SEVENTH FRAMEWORK PROGRAMME

ICT PPP

Future Internet

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

FP7-284898

Collaborative project

D2.4.1 Prototype of Application I

Guidelines Document

NILU

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Version	Date	Modified by	Comments
0.1	30/10/2012	Mike Kobernus (NILU)	Created first version and published
0.2	02/11/2012	Jasmin Pielorz (UBIMET)	Added abbreviation and acronyms, as well as provided correction to latest version.
1.0	06/11/2012	Jose Lorenzo, ATOS	Final revision

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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

Abbreviation / Acronym	Description
AQI	Air Quality Index
GEO	Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GMES	Global Monitoring for Environment and Security
FI-PPP	Future Internet Public-Private Partnership
INSPIRE	Infrastructure for Spatial Information in Europe
NFC	Near Field Communication
OGC	Open Geospatial Consortium
OMG	Object Management Group
PEIS	Personal Environmental Information System
PM10	Particulate Matter of 10 µg weight
REST	Representational State Transfer
RM-ODP	Reference Model for Object Distributed Processing
SDI	Spatial Data Infrastructure
SOA	Service Oriented Architecture
SoS	System of Systems
SoSE	System of Systems Engineering
SWE	Sensor Web Enablement
UML	Unified Modelling Language
VGI	Volunteered Geographic Information
VP	Viewpoint
W3C	World Wide Web Consortium
WMS	Web Map Service
XML	Extensible Mark-up Language

Table 1. Abbreviations and Acronyms

Executive Summary

The Personal Environmental Information System, or PEIS, is a mobile application designed to provide easy and intuitive access to environmental data. It is intended to meet a need that we believe will become more acute in the future; that people need environmental data that is tailored to their specific requirements.

As part of the ENVIROFI project, the team responsible for the PEIS have been striving to achieve the necessary data integration and infrastructure development that will enable a user to move from place to place (within Europe) and automatically be informed on local environmental conditions including meteorological, air quality and pollen. Furthermore, the PEIS should also enable the user to make observations of their own, both on the state of the environment and their own subjective health. These data will then be incorporated into the system allowing other users to be updated, when relevant.

This deliverable provides an installation description and user guide to the first prototype version of the PEIS application. Main functionalities include the visualization of air quality stations in Oslo and overlays for different pollution components providing the current (modelled) dispersion of the correspondent component.

1 Introduction

From the moment of our birth until our very last breath, we spend our lives immersed in a mixture of gases and aerosols known as "the air" or "atmosphere". Unsurprisingly, our well-being is closely connected to the characteristics of the air.

An average adult inhales and exhales close to ten litres of air each minute while at rest, while during heavy exercise, this volume will rise steeply and could be as high as 150-250 litres per minute.

However, while we are all clearly exposed to the air, sensitivity to airborne pollutants is very different from one person to another and in many cases highly dependent on the individual's patterns of behaviour.

Yet, while each individual has a unique relationship to the environment, the information on the state of atmosphere and related hazards available today is entirely generic, and by no means personalised.

We intend to address this lack of individualized information, through the development of an affordable 'Personal Environmental Information System, or PEIS' that will provide environmental data to the user that is tailored to their specific needs and interests.

2 Links to prototype

The PEIS prototype that has been developed during the ENVIROFI project can be accessed by either using the online version of the application or by installing the actual application on a mobile phone. To learn more about the available functionalities and on how to use them, there are a number of supporting documents, such as a demonstration webcast and a user guide for the prototype. This is intended to simplify the review process, as being a prototype, there are specific conditions to using the PEIS. More details on the available documents and files, as well as a detailed description of how to download and use them, can be found in the subsequent sections.

2.1 Online version

The online version of the application is provided to those people that want to test the application prior to installing it on their phone. It does not have the full functionality of the actual phone application; however, it does demonstrate most of the key features.

NOTE: The Online application requires a **Webkit** browser to run, so either Chrome or Safari can be used. While it may run on other browsers, they are not tested or supported so no guarantees can be made for them. If you try to run the online browser in a non **Webkit** browser, most likely you will see nothing or have erratic performance.

2.2 Phone application

The actual application is designed to work on the Android platform only.

Please note, this is not a commercial application and requires additional steps to install compared to most phone applications, so please follow the instructions carefully as described in section 3.2

2.3 Demonstration Webcast

This visual demonstration is intended to provide an overview of the PEIS to those individuals who have an interest, but are unable to run the application on their phone, are not able to test the application via the online web version or who may wish to inform others of the system.

To make this webcast, we created a series of PowerPoint slides that addressed the various background requirements that led to the creation of the PEIS, which we then merged with a narrated voice over.

The online Webcast demonstrating the background to the application and a walkthrough of its functionality can be viewed here:

http://Dev0.nilu.no/users/mjk/envirofi/WP2/index.html

Figure 1: Slide 1 from webcast

2.4 Paper Documentation - Guidelines document

This document in PDF Format can be downloaded from:

http://www.envirofi.eu/Portals/89/Docs/Project/Public_deliverables/D2.4.1_PEIS_Prototype_of_Application_I-Guidelines_document_v1.0.pdf

2.5 Online Application

The online application is provided to enable testing of the PEIS. You can find the online version listed in the products page on the ENVIROFI Web Portal, here:

http://www.envirofi.eu/ECRestrictedArea/ProjectPilots/tabid/10792/Default.aspx

Figure 2: Prototype access page on www.envirofi.eu

2.6 Download Application

To install the PEIS to your phone, first download the installation package here:

http://envirofi.ait.ac.at/arml/prototype_releases/PEIS/

NOTE: You must review the instructions in this document before proceeding further.

3 Guidelines to Users

3.1 Getting started

Read this guidelines document prior to using the online version of the PEIS, or installing it to your phone. This is useful in order to have a good understanding of what it can do, and how it works.

3.2 Installation

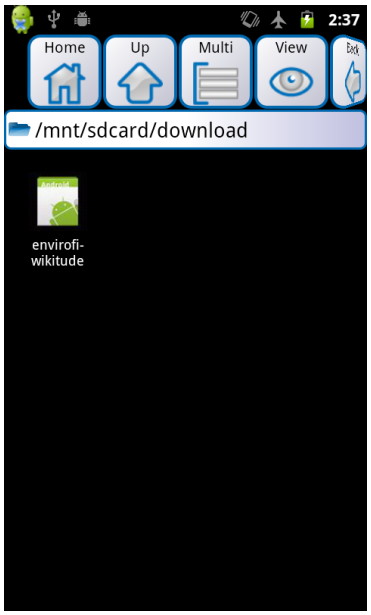
As a new user of the Personal Environmental Information System, or PEIS, you must first install the application. If you have already done this, skip to the next section.

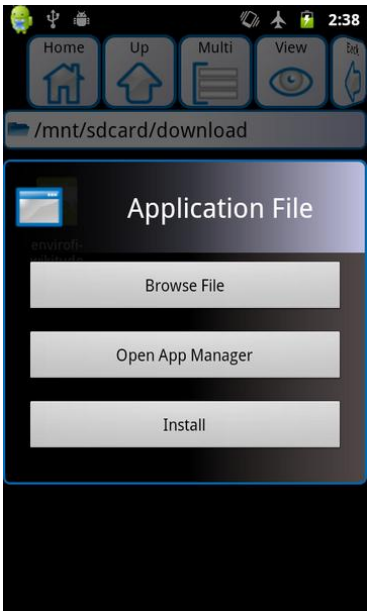
To install the application, please follow these steps:

First of all, go to the android release folder on the ENVIROFI server of AIT and download the latest version to your PC (currently PEIS 0.2.5). The hyperlink for this is http://envirofi.ait.ac.at/arml/prototype_releases/PEIS/

Make sure the file ending is ".apk" as some browsers are renaming the file to ".zip". Connect your phone with your computer, turn on the USB storage and copy the application to a folder of your choice (e.g. "Downloads").Now you have to install the Astro File Manager from Android Marketplace. https://play.google.com/store/apps/details?id=com.metago.astro&feature=search_result

Start it and go to the folder where you have saved the previously downloaded application. The screen on your mobile should display the following:

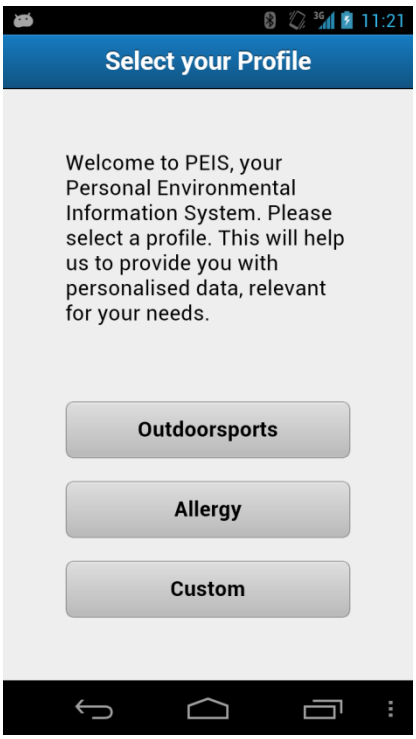




- Click on the "Install" button. It might be that the following message occurs:

- Click on "Settings" and enable the "unknown sources" option as shown in the picture below.

- Go back to the Astro File Manager and install the PEIS application. After installing you can find "PEIS" in the program menu with all other installed applications.If you are currently not in Oslo, you will not see any Air Quality Stations initially. In order to simulate being in Oslo, you can install Fake GPS from Google Play (former Android Market),
- https://play.google.com/store/apps/details?id=com.lexa.fakegpsor you simply deactivate all your locations services in the Settings of the Phone (Settings-->Location Services).This is necessary, as currently only AQI data from Oslo measurement Stations is available in the PEIS. Once you have installed the application, of if you have elected to view the online version, then you are ready to start using the PEIS.



3.3 Profile Selection

Before you can use the system, we first need to know what environmental data is useful to you. To make this simple, we have created some predefined profiles which track certain components.

You can use one of the existing profiles or choose to create your own. Once this data has been established, you will not see this screen again, as you will automatically be directed to your data screen.

For testing purposes, we recommend that you use the Outdoor Sports profile as this displays the most functionality currently.

Outdoor Sports

The Outdoor Sports profile is intended for those people who are active in outdoor activities, such as cycling, running, Tennis, etc. Because a person's respiratory rate increases when exercising, certain environmental components become increasingly important. We automatically track the following components for this profile:

- Temperature
- Precipitation
- Humidity
- PM10
- PM2.5
- Ozone
- UV

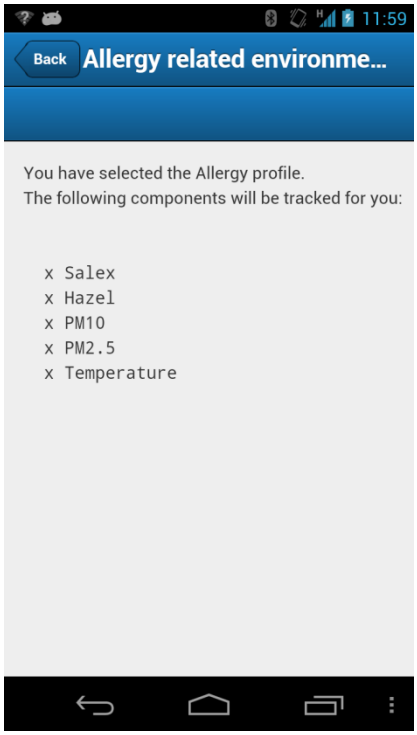
NOTE: While we have created two example profiles (Outdoor sports and Allergy) and we allow for the creation of custom profiles, the GIS application showing the current user location and any current air quality overlays is currently only available to the Outdoor sports profile.

3.3.1 Allergy Profile

The allergy profile is intended for someone who suffers from hay fever. Although there are multiple different types of pollen, the most typical types that affect the largest number of people are included. We automatically track the following components for this profile:

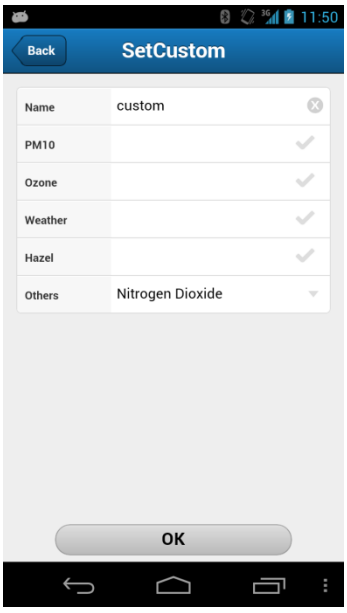
- Salix
- Hazel
- PM10
- PM2.5
- Temperature

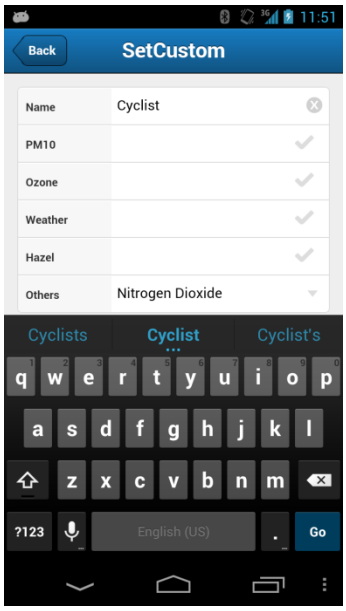
NOTE: Users can adjust the components tracked in the predefined profiles by customising them. This enables a highly personalised presentation of environmental data to the user.

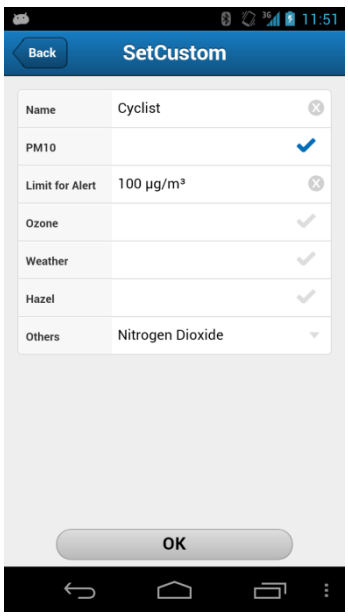


3.3.2 Custom Profile

The custom profile allows you to define your own profile, and determine what data you want to track in the system, as well as to set your own threshold limits.



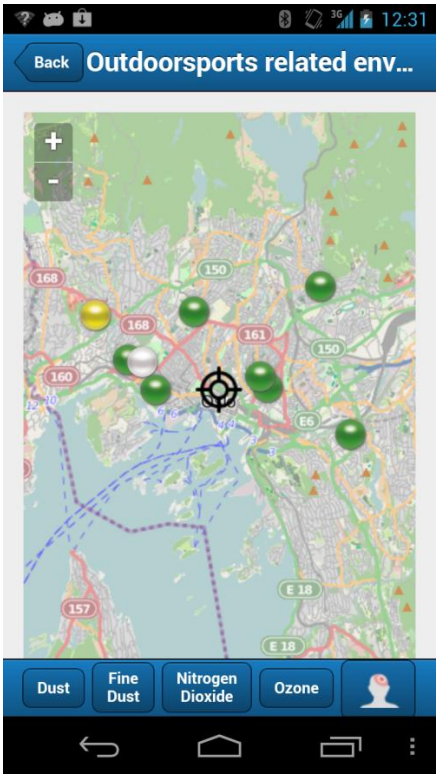




You can specify a new name that is relevant for your activity, for example, “GOLF!” or “Cycling” and choose which components to track. You can also set the threshold level for notifications here as well. This means that when the component exceeds the level specified in your profile, you will be alerted. In this example image you can see that the profile has been renamed to “Golf Profile” and the user is tracking PM10 with a threshold setting of “Low”.

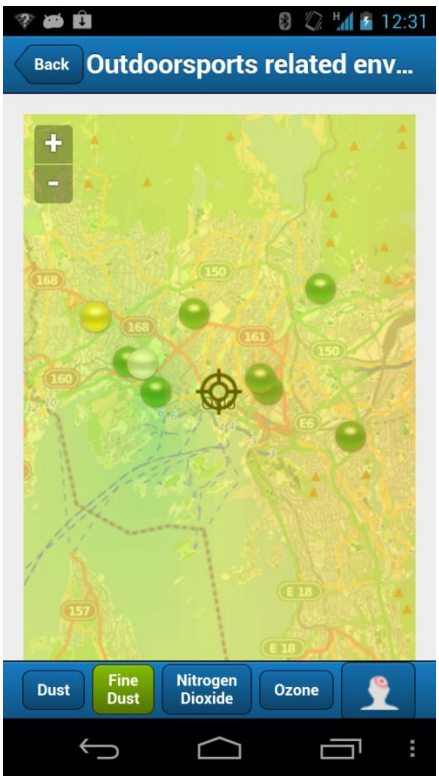
3.4 Current Status Report

We identify the user’s location via the GPS built into the user’s own phone. Once we know where the user is, and we know what the user is interested in (from the user profile) we can display relevant data to the user in a number of ways.

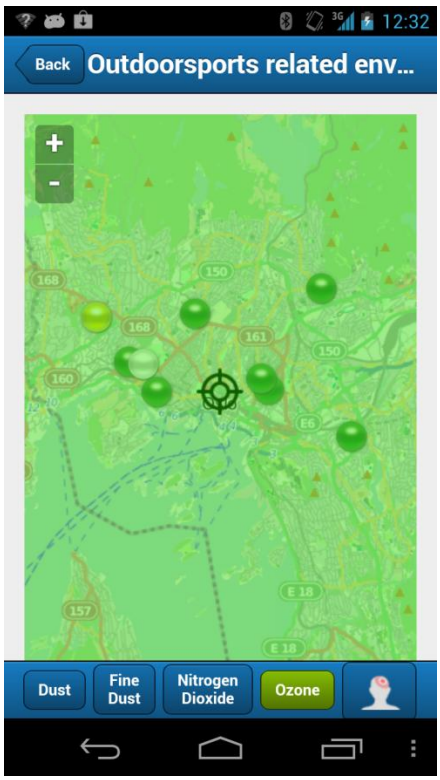


City measurement stations in Oslo, showing current Air Quality. User location denoted by crosshairs

Overlay showing current Dust (PM_{10}) in Oslo



Overlay showing current Fine Dust ($PM_{2.5}$) in Oslo



Overlay showing current Ozone in Oslo

3.4.1 Station Overlay

The images above show the location of the user, surrounded by coloured circles. These circles represent the actual locations of air quality measurement stations, while the colour represents the current Air Quality level at the station, in real-time.

- White means NO DATA
- Green means No risk
- Yellow mean some risk
- Orange means moderate risk
- Red means high risk

3.4.2 Station Data

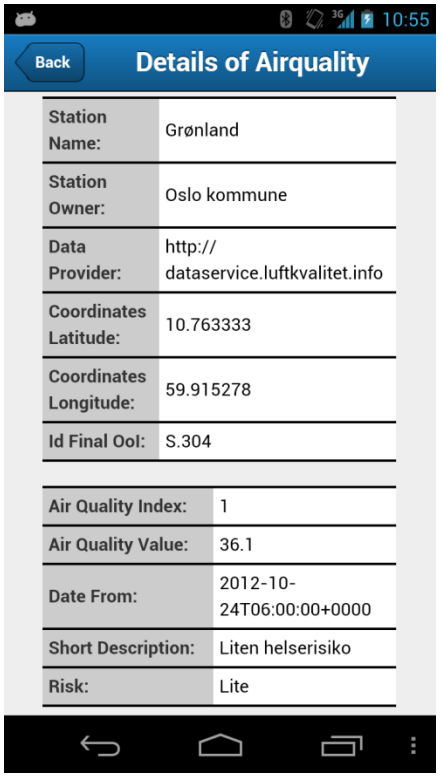
The user can click on a station in the GIS Map, to see various metadata for the station which includes:

- Station ID
- Component shown
- Station name
- Station Owner

Since much of this data is not useful to the user, we filter it and present it in a different lay-out. See below:

Id:	S.304.p
Station Name:	Grønland
Station Owner:	Oslo kommune
Data Provider:	http://dataservice.luftkvalitet.info
Data Provider Trust:	1
Coordinates Latitude:	10.763333
Coordinates Longitude:	59.915278
Schema Ool:	station
Schema:	observation
Id Final Ool:	S.304
Station Ext Id:	304
Storage Time:	2012-10-17T14:07:40+0000
Creation Time:	2012-10-17T14:07:40+0000
Air Quality Index:	1
Air Quality Value:	36.1
Date From:	2012-10-24T06:00:00+0000
Date To:	2012-10-24T07:00:00+0000
Short Description:	Liten helserisiko
Description:	Liten eller ingen helserisiko.
Text:	Lite
Color:	00E400

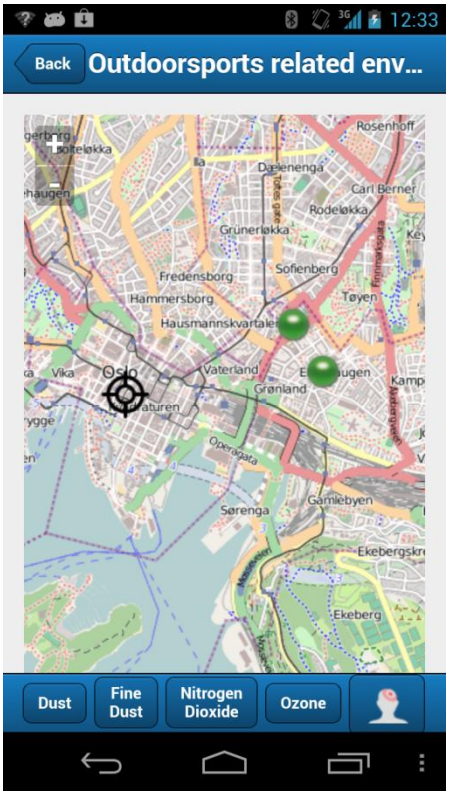
Available metadata for use in the station details page.



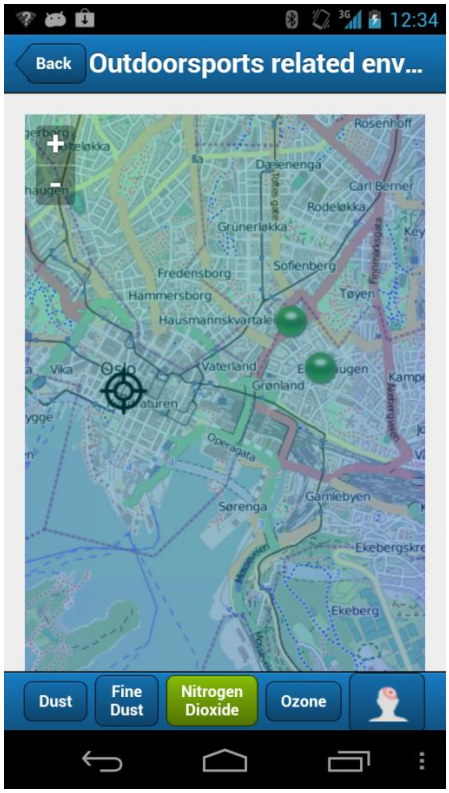
Station details page for Grønland station, in Oslo.

3.4.3 Pollution Overlay

The user can toggle on/off pollution overlays on the GIS map. In this instance, the image is showing the user in downtown Oslo. If the user wishes to see the current air pollution levels for the components that he is tracking, then he just needs to tap on the toolbar buttons. The second image shows NO_2 in the area in which the user is located. Currently, NO_2 is fine, so the user can tap the button again, and the overlay is removed.



User location and stations showing current AQI



User elects to view NO_2 overlay

As with the stations' Air Quality Index, the darker the colour, the worse the pollution level. The following list provides a guide to understanding the current pollution level in the overlays.

- Green means No risk
- Yellow means some risk
- Orange means moderate risk
- Red means high risk

In this instance, it appears that the city is largely in the green, so there is little or no risk. However, in the image below, we can see both yellow and red in the overlay, indicating higher risk.

Overlay for Dust (PM_{10}) indicating higher risk

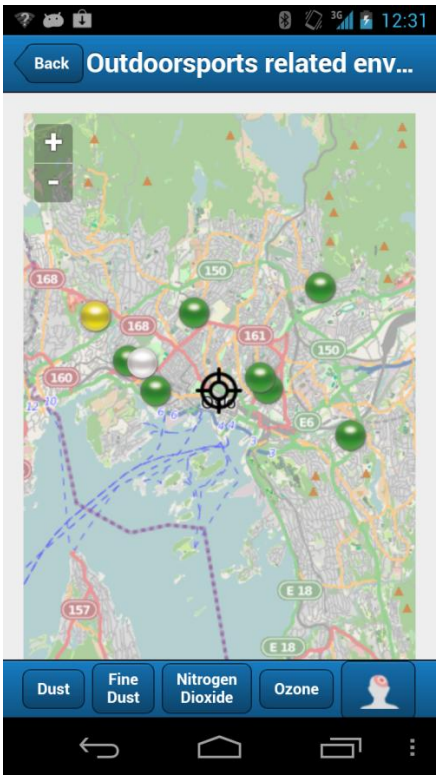
3.4.4 Weather Data

You can view current and forecast weather data on the app by selecting the toolbar button “Weather”. This will then display the data in the user’s current location. NOTE: Forecast weather data will also be for the user’s current location, so care should be taken when travelling. For example, if you want to check the weather tomorrow, in Prague, then you must set the user location to Prague first. Otherwise the forecast will be for your current location.

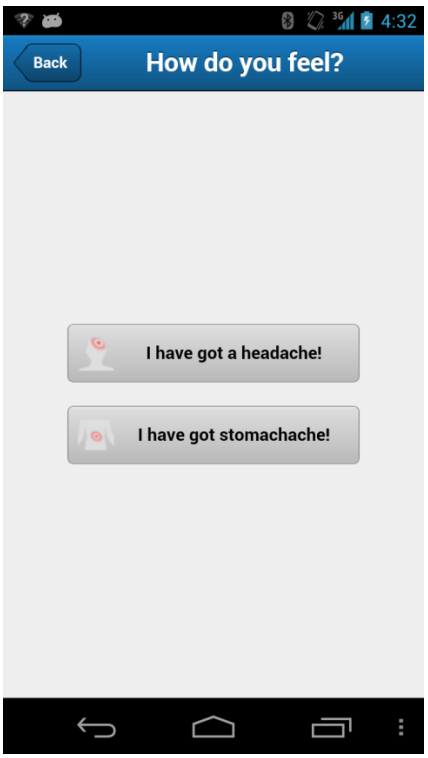
Meteorology data with Current AQI information included

3.4.5 User Observations

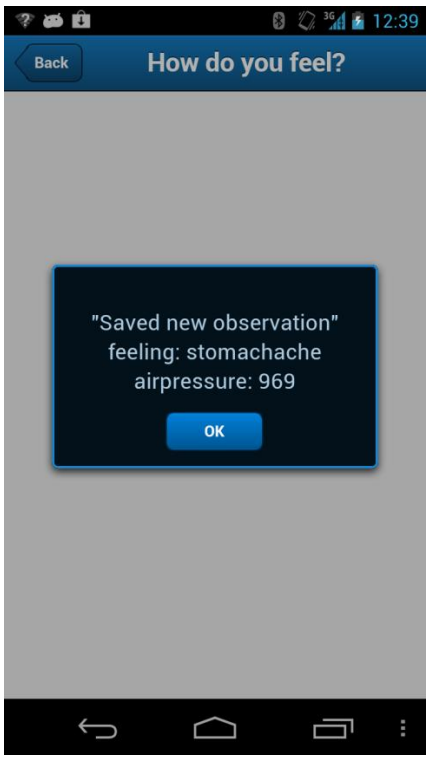
Users can upload their own observations to the system through the phone. This takes two forms currently, sensor observations (some phone in test currently have built in sensors, such as humidity, air pressure, etc, which we can read and take observations from) and subjective observations, such as how the user feels.



The user can select the observations icon



User can input currently only 2 subjective observations



Observation data is saved to the same database as the measurements from the static stations

Later versions of the PEIS will include additional functionality, and will expand upon what is currently available here. For testing purposes, we will elicit feedback from users with an online form that will encourage them to evaluate the PEIS. This gives the user the opportunity to say what is good, what is bad, or does not work as well as to specify new functionality that they wish to see implemented.

4 Feedback page

The feedback form is designed to capture responses from users and stakeholders with regards to the app's functionality, usability and usefulness. It also enables the user to provide input on suggestions for improvements as well as additional features. This data will be captured during the development and testing phases of the project with the results making up part of the final deliverable documentation. This data can then be used to improve the system in any future phases. This form will be available online from the ENVIROFI Products page.

Feedback Form for ENVIROFI-PEIS

Installation

How would you rate the installation process for the App?

Very Good	Good	Bad	Very Bad

Basic Usability

How user friendly is the App?

Very Good	Good	Bad	Very Bad

How would you rate the configurability of the App?

Very Good	Good	Bad	Very Bad

How easy was it for you to find data of interest in your area?

Very Easy	Easy	Bad	Very Bad

Providing Observations

How important is it for you to provide your own observations to the App?

Very Important	Somewhat Important	Not very important	Not Important at all

How easy was it for you to provide your observations using the app?

Very easy	Easy	Difficult	Very Difficult

Your experience with the prototype

How long have you been using the ENVIROFI-PEIS prototype?

sporadically (less than one day per month)	regularly (at least one day per month)	a lot (more than one day per month)

Which features would you improve?

Free text 400 words

Additional Comments

Free text 400 words

Would you be interested in participating in other tests related to ENVIROFI?

E-mail for future contacts (with due privacy statement)

5 Release Data

The following information details the development of the PEIS and includes basic functional updates for each version so far.

PEIS v0.2.5

- including the real air quality indices for the stations
- changing the workflow that the app starts directly at the profile which was stored by the user, or predefined "outdoorsports" in this release
- adding a selection (buttons) for showing the dust, fine dust, nitrogen dioxid or ozone WMS layer in the outdoorsports map
- adding "how do you feel" that can transmit indisposition in combination with location and sensor data (air pressure value)
- changing the custom profile for showing customized/combined data (weather/airquality data)

PEIS v0.2.4

- adding the functionality of showing a web map service (WMS) - layer on top of the outdoorsports map showing the current air pollution
- adding the functionality of transmitting the current air pressure value (taken from the internal air pressure sensor of a smartphone) together with timestamp, current position and a type like "headache" to the couchbase (http://envirofi.ait.ac.at/GeoCouch/_utils/database.html?newobservation)
- this service only works on phones with air pressure sensor like the Galaxy Nexus properly

PEIS v0.2.3

- adding the functionality of transmitting the current air pressure value (taken from the internal airpressure sensor of a smartphone) togehter with timestamp, current position and a type like "headache" to the couchbase (http://envirofi.ait.ac.at/GeoCouch/_utils/database.html?newobservation)
- this service only works on phones with air pressuresensor like the Galaxy Nexus properly

PEIS v0.2.2

changing the workflow of the app:

- added a custom profile
- added station data to the spatial design main document in couchbase for getting more fields of the NILU data … tree data is still there for older versions of the app

PEIS v0.2.1

- added the functionality of starting the app with NFC Tags

- increasing minSDK version from 7 to 10
- changed from phonegap-1.2.0 to cordova-1.6.1

PEIS v0.2.0

- added current weather forcast to the app (from worldweatheronline.com) for a showcase till weather data from our project partners is available

PEIS v0.1.0

- added Airquality stations to the map

PEIS v0.0.0

- basic structure of the app including the open street map

6 Suggestions

Bug reports and suggestions shall be placed at: https://service.ait.ac.at/mantis/main_page.php

7 Conclusions

The PEIS mobile phone application is a working prototype that is under continual development. At this stage, end October 2012, we have achieved substantial amounts of the desired functionality and have proven the concept that you can take real-time air quality measurement and meteorology data and present it to a user, according to hisown demands for what he sees, when and how. The ability to acquire the user's geographic location, and marry that to current environmental conditions is demonstrably working, with the additional feature that the user can dictate the data delivered by modifying his profile. Added to this the ability of the PEIS to acquire sensor data directly from the user's phone, as well as the inclusion of Volunteered Geographic Information (VGI) from the user as they inform us of the current well being, and we have delivered more than a simple methodology or framework, we have delivered the first version of a working prototype that provides environmental information, tailored to a user's specific needs.

This process required much development of infrastructures, such as specific and generic enablers, and these will be exploited further in this project, as well as later stages of the ENFIROFI saga. Furthermore, external FP7 projects have expressed considerable interest in using our enablers and there is good potential for re-use of the developed software in other projects, such as CITI-SENSE, which has just begun its 4 year project.

Further development for the PEIS is planned within the project, and will include notifications when threshold levels are broken, as well as more sophisticated user observation submission features (better VGI interface).