provides alerts to its users, when predefined thresholds are broken. Additionally, the system provides reports for predicted and actual situations for meteorological and air quality as well as assessments on exposure to pollution.

This deliverable presents the snapshot of WP2 use cases taken at 28.09.2011. Compared to snapshot presented in D2.1 [01 - ENVIROFI Consortium], the level of details increased in anticipation of the D2.2.2 deliverable. More specifically we extended the functional descriptions and use cases, further refined the scenario-specific use cases and created comprehensive UML diagrams for the thematic use cases [02 - Cockburn]. In addition, the use cases were extended with several features that are beyond the reach of the current project. Finally, the naming convention for use case IDs slightly changed in order to improve the communication between WP2 and WP4.

Disclaimer: Due to the rapid development of technology in the Information and Communication Technology (ICT) sector, the references to particular technologies in this document may not reflect the final technological choices of ENVIROFI and FI-PPP as a whole, and should be interpreted as instantiations of required functional components. At the same time, all relevant existing European standards will be taken into account as these are mandatory for many of the potential stakeholders of ENVIROFI. Those parts implemented within the two years of the project will mark milestones for the forthcoming phase 2 of the FI-PPP Program

1 Introduction

Today, we have easy access to a great deal of information via television, radio and the World Wide Web. This includes pollution, pollen and meteorological data which are all relatively easily accessed in one or more dissemination channels. All this data contributes to a common sense, but it is not tailored to an individual user's needs. Relevancy of data and interpreting it are key issues for users today, especially with regards to pollen, pollution and meteorological conditions which affect the population in its day-to-day life. Future eEnvironment services should therefore aid individuals in tailoring information relevant to their specific requirements by providing personalized threshold alerts for air quality, meteorological conditions and pollen, as well as enabling the users to feed data back into the system which will then be used to further enhance the relevancy of the data to the user.

This personalization of the information becomes more achievable due to the increasing prevalence of Global Positioning System (GPS) enabled mobile devices which will permit the system to assess the individual's exposure to pollution by recording the individual's coordinates and matching them with actual observation data with a higher degree of accuracy than is generally available to the public. In addition, by taking advantage of easier to use interface design we will enable the individual users to become part of the web of sensors by providing mechanisms for Voluntary Geographic Information (VGI). This data will feed back into the system and provide another layer of information to further enhance the existing infrastructure. An example of VGI could be a user reporting the prevalence of rag weed (to which he might be allergic) in an area where for which no data currently exists, thereby potentially alerting other sufferers of the existence of the allergenic plant.

The parts of this deliverable are structured as follows. We provide first, in section 5, a short description of the revision process for use cases within ENVIROFI and explain then how we apply this approach to our work package. This is followed by section 6 which gives an overview of the extended scenarios and use case descriptions after our first revision cycle. We detail then in section 7 the common functionalities between the various scenarios and give an overview of the new cross-cutting use cases we identified within this deliverable. Section 8 refines the user groups specific to our scenarios, maps users to common roles and sketches possible business models. This is followed by section 9 which covers the relevant data sources for the PEIS. We conclude with a review of the existing issues and hope to demonstrate just how the Personal Environmental Information System solves many of these concerns. Finally, in the appendix, we include the use cases detailing the various aspects of the PEIS as well as our developed UML diagrams for the scenaric use cases.

Figure 1. Diagram showing user interaction with PEIS from [01 - ENVIROFI Consortium]

2 Overview of the revision process

2.1 Applied software engineering methodologies

It is important to understand that ENVIROFI initially planned to follow the V-Model [03 - Hoffman & Beaumont] for all of its developments and deliverables. As result of the FI-Ware project decision to follow the AGILE development model [04 – Abrahamsson et al], and due to the strong relationship between projects in FI-PPP Programme, we decided to adapt the initial planning in the following way:

- The WP1, WP2 and WP3 shall continue developing the use cases (user stories in AGILE terminology) until the level where these can be used as specifications. Consequently, no formal "technical requirements" shall be developed within these WPs [2,3,4].
- WP4 shall, as its first task, analyse the pilot related use cases and formulate a set of abstract use cases common to various environmental applications. These abstract use cases shall serve as a basis for discussion on generic and specific enablers within FI-PPP [06, 08 - ENVIROFI Consortium].
- Finally, WP5 shall, as its first task, extract the functional and non-functional requirements, mainly based on WP1, WP2 and WP3 use cases, as well as on the architectural boundaries and stakeholders needs which were initially captured within D6.1.1 [05 - ENVIROFI Consortium] – in particular those inherited from GEOSS and INSPIRE. In order to simplify requirements tracking, WP5 requirements refer to abstract WP4 use cases where available, rather than directly referring the WP1, WP2 and WP3 use cases.

As a consequence, all information presented in this document should be seen as a snapshot of Use Cases at the end of m6 (September 2011), and will be further developed in discussion within ENVIROFI as well as in discussion within the FI-PPP Architectural Board.

In this way, ENVIROFI team expects to be able to keep the overall V-Model structure of the software development process within WP2, while still profiting from the flexibility of the agile development approach. A full description of the software engineering methodology adopted by ENVIROFI is given in D4.1.1 [06 - ENVIROFI Consortium].

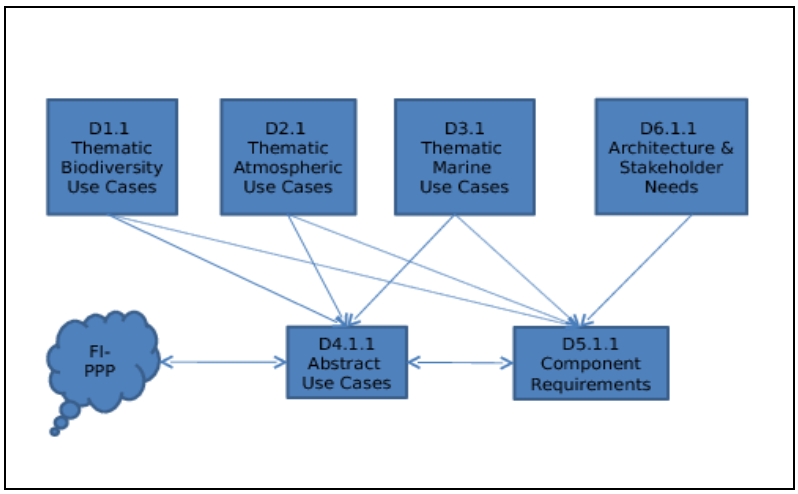

Figure 2. Relation between the work packages from [04]

2.2 Approach within atmospheric work package

In order to refine the use cases the following analysis, we follow the procedure as sketched in figure 2. As a result of this analysis, we decided within our work package to further improve the identified use cases with respect to:

- renaming them in order to get a clearer idea of their content and to align with other work packages
- stating a clear start and end condition for the use cases.
- refining the main success scenario if necessary by introducing sub use cases.
- linking the use cases to each other and the already existing requirements.
- resolving inconsistencies within and among the use cases.
- spotting the underlying abstract use Cases that might be useful for the other pilots as well.
- adding the corresponding UML diagrams.

Since the first stakeholder/advisory board meeting is planned for after this deliverable we will include their feedback only in the refined next deliverable D2.2.2. During the process of refining the scenaric use cases we broke them down into their functional components by introducing cross-cutting use cases (see section 7 for more details).

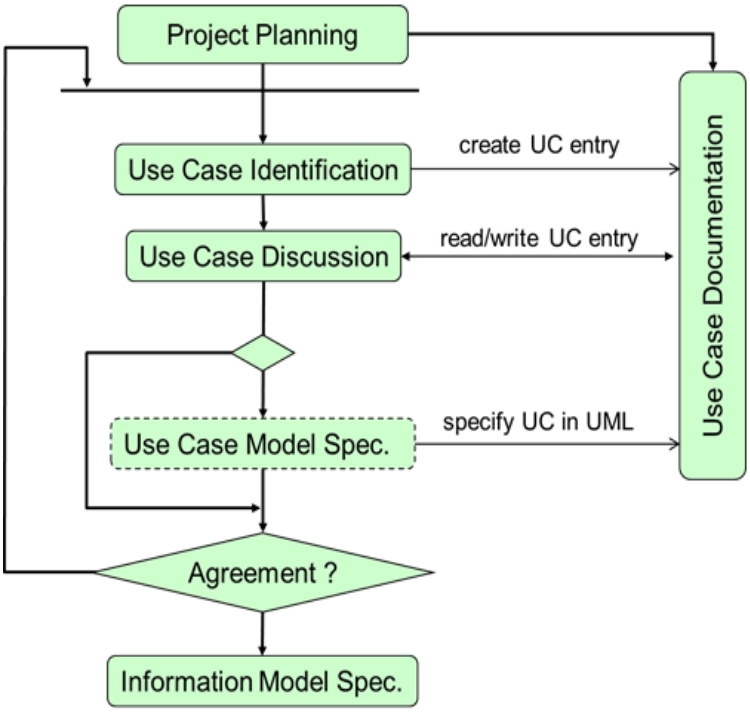

Figure 3. Use Case Analysis in ENVIROFI

3 Overview of extended Scenarios and Use Cases

The atmospheric work package aims at enhancing the human to environment interaction by creating a Personal Environmental Information System (PEIS) for air pollutants and allergens as well as meteorological conditions. As already identified in our first deliverable D2.1 [01 - ENVIROFI Consortium], there are three main foci in this work package upon which the data interface for the PEIS will be built:

- The first will be to create a personal assessment system for the users that provides information about past, present and future environmental conditions.
- The second will be to provide a notification and early warning system to inform the users on actual or expected environmental situations.
- Finally, a third focus is on developing a user input interface, in order to allow the users to interact with the system to provide observational data and interact with other users.

In order to reflect these foci, we decided to restructure our scenarios accordingly. Instead of the original eight scenarios in deliverable D2.1, we consider from now on three scenarios

- Scenario A**:** Personalised environmental information
- Scenario B**:** Personalised notification and warning system
- Scenario C**:** Building a community of users

Note that in contrast to WP1 our scenarios differ in the user roles available and not in the user groups considered. As a consequence, a hobby meteorologist can take over the same roles as an allergic person or a researcher. However, a system administrator has nevertheless access to more roles than a normal user. We will further discuss the mapping of users to common roles in section 9.

In the following we will go through each scenario and summarize the changes in the scenario-specific use cases from D2.1 to the current deliverable D2.2.1. However, in order to avoid confusion we explain first the change in the naming convention for use cases as agreed on throughout the work packages.

3.1 Naming convention for Use Cases

As mentioned above we have a slight change in our naming convention from deliverable D2.1 to D2.2.1 in order to align with the other scenario work packages, WP 1 and 3, and to alleviate communication with WP 4 and 5. By providing a consistent naming convention, we intend in particular to distinguish between Use Cases specific only to one scenario and cross-cutting Use Cases that are independent of the considered scenarios within our work package. More specifically, we apply for our work package now

UC-ENV2.<scenario>-<category>-<use case no.>.<sub use case no.>-V<version no.>

where

- **<scenario>**: The LETTER of the scenario within the WP or the NUMBER of the cross-cutting UC type.
- **<category>**: No particular scheme has to be applied. One can either specify it e.g. with 'mob' (for mobile application) or use 'any' if no specification needed.
- **<use case no.>**: Two digits to enumerate the use cases of one category.
- **<sub use case no.>**: Two digits to enumerate the corresponding sub use cases.
- **<version no.>**: Two digits to denote the version of the (sub) use case.

Use cases can be linked to each other via “preconditions“ or “triggers“. This means, a precondition for a use case can be either an external event or another use case. In this case the use case ID should be provided in the field ”preconditions“

Example:

UC-ENV2.A-RPT-01.01-V01

This denotes a use case of our work package from scenario A.

3.2 Scenario A: Personalized environmental information

This scenario is the core piece of the Personal Environmental Information System (PEIS) as it provides the user access to a plethora of environmental data in particular for air quality and meteorological events and the other scenarios cannot work without the data provided here. This includes past and up-to-date observational data as well as forecasts derived from appropriate models for arbitrary locations. In contrast to the other scenarios the user is provided here with raw data which he has to interprete for himself. However, depending on the level of user expertise (e.g. normal user or researcher) the data is presented accordingly. Typical user questions addressed by this scenario are 'What will the weather be like tomorrow?' or 'What is my current exposure to air pollution?'. The use cases found in this scenario differ with respect to the data type, i.e. pollen, air quality or meteorological, and their temporal extent, i.e. past, present or predictive.

As a result of our revision process for this scenario, we identified new functional use cases for the key features a user is interested to use, i.e. for choosing an alternative location, a specific observational parameter or a temporal extent. In order to provide an overview of the use cases in this scenario, we included a table that is followed by details on each of them. The table states the use cases' old and new IDs and prioritizes them for the development process by denoting them with either low, normal or high.

Use Case Name	Original Use Case ID	New Use Case ID	Priority
Display current meteorological conditions and events	UC-ENV-2.2-PSM-01.01-V01	UC-ENV2.A-PSM-01.01-V02	High
Display current exposure to air pollution and pollen	UC-ENV-2.2-PSM-02.01-V01	UC-ENV2.A-PSM-02.01-V02	High
Display predicted meteorological conditions and events	UC-ENV-2.3-PFO-01.01-V01	UC-ENV2.A-PFO-01.01-V01	High
Display predicted exposure to air pollution and pollen	UC-ENV-2.3-PFO-02.01-V01	UC-ENV2.A-PFO-02.01-V01	Normal
Display past meteorological conditions and events	UC-ENV-2.1-RPT-01.01-V01	UC-ENV2.A-RPT-01.01-V02	Normal
Display past exposure to air pollution and pollen	UC-ENV-2.1-RPT-02.01-V02	UC-ENV2.A-RPT-02.01-V03	Low
Personal Situation Monitoring - Met conditions alternate locations	UC-ENV-2.2-PSM-01.02-V01	deprecated	Low

Table 2. Overview of Use Cases for Scenario A

3.2.1 Display past meteorological conditions and events (UC-ENV2.A-RPT-01.01-V02)

Use Case summary

User wishes to know how much UV he has been exposed to during the last day. He requests a report for Met, including UV. EXTENSION The user wants to decide whether he has to water his garden plants. He may wish to find out the cumulative precipitation during the past three days at his current location. Depending on the cumulative amount of rain in e.g. mm/m**2 that hit the ground during the last three days he can then decide whether his plants need water.

Result of revision

Since all the UCs in this scenario have as an extension the choice of an alternative location and temporal extent, we decided to provide two new UCs for these features. At this stage we have not

decided into which category to put them. Additionally, we identified a new UC that allows the user to select additional environmental data.

3.2.2 Display past exposure to air pollution and pollen (UC-ENV2.A-RPT-02.01-V03)

Use Case summary

The exposure report system will develop customised reports for users on past environmental conditions and events at a specified location. These reports can contain information on air pollution, pollen/allergens or meteorological conditions. A typical situation in which the user might consult the system is e.g. when deciding whether he has to water his garden plants. He may wish to find out the cumulative precipitation during the past three days at his current location. Depending on the cumulative amount of rain in e.g. mm/m**2 that hit the ground during the last three days he can then decide whether his plants need water. Another example to use the PEIS could be the following: A user is about to decide whether he buys a house at a specific location and is interested to obtain a report on just how much cumulative pollution the location has been exposed to over the last seven days. Alternatively, the user is interested to find out how much pollution his kids at school have been exposed to over the last 24 hours. He may also want to include indoor exposure in his report.This may require that the user creates an individualized profile for the particular case detailing many characteristics that pertain to assessing indoor exposure values. For this purpose, the user profile will have an advanced section where specific information on the user will be stored.

Result of revision

New functional UCs for selecting alternative location, temporal extent and additional environmental information.

3.2.3 Display current meteorological conditions and events (UC-ENV2.A-PSM-01.01-V02)

Use Case summary

The user is deciding whether to go shopping by car or by bus depending on the weather condition. So he is interested in the present weather condition for the location he is situated now. He chooses current weather conditions and events and allows the system to use his current GPS coordinates. As a result he receives a visualization (meteogram) of the default meteorological parameters at his current location.

Result of revision

New functional UCs for selecting alternative location, temporal extent and additional environmental information.

3.2.4 Display current exposure to air pollution and pollen (UC-ENV2.A-PSM-02.01-V02)

Use Case summary

The user is interested in the current exposure to air pollutants at his daughter's school. He enters the location and specifies the air pollutant to be displayed. As a result he receives a visualization of the requested data.

Result of revision

UC rewritten to match UC-ENV2.A-PSM-01.01-V02.

3.2.5 Display predicted meteorological conditions and events (UC-ENV2.A-PFO-01.01-V01)

Use Case summary

The user is making plans for her weekend and consults her personal environmental information system. She specifies the meteorological parameter(s) and the location to be monitored and receives a visualization (meteogram) of the requested data.

Result of revision

UC rewritten to match other UCs of this scenario.

3.2.6 Display predicted exposure to air pollution and pollen (UC-ENV2.A-PFO-02.01-V01)

Use Case summary

The user is planning a trip to the countryside. He wants to know the predicted air quality and pollen count for the next day. The user therefore requests a forecast for a specific user-defined location and time and receives a visualization of the requested data.

Result of revision

Rewritten to match other UCs of this scenario.

3.3 Scenario B: Personalized notifications and warnings

In addition to the reports from scenario A, the user can receive personal notifications and warnings for air quality and meteorological parameters as well as for the specific environmental events. In order to be notified by the system about the breach of a parameter or the occurrence of an event, the user can either set a threshold/range for a specified parameter, or choose from a list of pre-defined events or user profiles. Additionally, it will be possible to specify time-limits for the warnings, the location to be monitored and the type of notification the user wishes to receive. In case the user provides regular input on his personal well-being (see also scenario C), the system can suggest appropriate thresholds for the user. As an example, if the user consistently reports sneezing when pollen is notably high, but the user has NOT set a low threshold for pollen, then the system can automatically adjust this setting to ensure that the user will receive more timely warnings in the future.

A list of use cases in tabular form provided below gives an overview of the offered functionalities. It states the use cases' old and new IDs and prioritizes them for the development process by denoting them with either low, normal or high.

Use Case Name	Original Use Case ID	New Use Case ID	Priority
Create parameter threshold to receive personalized alerts	UC-ENV-2.2-NTA-01.01-V01	UC-ENV2.B-NTA-01.01-V02	High
Raise system alert and notify user if threshold is breached	UC-ENV-2.2-NTA-02.01-V02	UC-ENV2.B-NTA-02.01-V03	High
Choose from predefined profiles in order to receive alerts	UC-ENV-2.2-NTA-03.01-V01	UC-ENV2.B-NTA-03.01-V02	Normal
Provide thresholds for alerts on the basis of historic user input	UC-ENV-2.2-PRA-01.01-V01	UC-ENV2.B-PRA-01.01-V02	Normal

Table 3. Overview of Use Cases for Scenario B

3.3.1 Create parameter threshold to receive personalized alerts (UC-ENV2.B-NTA-01.01-V02)

Use case summary

The user is allergic to birch. Since the season for birch pollen has just started he wants to be notified in case a threshold for this pollen is exceeded. In his personal information system he specifies the component to be monitored at his current location and sets a threshold.

Result of revision

Requires an additional revision due to strong dependencies on other UCs.

3.3.2 Raise system alert and notify user if threshold is breached (UC-ENV2.B-NTA-02.01-V03)

Use case summary

The user has subscribed to receive warnings in case the amount for a certain type of pollen is breached. The system identified a threshold breach and raises an alert. As a consequence the user receives a warning notification. According to his personal settings this can be a push notification, an email or an sms. Additionally, the parameter that caused the alert is visualised.

Result of revision

Only minor modifications.

3.3.3 Choose from predefined profiles in order to receive alerts (UC-ENV2.B-NTA-03.01-V02)

Use case summary

Many users will not have the basic knowledge on what parameters and corresponding thresholds are important or relevant for them. In order to facilitate the usage of the PEIS, they can select from predefined configurations with automatic threshold values for key parameters. For example: Suffer from hay fever? Click this profile. Have asthma? Click this profile. Get headaches when the weather changes? Click this profile. Like outdoor sports? Click this profile. The system will set the thresholds for the relevant parameters accordingly.

Result of revision

Only minor modifications.

3.3.4 Provide thresholds for alerts on the basis of historic user input (UC-ENV2.B-PRA-01.01-V02)

Use case summary

Historic users input (Health reporting) is used to predict potential repeat of symptoms (see UC-ENV-2.2-any-01.01-V01)

Result of revision

Could be more detailed. Requires an additional revision due to strong dependencies on other UCs.

3.4 Scenario C: Building a community of users (User input)

In addition to passively using the data from existing networks, the users can act as mobile sensors and supply (mostly qualitative) observations back into the system. In this way the user provides an additional layer of information to the PEIS and it will be possible to build a community of environmentally aware users. Within this scenario we identified so far two types of possible user reports, namely observational and health report. While the first type can in general be validated either by other users or the system, the second type is highly subjective.

The purpose of the personal reports from users will be to form a basis for creating predictive alerts that will be specific to the individual user and could enable the system to predict when an event will occur which could have a medical, or health related impact to the user. For example, low pressure fronts are linked to headaches in humans. If a user reports headaches at a time when a low pressure front is recorded, then the system will, after a period of time be able to make the connection between the low pressure event and the impact to the user. An alert will be sent the next time a low pressure front is predicted, warning the user of the possibility of a headache.

In extension to the first deliverable D2.1, we provide new use cases that allow the user to display the other users' observational and health reports. Additionally, we provide more functional use cases that support the system to check the trustability of users providing reports in functionality 5: Semantic Quality Assurance and Feedback

Use Case Name	Original Use Case ID	New Use Case ID	Priority
Report environmental observation to system	UC-ENV-2.3-USI-01.01.-v01	UC-ENV2.C-USI-01.01.-V02	Normal
Report health condition to system	UC-ENV-2.3-USI-02.01.-v01	UC-ENV2.C-USI-02.01.-V02	Normal
Provide demographic information of user	UC-ENV-2.3-USI-03.01.-v01	UC-ENV2.C-USI-03.01.-V02	Normal
Display observational reports of other users	new	UC-ENV2.C-USI-04.01-V01	Low
Display health reports of other users	new	UC-ENV2.C-USI-05.01-V01	Low

Table 4. Overview of Use Cases for Scenario C

3.4.1 Report health condition to system (UC-ENV2.C-USI-02.01-V02)

Use Case summary

A hobby meteorologist is observing the approach of a thunderstorm that the system is not aware of yet. He can then e.g. notify the system by sending a message or by taking a photo of the weather condition and uploading it to the system.

Result of revision

Only minor modifications were necessary.

3.4.2 Report environmental observation to system (UC-ENV2.C-USI-01.01-V02)

Use Case summary

User can select one or more attributes from a predefined list to describe his current health condition. These conditions can include the following: Headache, Irritated eyes, Sneezing, or Coughing In addi-

tion, the user can characterize the attributes with values, such as mild, moderate, strong, or severe.

Result of revision

Only minor modifications were necessary.

3.4.3 Provide demographic information of user (UC-ENV2.C-USI-03.01.-V02)

Use Case summary

User is elderly, and does not manage to get outside often. User wishes to receive reports on indoor exposure. User needs to ensure that relevant information about himself is stored in the system. User stores specific information about himself such as Sex/Age residence location work location. This is necessary if the user wishes an indoor assessment.

Result of revision

Private issues have to be considered more carefully. Is the requested data stored locally?

3.4.4 Display observational reports of other users (UC-ENV2.C-USI-04.01-V01)

Use Case summary

The user wishes to know how much pollution other user at his location were exposed to during the last day or a specific period. He requests a report for pollution exposure. In order to provide the user with this information, the system determines the user's current location and searches on the server for user reports matching his request. As a result the system provides a map visualizing the positions of the users and the amount of pollution they have been exposed to.

Result of revision

Decide whether this feature is available only for web portal and registered users.

3.4.5 Display health reports of other users (UC-ENV2.C-USI-05.01-V01)

Use Case summary

The user wishes to know how many other users at his location suffered from a headache during the last day or a specific period. He requests a health report for headaches. In order to provide the user with this information, the system determines the user's current location and searches on the server for user reports matching his request. As a result the system provides a map visualizing the positions of these users.

Result of revision

Decide whether this feature is available only for web portal and registered users.

4 Common Features and Functionalities

Since in our first deliverable D2.1 [01 - ENVIROFI Consortium], we did not distinguish explicitly between scenario-specific and cross-cutting use cases, we make up for this in the current deliverable and provide here a detailed description of the UCs we identified as cross-cutting. In contrast to scenario-specific UCs, cross-cutting UCs are intended to display the various aspects of the system that are common to all the scenarios in WP2. In many cases, these features will be common not only to the WP2 scenarios, but possibly also to WP1 and WP3.

In the following we list all identified categories for use cases and give a brief summary of the functionalities they provide. In comparison to the first deliverable, we merged the 'data acquisition' with the 'data administration & storage category' and introduced a new category 'data fusion & visualisation'. All use cases not matching the categories identified up to now are included in 'miscellaneous' which is a category of its own. Note that since the cross-cutting UCs are new in this deliverable, we have no 'result of revision' part included into the descriptions. Additionally, we decided to provide use case summaries only for the more complex ones, since most of the functional use cases identified here are self-explanatory. The tables below provide an overview for each functionality category, give an overview of their priority and show their link to the scenario-specific use cases. The subsequent table relates use case categories with abbreviations used within the use case ID.

Functionality Category	Abbreviation for UC ID
1: User Administration & Authentication	aut
2: Data Administration & Storage	dat
3: Data Fusion & Visualization	vis
4: Pattern Recognition & Semantic Enrichment	pat
5: Semantic Quality Assurance & Feedback	sem
6: Miscellaneous	mis

Table 5. Abbreviations for functionality categories

4.1 Functionality 1: User Administration & Authentication

In particular for scenario B and C which deals with personalised warnings and the input of user-specific information, user authentication is an important precondition. This is necessary both for proper citation of the data provided by the users as well as avoiding misuse of the system. However, it is NOT necessary to actually store personal data about the user on the server. A simple, anonymous identifier will suffice, e.g., a Globally Unique Identifier, or GUID. Person-specific data will only be stored localy on the user device.

In addition, it needs to be possible to configure individual user profiles; this information will be used for assessing an individual's exposure to indoor pollution as well as store VGI relating to health and environmental observations. The user profile will also enable the system to store quality assurance data relating to the user, such as a user's level of reliability. This will be taken into account in assessing the relevance of a user's feedback on existing data as well as their own observational inputs. Additionally, the settings in the profile will also save key data related to threshold levels for parameters as well as notification methods. Finally there has to be an administrator with rights to manage the users and the data they provide.

Use Case Name	Use Case ID	Required for UCs	Priority
Provide web based services for administration	UC-ENV-2.1-aut-01-V01	Scenarios B, C	High
Register user on web portal	UC-ENV-2.1-aut-02-V01	Scenarios B, C	High
Login user	UC-ENV-2.1-aut-03-V01	Scenarios B, C	High
Administrate users	UC-ENV-2.1-aut-04-V01	All	High
Change personal settings	UC-ENV-2.1-aut-05-V01	All	High
Check personal settings	UC-ENV-2.1-aut-06-V01	All	High

Table 6. Overview of Use Cases for "User Administration & Authentification"

4.2 Functionality 2: Data Administration & Storage

Whilst the main focus of the ENVIROFI PEIS scenarios is the provision of information and warnings via mobile devices, the acquired data from the reports provided by the users must also be stored and administrated. In addition to the data acquired within ENVIROFI, ENVIROFI integrates also data from various existing external sources; storage containers must be provided for this data. For this reason, tools should be provided to allow the user to:

- manually enter new data;
- edit data;
- up- and download data;
- store data.

ENVIROFI will provide simple mechanisms to enter, edit, up- and download data in predefined formats. These must be based on European and international standards. Since the Use Case names already provide a sufficient description for this type of functionalities, we abandon the indication of the Use Case summaries and only provide an overview table instead.

Use Case Name	Use Case ID	Required for UCs	Priority
Upload of data from external sources	UC-ENV-2.2-dat-01-V01	Scenarios C	Normal
Edit provided data	UC-ENV-2.2-dat-02-V01	Scenarios B, C	Normal
Check availability of data on system server	UC-ENV-2.2-dat-03-V01	All	High
Download data to mobile device	UC-ENV-2.2-dat-04-V01	All	High
Store data on system server	UC-ENV-2.2-dat-05-V01	All	High

Table 7. Overview of Use Cases for "Data Administration & Storage"

4.3 Functionality 3: Data Fusion & Visualization

The PEIS provides different types of data sources with large amounts of data in different formats. In order to combine this data effectively such that additional information is provided for the user, data fusion techniques are needed. Of importance for our work package will be to fuse meteorological with air quality data and user reports and to visualise the resulting output. For this reason, we decided to include a category of Use Cases that deals with these problems. However, in order to provide more technical details more input from WP4 and 5 is required.

Use Case Name	Use Case ID	Required for UCs	Priority
Select temporal extent of requested information	UC-ENV-2.3-vis-01-V01	All	High
Select location for requested information	UC-ENV-2.3-vis-02-V01	All	High
Select environmental parameter of interest	UC-ENV-2.3-vis-03-V01	All	High
User views data on web portal	UC-ENV-2.3-vis-04-V01	All	High
Fuse real-time data with user reports	UC-ENV-2.3-vis-05-V01	Scenario C	Normal
Provide visualization of requested data	UC-ENV-2.3-vis-06-V01	All	High

Table 8. Overview of Use Cases for "Data Fusion & Visualization"

4.4 Functionality 4: Pattern Recognition & Semantic Enrichment

Since the user is equipped with various possibilities to provide input to the system, for example

- Text messages
- Social networking portals
- Uploading photos

There has to be a mechanism that can extract the relevant information. For analyzing visual information as e.g. whether there is snow in a photo, or to estimate the visibility range in a photo, our work package requires appropriate tools for pattern recognition. Depending on how this field of research evolves in the future it might be possible to extract from photos weather conditions as well as cloud types etc. In order to obtain information from Social Networking applications, and text messages, it is important to extract information from the text input and categorize.

Use Case Name	Use Case ID	Required for UCs	Priority
Provide activity pattern of user	UC-ENV-2.4-pat-01-V01	Scenarios B	Normal
Determine air quality from uploaded photo	UC-ENV-2.4-pat-02-V01	Scenarios C	Low
Determine weather condition from uploaded photo	UC-ENV-2.4-pat-03-V01	Scenarios C	Low
Geo-tag provided report	UC-ENV-2.4-pat-04-V01	Scenario C	Normal

Table 9. Overview of Use Cases for "Pattern Recognition & Semantic Enrichment"

4.4.1 Provide activity pattern of user (UC-ENV2.4-pat-01-V01)

Use Case summary

The user wishes to know how much pollution he will be exposed to during the next day or a specific period. He requests a report for pollution exposure. In order to provide the user with this information, the system determines continuously the user's location and stores the coordinates as well as the amount of pollution . As a result the system automatically determines the user's activity pattern.

4.4.2 Determine air quality from uploaded photo (UC-ENV2.4-pat-02-V01)

Use Case summary

The user wishes to provide an observational report. He takes a photo with his mobile device and uploads it to the server. By using a clever pattern recognition algorithm, the system is able to determine the amount of pollution and sends a report to the user.

4.4.3 Determine air weather condition from uploaded photo (UC-ENV2.4-pat-03-V01)

Use Case summary

The user wishes to provide an observational report. He takes a photo with his mobile device and uploads it to the server. By using a clever pattern recognition algorithm, the system is able to determine the weather condition and sends a report to the user.

4.4.4 Geo-tag provided report (UC-ENV2.4-pat-04-V01)

Use Case summary

The user provided input about his current health condition and wishes to share this information with the PEIS user community. By allowing the system to share, this information is uploaded to the PEIS server. As an extension to this the user can geo-tag his input on a map.

4.5 Functionality 5: Semantic Quality Assurance & Feedback

Volunteered observations are a-priory less reliable than those provided by high quality sensors. Furthermore, the amount of information received through this channel can be large. It is therefore important to provide scalable mechanisms for quality assuring the volunteered observations. Some possibilities include:

- Automated QA based on statistic methods. This is for instance possible under the assumption that many users contribute the observations in the same area, and that most of these users can be trusted.
- Similarly, the unlikely observations can be automatically singled out by comparing them with model results or measurements of nearby quality sensors (plausibility check).
- Community peer-reviewing, where users are asked to assess the quality of the observations contributed by other users
- Trust relations, where certain users are trusted more than other, for instance because they have a proven track record of providing high quality observations.

In addition to distributed quality assurance (via community peer review), Social Networking mechanisms can be also used to encourage more users to contribute their observations. With this in mind, it is important to assure the high visibility of the user-contributed observations, and to acknowledge how much these observations contributed to improved quality of service.

User provided data has two uses within the system. One is to provide qualitative information about the current environmental conditions that can affect others. The other purpose is to provide a basis for predictive alerts.

Use Case Name	Use Case ID	Required for UCs	Priority
Check observational report of user	UC-ENV-2.5-sem-01-V01	Scenario C	Normal
Cross-check report with internal data	UC-ENV-2.5-sem-02-V01	Scenario C	Normal
Determine user trustability	UC-ENV-2.5-sem-03-V01	Scenario C	Normal
Request validation of report from other users	UC-ENV-2.5-sem-04-V01	Scenario C	Normal
Rate accuracy of provided service	UC-ENV-2.5-sem-05-V01	All	High

Table 10. Overview of Use Cases for "Semantic Quality Assurance & Feedback"

4.5.1 Check observational report of user (UC-ENV2.5-sem-01-V01)

Use Case summary

Validation of user input. This will be performed behind the scenes by the system when a user uploads a personal observation report. User entries will be judged by several factors, including user trustability, likelihood of the observation made and comparison with other user reports.

Result of revision

Only minor modifications necessary.

4.5.2 Cross-check report with internal data (UC-ENV2.5-sem-02-V01)

Use Case summary:

Validation of user input by comparing with current conditions as reported by the existing monitoring network.

Result of revision:

Provide more details in next revision.

4.5.3 Determine user trustability (UC-ENV2.5-sem-03-V01)

Use Case summary

The user has provided several observations to the system. If a sufficient number of valid observations has been provided the user is considered to be trustworthy and can share his information with the system.

Result of revision

Provide more details in next revision.

4.5.4 Request validation of report from other users (UC-ENV2.5-sem-04-V01)

Use Case summary

A user provides a weather report for the first time, i.e. there is no way for the system to determine his trustability from past reports. The system sends a push notification to other users at the same location and requests to verify the report of the first user.

Result of revision

Provide more details in next revision.

4.5.5 Rate accuracy of provided service (UC-ENV2.5-sem-05-V01)

Use Case summary

The user obtained a warning from his PEIS that due to strong changes in pressure he has a higher probability of experiencing a headache. After one day the system asks him to rate the accuracy of this service. The user can give different grades (low, good, high).

Result of revision

Provide more details in next revision.

4.6 Functionality 6: Miscellaneous

This category of functionalities includes all Use Cases that do not match one of the already identified categories. So far, it includes the following Use Cases:

Use Case Name	Use Case ID	Required for UCs	Priority
Determine GPS position of mobile device	UC-ENV-2.6-mis-01-V01	All	High
Share information with social net-works	UC-ENV-2.6-mis-02-V01	All	Normal
Share information with other users	UC-ENV-2.6-mis-03-V01	Scenario B, C	Normal
Pay for requested service	UC-ENV-2.6-mis-04-V01	Scenario B, C	Normal

Table 11. Overview of Use Cases for "Miscellaneous"

5 Comparison with State-of-the-Art

5.1 Current Situation

At the time of writing, the State-of-the-Art for Air Quality dissemination systems relies heavily on web-based portals to inform the public of the current air quality index (AQI) within their region. Although the classical dissemination channels via TV, radio and newspapers still play a role, it is not major for Air Quality. This, of course, cannot be said about the distribution of weather information to the public, which shares a much more equal distribution across all dissemination channels and is not heavily biased towards web based services.

However, an increasing number of users consult web-based portals or services of specific information on weather conditions is required as e.g. the forecast at a specific location for the next three days. This is become more prevalent while the method of accessing this data is moving towards handheld devices, rather than standard PC use.

An example of an advanced AQI system includes the Norwegian public Air Quality portal, www.Luftkvalitet.info, which displays current air quality values for the major cities of Norway, as well as historic data which can be displayed in a number of ways (graphs, charts, etc). This portal is considered to be a good example of public air quality dissemination, and can be considered to be representative of the majority of similar National portals available worldwide (some of which are actually based on this system). For example, the national portals for Cyprus and the Arab Emirates use very similar systems which clearly demonstrate their origins in the Norwegian Luftkvalitet.info portal. But, while these portals typify the best "current" method for informing the public today, they are far from the only mechanisms.

The standard online weather portal provides the user in general with information about the current weather condition, detailed weather forecast for the next three-seven days, less detailed long-term weather forecast and severe weather warnings for specific locations. Apart from this the different portals offer additional features ranging from weather information for different situations e.g. health or sailing weather, over more detailed weather data for (hobby) meteorologists to connections to social media and uploading user reports or photos. Typical examples for such web portals include www.weather.com and www.accuweather.com. Many portals extended their service to offer a Smartphone app which provides the user with weather forecast information. However, usually these particular applications focus on delivering the user existing data instead of allowing the users to interact with the system (weatherpro, weather.com, wetter.at).

Since one of the core functionalities of the ENVIROFI PEIS is to allow the user to interact with the system and share information with other users, we have a particular interest in learning what state-of-the-art here is. In the case of user-generated weather reports the common practise is to provide the user a Smartphone application where the user can easily select between various degrees of strength for different weather conditions and send a report immediately. In case of www.shareweather.com it is possible as well to upload a photo of the current weather situation or alternatively to choose from given photos which types of clouds match the current weather best.

In many cases it is not possible to see historic data, or to modify or change the data display by selecting different parameters, or time values. In some cases, access to the data is via report only and requires downloading a document, such as a CSV file. These, less user friendly systems limit and in some cases prohibit the general public from gaining access to and understanding what is happening in their region.

However, as handheld devices become more ubiquitous, it is to be expected that this new platform becomes the focus for future dissemination of e-Environmental information, and that many of the existing online National portals will migrate their services, or develop new services to cater to this platform.

To some degree this has already occurred, and with some success. For example, the Bay Area Air Quality Management District (BAAQMD) in San Francisco uses a Smartphone application to inform its users of current smog and air quality levels. Called the iSmog, it uses Push Notifications to inform the user on the current AQI (available at http://511contracosta.org/ismog/). A similar system is the London Air iPhone app (http://www.londonair.org.uk/london/asp/iPhone/default.asp) which allows a user to

monitor air quality at different locations within London and to receive notifications if the air quality level changes.

These applications share many features with each other, such as notifications, historic data overview, and AQI information; and while these features are shared in common with ENVIROFI's vision for Work Package 2 as well, they do not go nearly as far as the PEIS in terms of providing a customisable Smartphone service for e-Environmental monitoring.

The ENVIROFI PEIS is currently the most advanced application "on any platform" as it incorporates all the common functionality available to many Smartphone applications but it also includes additional features that are unique only to it. These features take the PEIS to a whole new level and almost literally 'puts the environment in the palm of your hands.' Some of these features are highlighted in the section, Going beyone the State-of-the-Art.

5.2 Going beyond State-of-the-Art

A key feature of the PEIS is that it incorporates data from different sources. Currently there are many weather watching applications, air quality applications and even some pollen warning applications. However, there is no single application which incorporates all three of these differing data sources into a single, homogenous system.

Additionally, the PEIS not only receives data from different source types, but also from different countries. The future potential for PEIS is thus extremely broad, since it will be able to receive data from a wide range of sources and channel this data into a single point. Thus allowing a PEIS user to travel (for example, within Europe) and receive information, warnings, threshold alerts, etc, wherever he is.

The PEIS prototype will demonstrate this potential by incorporating data from Austria and Norway and enable users in both locations to take advantage of its functionality.

Features such as the customisable threshold alerts as well as the predictive health alerts, make the system extremely user configurable and enable the user to engage with the data, and hence the environment, in a dynamic way. In addition, the user can provide their own input directly into the system which will add another layer of observational data. This takes the form of environmental observations as well as health related observations. The predictive alert system will then use the personal observations to make predictions based on both historic information and current conditions.

These features place the PEIS very far ahead of all "current" Smartphone apps designed to alert the user to changing weather or air quality conditions and will create a whole new level of expectations from the user as to the services provided, method of delivery and ability to interact with the system and data, and in doing this it will raise the bar for future service providers who will need to ensure that they offer a truly interactive system and not just offer basic data services.

6 User, Roles and Business Models

6.1 User groups

As we have seen in deliverable D2.1 [01 - ENVIROFI Consortium], our work package targets a wide variety of different user groups. Apart from normal citizens that are mostly interested in basic weather and air quality predictions for the current and next few days, typical user groups with in interest environmental data are hobby meteorologists, allergenic persons, outdoor sportsmen and people at risk. While the needs of these diversified groups is often quite different, because the PEIS is designed to be both flexible and totally customisable, they will all use the same basic mechanisms and tools to interact with the system. For this reason our scenarios, as described in section 6, differ in the roles offered but are accessible to all user groups.

However, our first approach lacks the possibility to manage these different user groups and does not distinguish between the different quality of data as is e.g. required for researchers or public authorities. Additionally, it makes sense to give regular users the possibility to register themselves when using the PEIS. In this way they have a personalized access to the system independent of the device they use and it becomes easier to apply a business model in which the user has only access to services he paid for.

To reflect this broader usage of our environmental system, we suggest to consider three different user groups, namely a group that covers all users (all), another for regular users with registration (registered users) and a third for administrators (admins). Apart from this the system itself and the stakeholders are additional actors.

6.2 Mapping of users to common roles

Based on our more generalized understanding of user groups, it makes sense to define their responsabilities in more details and to provide a hierachy among them.

- Administrator**:** The administrator stays at the top level of our user group hierachy. He can controll and manage the different user groups and is additionally equipped with rights to manage the data provided by the users. Since he has to administrate the whole PEIS, he needs these rights within all three scenarios. Among the functional use cases the following two categories provide special use cases for administrating the system:
  - Functionality 1**:** *User Administration & Authentication*
  - Functionality 2**:** *Data Administration & Storage*
- Unregistered Users**:** This user group can make use of the basic features of PEIS, i.e. they can request weather and air quality forecasts and monitor environmental conditions at different locations. However, if a service requires regular input of user data, e.g. in case of the personalized warnings, these user have to register themselves in order to allow the system to reference the provided input properly. Due to their limit access they have no allowance to make use of the functional use cases and thus can only act within scenario A: *Personalized environmental information.*
- Registered Users**:** Once users are registered to the PEIS they have access to all roles provided by the scenaric use cases. Since they can provide personalized observational and health reports and are allowed to manage their own uploaded data, two categories of functional use cases are relevant to them:
  - Functionality 2: Data Administration & Storage
  - Functionality 3: Semantic Quality Assurance & Feedback

- System**:** Since the cross-cutting use cases basically describe roles on the functional level of the system, they describe at the same time the responsibilities of the system. While in the scenaric use cases the system is always a secondary actor, it is the primary actor for the functional use cases.

A mapping of users to common roles on the use case level can be found in the appendix. The figure below provides an overview of the roles a registered user can make use of.

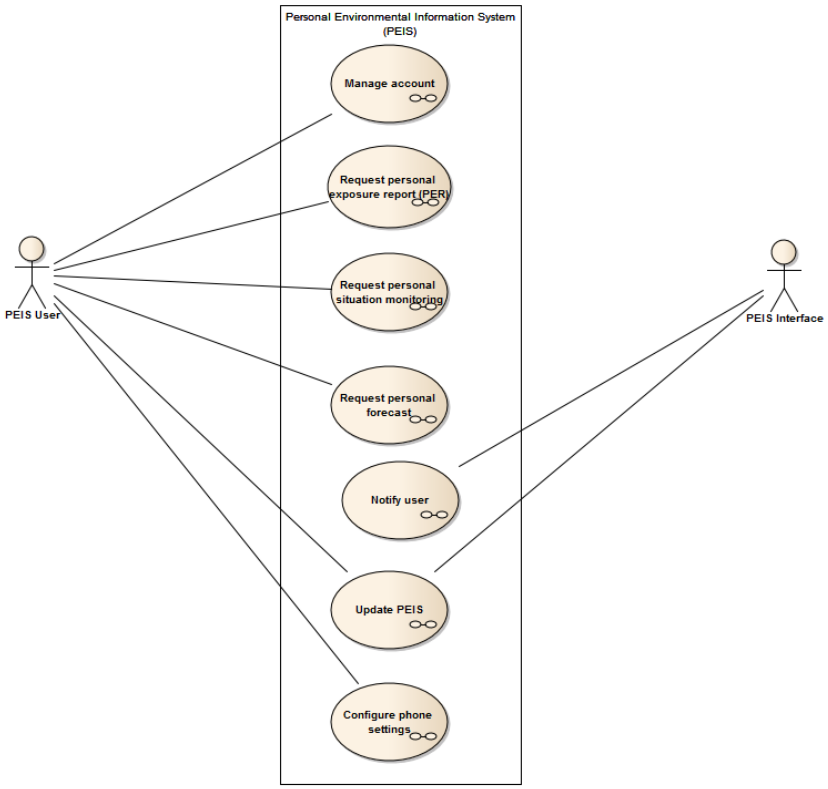

Figure 4. Roles of a registered user in PEIS

6.3 Business Models

Providing services based around the PEIS prototype that will enable users to leverage the full power of the combined data types and create their own uniquely personalised environmental data system. These services can be delivered via a number of different business models. Subsequently we provide an overview of the possible business models that could be applied for single consumers or other businesses.

6.3.1 Business2Consumer

Freely available:

- as a test version
- standard version but with advertisements
- standard version but user provides personal input

Subscription:

- user can purchase e.g. pollen data on regular basis.
- user can purchase full version for a certain duration.
- user can subscribe for a specific service.

Purchasable Full Version:

- user pays once and has unlimited access to the full version with all data and services.

6.3.2 Business2Business

Additional Service:

- a company is already a costumer and obtains service as add-on

Subscription:

- a company subscribes for a specific type of data and/or services

Available for a special prize:

- for authorities
- for research organizations
- universities

7 Data Sources and Data Input

7.1 Meteorological data

- Local data for Vienna is available from UBIMET
- Local data for Oslo is available from Met.no

7.2 Pollen data

Pollen data is currently being made available from two sources;

- Vienna (UBIMET/UNIWIE cooperation) since January 2011
- Norway (NAAF, NILU)

The pollen data for Norway will be supplied by the Norwegian Society for Asthma and Allergy. This data is currently available to NILU and will be made part of the ambient air quality information for Oslo.

7.3 Air quality data

Austrian + Norwegian official networks

Air quality information will be made available for two cities, Oslo and Vienna.

Data for Oslo will be supplied by the Norwegian Institute for Air Research, while the Vienna data will be supplied by Umweltbundesamt in Austria.

7.4 User Input

VGI Volunteer Geographical Information. Users will input their own direct observations into the system to provide another layer of data.

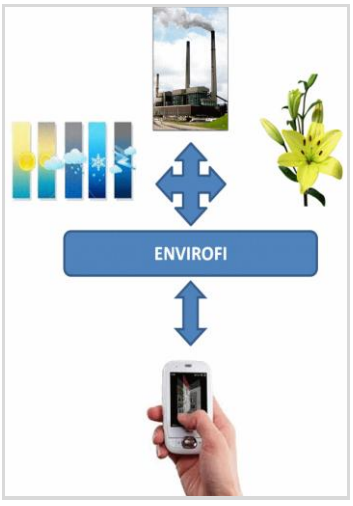

Figure 5. Different types of data sources in WP2

8 Conclusions and Future Work

This deliverable has summarized the work done with regards to the use case revision within ENVIROFI WP2. We have taken the original use cases, and further refined them through an iterative review process and identified a large number of new Use Cases that describe functionalities that can be applied throughout our scenarios within WP2. This has led to the development of a higher standard of more harmonized and complete use case collections better reflecting the concept of the PEIS. In addition, efforts were used to create UML diagrams that demonstrate the use cases and their relationships. These are also included in the appendix and where relevant are included directly in the use cases themselves.

The use case revisions presented in this document have been directly used within WP5, where system requirements for the FI are derived. Furthermore, WP4 has extracted information on generic and environmental enablers. These will be later used for discussions with the FI-PPP advisory board. Information will be completed with feedback from the ENVIROFI stakeholder community, which is collected via the stakeholder engagement work package (WP6).

The experiences gained in the presented use case analysis have already been fed back to WP4, which is responsible for the overall definition of the use case and requirements capturing methodology, including the provision of use case and requirement templates. As a result, future use case and requirement descriptions might be provided with extended, more restrictive and formal guidelines, which should improve their overall quality.

The next phase will bring:

- Creating UML diagrams for functional use cases
- Refining and aligning functional use cases throughout work packages (esp.1,2,3)
- Use further stakeholder input during next revision cycle
- Expand on business models (new use cases) and data sources, formats etc.

This will lead us to a position where the development of the PEIS will be realisable and enable the creation of a tool that will make the environment a part of people's everyday lives.

At this point, we would like to provide our thanks and acknowledge the support of Sparx Systems (http://www.sparxsystems.com/), who generously provided non-commercial software licenses for the Enterprise Architect UML editor, as part of their on-going commitment to supporting environmental standardization efforts.

9 References

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Table 12. References within this deliverable

10 Annexes

The following sections provide an overview of the first revision of use cases within the ENVIROFI atmospheric scenarios. The detailed use case information is available from the online ENVIROFI use case repository, this annex just reflects the recent status (September 30, 2011).

10.1 Modeling of UML diagrams

All thematic WPs started the (semi) formal specification of use cases with the Unified Modeling Language (UML). At this stage, the diagrams reflect current work in progress and focuses on the thematic use cases. The full specifications are still in progress as they require in depth discussions between WP1, WP2, WP3, but also with the technical work packages (WP4 and WP5). Recent versions are available as Enterprise Architect files.

Disclaimer: we are well aware that we are at the moment not committing to the common semantics of UML. Whereas sequence diagrams ought to explain message exchange between processes, activity diagrams should be used when explaining workflows with support of choice. This is beyond the scope of current T2.2 work, where. We currently do not have any intensions to go further in the formal system specification (in this WP)

10.2 Overview of Use Cases

The table below provides an overview of all functional and thematic use cases in WP2 including changes with respect to deliverable D2.1 and an extra column for the primary actors in each use case. The details about each use case are given in a separate annex.

ID	Name	New	Changed	Renamed	Actor
UC-ENV-2.1-aut-01-V01	Provide web based services for administration	X			System
UC-ENV-2.1-aut-02-V01	Register user on web portal	X			System
UC-ENV-2.1-aut-03-V01	Login user	X			System
UC-ENV-2.1-aut-04-V01	Administrate users	X			Admin
UC-ENV-2.1-aut-05-V01	Change personal settings	X			All users
UC-ENV-2.1-aut-06-V01	Check personal settings	X			All users
UC-ENV-2.2-dat-01-V01	Upload of data from external sources	X			System
UC-ENV-2.2-dat-02-V01	Edit provided data	X			All users
UC-ENV-2.2-dat-03-V01	Check availability of data on system server	X			System
UC-ENV-2.2-dat-04-V01	Download data to mobile device	X			System
UC-ENV-2.2-dat-05-V01	Store data on system server	X			System
UC-ENV-2.3-vis-01-V01	Select temporal extent of requested information	X			All users
UC-ENV-2.3-vis-02-V01	Select location for requested information	X			All users
UC-ENV-2.3-vis-03-V01	Select environmental parameter of interest	X			All users
UC-ENV-2.3-vis-04-V01	User views data on web portal	X			All users
UC-ENV-2.3-vis-05-V01	Fuse real-time data with user reports	X			System
UC-ENV-2.3-vis-06-V01	Provide visualization of requested data	X			System

ID	Name	New	Changed	Renamed	Actor
UC-ENV-2.4-pat-01-V01	Provide activity pattern of user	X			System
UC-ENV-2.4-pat-02-V01	Determine air quality from uploaded photo	X			System
UC-ENV-2.4-pat-03-V01	Determine weather condition from uploaded photo	X			System
UC-ENV-2.4-pat-04-V01	Geo-tag provided report	X			System
UC-ENV-2.5-sem-01-V01	Check observational report of user	X			System
UC-ENV-2.5-sem-02-V01	Cross-check report with internal data	X			System
UC-ENV-2.5-sem-03-V01	Determine user trustability	X			System
UC-ENV-2.5-sem-04-V01	Request validation of report from other users	X			System
UC-ENV-2.5-sem-05-V01	Rate accuracy of provided service	X			Reg. users
UC-ENV-2.6-mis-01-V01	Determine GPS position of mobile device	X			System
UC-ENV-2.6-mis-02-V01	Share information with social networks	X			Reg. users
UC-ENV-2.6-mis-03-V01	Share information with other users	X			Reg. users
UC-ENV-2.6-mis-04-V01	Pay for requested service	X			Reg. users
UC-ENV2.A-PSM-01.01-V02	Display current meteorological conditions and events		X	X	All users
UC-ENV2.A-PSM-02.01-V02	Display current exposure to air pollution and pollen		X	X	All users
UC-ENV2.A-PFO-01.01-V01	Display predicted meteorological conditions and events			X	All users
UC-ENV2.A-PFO-02.01-V01	Display predicted exposure to air pollution and pollen			X	All users
UC-ENV2.A-RPT-01.01-V02	Display past meteorological conditions and events		X	X	All users
UC-ENV2.A-RPT-02.01-V03	Display past exposure to air pollution and pollen		X	X	All users

ID	Name	New	Changed	Renamed	Actor
UC-ENV2.B-NTA-01.01-V02	Create parameter threshold to receive personalized alerts		X	X	Reg. users
UC-ENV2.B-NTA-02.01-V03	Raise system alert and notify user if threshold is breached		X	X	Reg. users
UC-ENV2.B-NTA-03.01-V02	Choose from predefined profiles in order to receive alerts		X	X	Reg. users
UC-ENV2.B-PRA-01.01-V02	Provide thresholds for alerts on the basis of historic user input		X	X	Reg. users
UC-ENV2.C-USI-01.01.-V02	Report environmental observation to system		X	X	Reg. users
UC-ENV2.C-USI-02.01.-V02	Report health condition to system		X	X	Reg. users
UC-ENV2.C-USI-03.01.-V02	Provide demographic information of user		X	X	Reg. users
UC-ENV2.C-USI-04.01-V01	Display observational reports of other users	X			Reg. users
UC-ENV2.C-USI-05.01-V01	Display health reports of other users	X			Reg. users

Table 13. Overview of use cases in atmospheric work package