D7.1: Pilot plan

WP7 – Pilot operation and evaluation

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1 Executive summary

This document provides a description of the pilot plan for the pilot to be operated in Norway and Germany within the framework of the hackAIR project. This pilot plan shall serve as a general guideline aimed to give operational details on how the work will be done at each location and pilot study. The plan will intentionally be kept relatively open since sensor technologies will be regularly updated to keep up with the current advancements. We are planning to engage with participants only after the hackAIR platform will be up and running.

2 Introduction

This deliverable is the pilot plan for hackAIR as a general guideline, aiming at giving specific operational details on how the work will be carried out at each pilot study, with the goal of using a common structure where possible at both pilot locations, Norway and Germany.

The pilot plan is structured as follows:

- Background of the pilot case
- Aims and objectives of each pilot
- Pilot scope
- Methods – technological side: in collaboration with WPs 3, 4 and 5
- Methods – people side: in collaboration with WP2 and WP6
- Pilot implementation phases and responsibilities: in collaboration with WPs 2-8
- Risk assessment and contingency plan
- Pilot communication activities: in collaboration with WP8, pilot communication activities gives information on how the pilots will be communicated in both Norway and Germany, including tools we can offer to the participants, what participants can gain from their participation in the pilot and how they can use the hackAIR services, etc.

In addition, in cooperation with WPs 3, 4 and 5, we have developed a set of Key Performance Indicators (KPIs) aiming to be used to evaluate the performance of the hackAIR platform including the indicators to evaluate the main toolkit towards its planned objectives (See Annex).

3 Background

3.1 Background of the pilot case in Norway

Geographically, the pilot will cover the whole country of Norway, but we will focus on the following four cities where we have set up the initial contact aiming at engaging as many participants as possible (Figure 3.1):

1) Oslo: the capital and the most densely populated city in Norway.
2) Bergen: on the west coast, the second most densely populated city in Norway.
3) Trondheim: the third most densely populated city in Norway.
4) Tromsø: the most densely populated urban area in Northern Norway.

Figure 3.1 – Pilot location in Norway

However, since hackAIR partner NILU is located in the area of Oslo, the major engagement activities will be carried out in Oslo and the larger Oslo area. Oslo is experiencing rapid demographic growth. In some neighborhoods, this growth is as high as 2-3% per year. This creates challenges on the city's infrastructures, including traffic and health management, as well as on the maintenance of environmental quality. Additionally, motorized traffic in Oslo creates problems with congestion, air pollution and CO_2 emissions. It is recognized that air quality is a major factor affecting human health. In order to improve quality of life, Oslo is aiming for green mobility and green growth.

In 2017, the Oslo metropolitan area has a population of 1.5 million. The city has a population density of 1,400 people per square kilometer. The urban area has a population of 952,000 with an even higher density of 3,300 people per square kilometer[1].

In Oslo, air quality is constantly monitored by 12 air monitoring stations installed in 12 of the 15 districts of the municipality[2]. Pollutants measured include PM_{10}, $PM_{2.5}$, NO, NO_2, NO_X, O_3, SO_2, and BaP. Among the 12 stations, 11 stations monitor PM_{10} and 8 stations monitor $PM_{2.5}$.

In 2016, the yearly average $PM_{2.5}$ and PM_{10} level in Oslo was 8.63 $\mu g/m^3$ and 17.5 $\mu g/m^3$, respectively[3]. The Norwegian air quality standard for $PM_{2.5}$ and PM_{10} are 8 $\mu g/m^3$ and 20 $\mu g/m^3$ based on an annual average, respectively. $PM_{2.5}$ is thus above the air quality criteria.

Real-time air quality data at street level is currently scarce or non-existent in Norway. This undermines citizens' awareness of their environment, and consequently limits their ability to recognize and change both their contribution and their exposure to air pollution.

3.2 Background of the pilot case in Germany

The German pilot will extend through the whole of Germany. BUND is a grassroots organization, its national headquarter coordinating, representing and supporting the activities of 16 federal offices and around 2,000 local groups (Figure 3.2). Overall in 2016, BUND was counting a network of 584,000 members and supporters.

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[1] http://worldpopulationreview.com/world-cities/oslo-population
[2] http://luftkvalitet.info
[3] http://luftkvalitet.info/Libraries/Rapporter/Luftkvaliteten_i_Oslo_i_2016_-_En_oppsummering.sflb.ashx
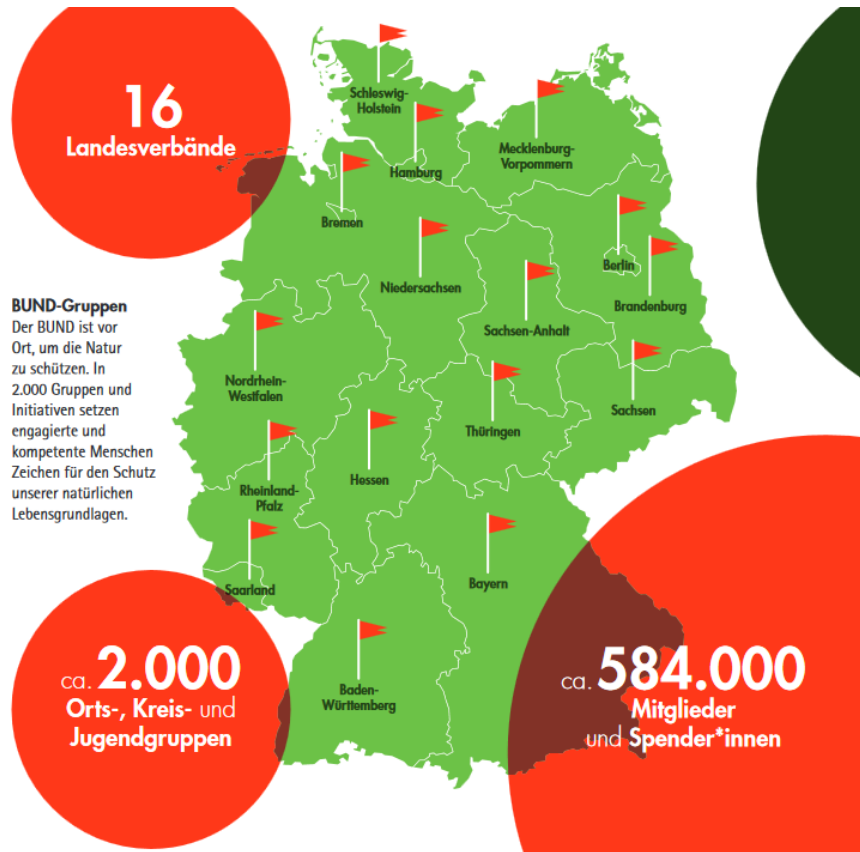
Figure 3.2 – Structure of BUND (German)

BUND is already getting in touch with several federal offices that are particularly active on the topic of air quality. These include Berlin, Hamburg, Stuttgart, and several cities in North-Rhine Westphalia. We are in touch with Bavaria as well, and talks with the regional offices in Munich have already taken place.

Air Quality has been a major topic in the last years. Germany has NO_2 levels consistently exceeding limit values in most of its urban agglomerations. A number of court cases is pushing cities to act more decisively on measures to improve air quality. Recent focus has been NO_2, but much of the air quality impacts as well as the public awareness are still targeting particulate matter (PM).

To date Germany does not have an easy to access go-to information source on current air quality levels. Local initiatives like the Stuttgart region luftdaten.info project, which is run by activists of the regional OKlab, are already pursuing a similar approach and hackAIR is integrating their obtained air quality data into the hackAIR platform.

4 Aims and objectives

The overall objective of the pilot operation and evaluation is to test, implement and evaluate the hackAIR platform, to engage citizens by using the hackAIR toolkit, to provide air quality information for the citizens, to raise citizens' awareness, to assess the impact of hackAIR in society, and to explore the exploitation possibilities of the hackAIR services in both Norway and Germany.

5 Pilot scope

The total number of targeted participants in the pilot is planned and presented in Table 5.1. The pilots are expected to involve 8,290 citizens, including 8,000 basic users, who will contribute with uploading mobile photos, and participate through perception questionnaires, and 290 dedicated users (i.e., enthusiasts/hacktivists) who will contribute with open hardware measurements.

Table 5.1 – Planned target participants in each pilot

Type of participants	Target number		
	Germany	Norway	Total
Basic participants in pilots	5,000	3,000	8,000
Dedicated participants in pilots	200	90	290
Total	5,200	3,900	8,290

6 Methods – technological side

In the pilots both in Norway and Germany, we will test, implement and evaluate the technical elements along the hackAIR data flow chain (Figure 5.1), and use various tools developed in the project to engage citizens to participate in and contribute to air quality monitoring.
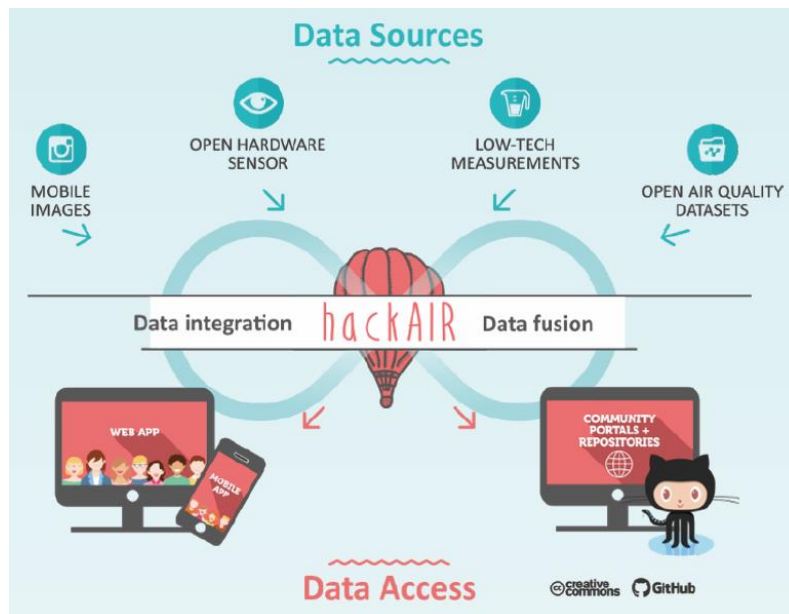
Figure 6.1 – hackAIR data flow chain

6.1 Data sources

In hackAIR, the main data sources include open hardware sensors, low-tech measurement, mobile images and images from Flickr and web cams, open air quality datasets, open-source data from social media and other sources, and public perception on the current air pollution.

6.1.1 Open hardware sensors

In hackAIR, two solutions of easy-to-build open hardware sensor modules are designed and will be used in the pilot, including an Arduino node (static) and a PSoC Bluetooth Low Energy (BLE) node (portable) (See D3.6, Stavrakas et al., 2017). In Norway, the Arduino node is intended to be used to engage technical high school students in Oslo by teaching them to build such a sensor and test it in their surroundings. The PSoC node is planned to be assembled by pro-environmental citizens, University college students, and members from the Norwegian Asthma and Allergy Association. In Germany, both the Arduino and the PSoC solution will be tested by interested users. Both have advantages and thus would be used for different applications. Test kits can be ordered for both of them, but a focus will be in on the Arduino sensor, as most people are expected to be interested in a fixed home station. Furthermore, BUND also intends to test the integration of possible additional nodeMCU units.

6.1.2 Low-tech measurement

hackAIR will also use low-tech measurements to engage especially children in air quality monitoring. The commercial off-the-shelf (COTS) tool comprises of a low-tech measurement setup, involving cardboard and petroleum jelly. Air borne particles will settle down in the jelly and can be seen with a magnifying glass. A picture of the particles, taken by a mobile phone can be uploaded through the hackAIR app which in return provides more accurate information about the pollution data (See D3.6, Stavrakas et al., 2017). Children can be taught how to build this tool and how to use it. Potential users in Norway could be the children's' environmental protection organization, such as miljoagentene (Eco-agents, the environmental organization for children in Norway)[4]. In Germany, BUND will offer guidance to the COTS air quality estimation tool and will assist interested users with building and interpreting data from the app.

6.1.3 Mobile images

The approach of the air quality information derived from mobile phone pictures of the sky via hackAIR mobile app is targeting at any users who are interested in being engaged and use the hackAIR mobile app to receive information about AQ conditions in their surroundings, and to contribute to environmental monitoring themselves by taking sky-depicting photos. In addition to the general public, this approach could be used to engage with the elderly population. In Norway, smartphones are used by a large part of the population, including elderly[5]. Retired people could be interested in testing the app and contributing to air quality measurements in Oslo. We plan to contact the *bydeler* (district offices) and frivillighetssentraler (Community Service Centers)[6] close to where we live in Oslo and to engage those elderly people to contribute to the hackAIR pilot in Norway.

6.1.4 Open air quality datasets

Publicly available AQ data include data generated from official monitoring stations, e.g., data from luftkvalitet.info in Norway[7], luftdaten.info in Germany[8], and AirBase – the European air quality database of EEA (European Environmental Agency)[9]. These data will be fed into the hackAIR platform and visualized through both hackAIR mobile app and web application.

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[4] http://miljoagentene.no
[5] https://www.telenor.com/helping-the-elderly-to-master-tablet-and-smartphone
[6] http://en.oslomamma.net/make-someone-happy---donate-toys-or-visit-elderly-people.html
[7] http://luftkvalitet.info
[8] http://luftdaten.info
[9] https://www.eea.europa.eu/data-and-maps/data/airbase-the-european-air-quality-database-7

6.1.5 Open-source data from social media and other sources

We will use an open-source environmental node discovery tool developed in WP3 to extract air quality related content via text and images (e.g., twitter, Facebook, Flickr).

6.1.6 Participants' perception

The participants can contribute to the pilot via the hackAIR mobile app, by giving their subjective perception about the air quality right where they are (see D5.2 – 1st version of integrated and tested hackAIR open platform, Tekes et al., 2017). The interested participants in both Norway and Germany will be guided to give their perception by using hackAIR mobile app.

6.2 Data storage

All the data generated by the different tools and from various sources will be stored at a central database in Greece, held by DRAXIS (See D5.1, Anastasiadou et al., 2016).

6.3 Data integration and data fusion

The heterogeneous air quality data collected in both Norway and Germany will be synthesized to provide value-added air quality maps and to offer air quality-based personalized services to the public (D4.1, Schneider 2017; restricted access; see D4.2, Riga et al, 2017).

6.4 Data and information access

There are two ways to access the hackAIR data and information: (i) via web application and (ii) via mobile app. The participants have not only access to their own observations and perceptions, but also to others' (anonymized). The data and information that can be accessed include:

- Data fusion map
- Data from the hackAIR sensors
- Data from the sky photos
- Open available air quality data
- Participants' perception
- Participants' sensor data
- Participants' sky photos

7 Methods - people side

7.1 Methods - people side for the pilot case in Norway

In Norway, we have identified and set up a network with four target groups, covering different age groups (e.g., children, adults, elderly, etc.), including:

> 1) Pro-environmental citizens: co-creation workshop participants (see D2.4, Coppens P & Claeys, 2017) and those who expressed interest through our social media pages (see D8.4, Fellermann 2017). This could also include retired citizens who would like to spend some of their free time by either contributing with air quality measurements by holding a static sensor, and/or carrying a portable sensor or by taking pictures of the sky with the hackAIR app. We will contact some district administrations in Oslo to get into contact with potential

volunteers. It needs to be addressed that according to SSB (Statistics Norway), more than 90% of all households in Norway have internet access[10], and smartphones are used by a large part of the population, including elderly.

2) Citizens with respiratory issues: members from the Norwegian Asthma and Allergy Association (NAAF).

3) Members from environmental organizations: e.g., Friends of the Earth in Norway, FriskBy in Bergen. The Children's environmental protection organization in Norway will be addressed to engage with children through the COTS tool developed by hackAIR and raise their awareness towards AQ issues.

4) Students, experts and academics: high school students, university students, researchers and experts/professionals in the environmental science fields.

These four groups are interested in AQ related issues for different reasons, and are expected to be involved in the pilot in Norway. We are constantly working on dissemination at both municipal and national level, aiming at engaging as many participants as possible to contribute to the hackAIR case study in Norway.

In order to engage these four groups, we have planned different workshops, aiming at:

- Reaching a large community of interested citizens to build awareness about the project, its benefits and results;
- Engaging citizens, local air quality advocates, end users and members of organisations working on air quality;
- Allowing them to explore the hackAIR tools with a hands-on approach (e.g., building their own air quality monitoring sensor, using hackAIR data for local campaigning or participating in an air-quality photo safari);
- Receiving instant feedback from users; and
- Providing opportunities for media coverage (D8.5, Jansen 2017).

For Norway, five workshops are planned to be held during the pilot period, covering the winter and spring seasons, as follows (see D8.5, Jansen 2017):

- October 2017 – December 2017 (2 workshops for technical high school students in Oslo)
- November 2017 – December 2017 (1 workshop at the Oslo and Akershus University College of Applied Sciences (HIOA))
- January 2018 – February 2018 (1 workshop targeting members from NAAF and Friends of the Earth in Norway)
- March 2018 – June 2018 (1 workshop targeting at environmental professionals and pro-environmental citizens)

Each workshop will comprise of one or several modules, prepared by WP8. The modules we intend to include at these five workshops (either alone or in combination) are:

- Knowledge about air quality issues and its environmental and health impacts
- Introduction to the hackAIR platform
- Build your own Arduino, PSoC, and/or COTS sensors
- Air quality photo safari

In order to find more volunteers, we will participate in two workshops organized by Norwegian universities. One is held by the Norwegian University of Science and Technology (NTNU) on 18-20 October 2017, Trondheim. Here we will be aiming to engage some of the university students who are interested in using hackAIR tools for Trondheim[11]. Another one is held by the University of Tromsø (UiT) on 25-26 October 2017, Tromsø, aiming to engage some of the high school students who are involved in a similar project in Tromsø[12].

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[10] https://www.ssb.no/en/teknologi-og-innovasjon/statistikker/ikthus/aar/2015-10-01
[11] https://www.ntnu.edu/sustainability-science
[12] https://uit.no/skolelab/elev/aktivitet?p_document_id=525868

To engage some participants in Bergen, we will find the appropriate approach by the help from FriskBy Bergen[13] after the hackAIR platform is ready to be released to the public.

7.2 Methods - people side for the pilot case in Germany

In Germany, BUND has several target groups, with whom the organization already is in contact partially:

1) Members of BUND (Pro-environmental citizens): Many sections of our organization are already working on air quality and have a long lasting conversation with the national office on this topic.
2) General Audience.
3) Citizens with respiratory issues: This group potential is the most responsive to the project, as users have a high personal affiliation with AQ as topic.
4) Pro-Environmental citizens: that are not yet active in BUND.
5) Tech-savvy citizens: are already very active on AQ in other projects, and will be interested from a technical point of view.
6) Schools: will have an interest in measuring AQ hands-on.

Local BUND groups will want to use hackAIR tools to increase awareness and establish dialogue with official institutions and will try to use the tool to implement sustainable solutions. Beyond its own membership base, BUND is targeting the general public and wants to attract participants to hackAIR beyond the current membership base of BUND. There will be a larger group that will use hackAIR as information platform and for updates. Those users who are more active and interested in setting up and using sensors will be a key focus group for BUND.

With regard to reaching out to younger citizens, BUND will also involve its youth organization, Young friends of the Earth, or Bund Jugend. We have cooperated before on matters of transport policy and air quality and already have established talks about them being involved in the preparations of the pilot.

With regard to our outreach to elderly citizens, BUND naturally has a larger share of elderly members that will receive information about this project. Additionally we will put emphasis on material explaining hackAIR so that all citizen groups can be involved in the project.

The main pilot time for BUND will be the winter months of 2017/2018 as particulate matter concentrations and general awareness will be higher during those months. BUND and its regional offices will jointly offer hackAIR as solution for its members and other interested citizens to create awareness for themselves and in their local area. We will offer workshops that will help them setting up and using hackAIR.

Once the different interested parts of BUND have taken up using the platform, BUND will focus on involving the larger audience and intensify its outreach.

Support of interested active users that want to start measuring air quality is a key element of getting a hackAIR community started. BUND has several online tools that can be used for outreach to members, on top of the communication means that hackAIR already has established. Additionally it is important to give support offline and locally. BUND currently plans to offer regional workshops for those regions that are particularly interested and can gather a sufficient amount of users. These workshops will be planned once the pilot has started and regions have established their communication with members.

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[13] http://www.friskby.no/

8 Pilot implementation phases and responsibilities

8.1 Pilot implementation phases

Currently, we plan to implement the pilot through five phases in both Germany and Norway (Table 8.1). The planned phases might be modified according to the feasibility of the hackAIR platform and toolkit, and the target groups' time schedule, for example, we must fit our workshops with the targeted schools' curricula.

Table 8.1 – Five phases of the pilot operation plan.

Phases	Aim	Estimated Timeframe/ Estimated number of Users	Activities/Requirements
I-Pre-test	To test Arduino sensor To test PSoC sensor To test mobile app To test COTS	November 2016-August 2017 Estimated number of users: 20	• User testing and training during development phase • Support by sensor developer • Support by mobile app developer • NILU involved 4 university college students to test Arduino sensor
II-Platform launch and test	To test the final version of the hackAIR platform including mobile app, sensors, and data communication	September to October 2017 Estimated number of users: 50-100	• User testing and training (this is not the end-users but consortium members and their colleagues testing this) • Support by sensor developer • Support by platform developer
III-Full pilot	Pilot full implementation	November 2017-March 2018 Estimated number of users: 500-1000	• Active user recruitment in Norway and Germany • Limited recruitment elsewhere • Most materials available online
IV-Full pilot expansion	Pilot expansion	April-October 2018 Estimated number of users: 8000	• Continue active user recruitment in Norway and Germany • Active user recruitment and scaled-up engagement in other hackAIR locations • Materials for multipliers
V-Evaluation and integration	Pilot reporting, integration and evaluation	November-December 2018 Estimated number of users: 1000	• No further active user recruitment • Reporting and evaluation • If possible, keep users engaged to support sustainability

8.1.1 Phase I – Pre-test (Nov 16 – Aug 17)

This phase has been used to develop and test Arduino and PSoC sensor and COTS, and the mobile application. The test is done in a very small scale. The main aim is to bring together dedicated participants in BUND and NILU in an early stage of the process, which could be good for motivating them.

For the development of the mobile app, we had arranged for two co-creation workshops in both Norway and Germany. Consortium partners DRAXIS and CERTH designed the mobile app based on the input of the workshop participants and incorporated also their requests regarding functionality, privacy, etc. (see D2.4, Coppens P & Claeys, 2017). Further development of the mobile app has been carried out until to-date (August 2017). This applies as well for the Arduino and PSoC sensor. The modules have been tested and further developed by TEI, third party of the hackAIR consortium.

NILU had engaged with some university college students who helped testing the Arduino sensor platform. Based on their feedback and feedback from the project consortium, further changes have been conducted. Work on the hackAIR platform where all data will be merged and displayed are also ongoing.

8.1.2 Phase II – Platform launch and test (Sep – Oct 17)

During this phase, we will test the functionality and operability of all parts of the hackAIR platform, including the mobile application, and sensor modules. This includes also all data communication/data flow. The test will be done in a small scale by the hackAIR consortium and their colleagues. The aim of the test is to see what toolkit works well, what not and explore why it is not working. If there is an ongoing problem, it can be really important to know at what extent it has to be solved and to propose a possible solution for dealing with this issues in the full pilot by the external users (Phase III) and full pilot expansion (Phase IV).

WP7 has compiled a set of Key Performance Indicators (KPIs – see Annex) to evaluate the level of the success for the hackAIR platform including the indicators to evaluate the main toolkit towards its planned objectives. The KPIs will be assessed by those hackAIR consortium members that developed the tools (DRAXIS, CERTH and DUTH) and those who have tested the tools in practice and used them in their pilot activities, e.g., NILU and BUND.

The KPIs are different from the evaluation and impact assessment framework that will develop indicators for: 1) User experience and usability, technical indicators, pilot indicators and 2) Social and environmental impact assessment at the meso and macro scale (D7.4, *in progress*). The KPIs refer only to the performance of the hackAIR platform and other products and services developed in the project.

The KPIs will be evaluated after all the tools have been tested by the hackAIR consortium members and before they are used to engage citizens to contribute to the pilot in Norway and Germany. The outcome of the KPIs assessment will be feedback to the hackAIR platform developers to make necessary updates for the tools to ensure that all the tools work as they are expected in the pilot.

As a result of this phase, we will compile a set of instructions for the pilot participants, combined with assisting material in case of trouble shooting. This material will be translated into Norwegian and German (and later into the languages of the extended pilots), and contain as well contact information for each pilot.

At the end of this phase, once we can rest assured that all sensors, the mobile app and the hackAIR platform work flawless, we will establish contact with potential users/participants and start the user engagement. The detailed communication plan can be found in the Section 10 of this document.

8.1.3 Phase III – Full pilot (Nov 17 – Mar 18)

During this period, the main recruitment and engagement activities will be carried out (See D6.1, McCrory et al., 2017). In both Norway and Germany, we are aiming at engaging as many participants as possible to contribute to the hackAIR case study via different engagement methods. For example, at country level, we will do it mainly via various social media (e.g., Facebook page, Twitter account, LinkedIn group) (See D6.3, Spyromitros-Xioufis et al., 2017), and disseminate the hackAIR pilot activities at relevant conference and meetings. At city level, in addition to using social media (See D6.3) and conferences and meetings, we plan to organize the hackAIR pilot workshops toward different target groups (See D8.5, Jansen et al., 2017). The activities and timeline can be found in the communication plan in the Section 10 of this document.

8.1.4 Phase IV – Full pilot expansion (Apr – Oct 18)

Phase IV will be dedicated to further recruitment of active users in both Norway and Germany. Depending on the availability and functionality of sensor modules, mobile app and hackAIR platform during Phase III, full pilot activities will continue in Norway and Germany.

8.1.5 Phase V – Evaluation and integration (Nov – Dec 18)

In the last phase of the project, no further recruitment activities will be carried out and all engagement activities will be finalized. The results will be evaluated based on a set of evaluation indicators developed by VUB in summer 2017. We will try to keep users engaged to support sustainability and find a solution to keep the hackAIR platform and mobile app alive even after the project finishes.

8.2 Responsibilities

We have allocated responsibilities among the consortium partners for the implementation of the pilot operations, including responsible persons for the overall planning and monitoring, pilot training, pilot execution, technical support, pilot evaluation/adaptations to the platform based on users' feedback, etc. With this allocation, we will know who to contact for support (Table 8.2).

Table 8.2 – The allocated responsibilities for the pilot implementation

Tasks	Primary Responsible	Contact information
Overall planning, monitoring, pilot training, pilot execution and evolution in Norway	Hai-Ying Liu (NILU) Sonja Grossberndt (NILU)	hyl@nilu.no sg@nilu.no
Overall planning, monitoring, pilot training, pilot execution and evolution in Germany	Arne Fellermann (BUND)	Arne.Fellermann@bund.net
Technical support for Arduino sensor, PSoC node and COTS	Ilias stavrakas (TEIATH)	ilias@ee.teiath.gr
Technical support for hackAIR mobile app and web app	Panagiota Syropoulou (DRAXIS) Stavros Tekes (DRAXIS)	syropoulou.p@draxis.gr stavros@draxis.gr
Technical support for taking picture of sky	Panagiota Syropoulou (DRAXIS)	syropoulou.p@draxis.gr
Technical support for upload data to the hackAIR platform	Panagiota Syropoulou (DRAXIS) Stavros Tekes (DRAXIS)	syropoulou.p@draxis.gr stavros@draxis.gr
Pilot adaptations to the platform based on users feedback	Panagiota Syropoulou (DRAXIS) Stavros Tekes (DRAXIS)	syropoulou.p@draxis.gr stavros@draxis.gr
Support for communication and dissemination	Wiebke Herding	wiebke@onsubject.eu

9 Risk assessment and contingency plan

As in any other project, there are a number of risks in hackAIR that can put the successful engagement of citizens in danger. The following overview serves as both visualization and awareness of these risks and shall help the hackAIR consortium to bring the pilot activities to a successful end (Table 9.1).

Table 9.1 – Potential risks and contingency plan (H = high; M = medium; L = low)

Description of risk	Possible consequences	Probability of risk	Severity of risk	Overall risk	Contingency plan
Data flow is not ensured by beginning of Phase III due to technical implications;	Expansion of Phase II and delay with shortening of Phase III; some user groups (e.g., high schools) cannot be involved before spring 2018 due to their curriculum	M	H	H	Prepare a Plan B for user recruitment and engagement (e.g., buy other off the shelf-sensors for high schools)
Users are difficult to be motivated to participate	Due to low number of participants and limited resources not all	M	M	M	Use existing groups/initiatives to find users; prioritize recruitment activities

	engagement activities can be carried out as planned				
Users are not willing to buy their own sensor	Consortium has to buy sensors for the participants	H	H	H	Redistribution of budget to allow for the purchase of a smaller number of sensors; distribute sensors in a way that is efficient (e.g., one sensor for 5 high school students, giving already assembled sensors to the next user to measure AQ only)

10 Pilot communication activities

10.1 General context

During the pilot phase of the hackAIR project, our communications will focus on three main objectives:

- Recruitment: i.e., attract new people to the hackAIR project and inspire them to take action;
- Information: i.e., provide sufficient information to remove obstacles regarding participation; and
- Engagement: i.e., invite existing participants to engage more often and more deeply.

While Work Package 8 (Dissemination, Communication and Exploitation) focuses on the general communication of the project to English-speaking users across Europe, the pilots in Norway and Germany need to communicate in a targeted manner to users in their countries and languages.

10.2 Core communication channels

Overall, the hackAIR project plans to maintain the following communication channels during the pilot operations (Table 10.1). While WP8 will prepare communication materials for these platforms in English, WP7 will use them as basis for the pilot in German or Norwegian and translate them into the respective language.

Table 10.1 – hackAIR communication channels

Channel	Objective	Comment
Email lists	Engagement	Can be segmented: Interested/Users Geography/language
App notifications	Engagement	Mostly used for behavior change recommendations; to be verified how to use them for other targeted invitations
Social media	Recruitment Information Engagement	Links: Facebook: @hackairproject Twitter: @hack_air Instagram: @hackairproject
Outreach/ Media	Recruitment	Using press releases and direct communication with stakeholders
Online advertising	Recruitment	Can be used for targeted recruitment
Website	Mostly: Information	Currently at http://www.hackair.eu, will be linked to the hackAIR platform later. Includes general contact details for the project, and download of materials
Platform	Engagement	Draft at http://hackair.draxis.gr, will be available at http://www.hackair.eu at some later point. Should include a list of all upcoming events and local contact details

10.3 Pilot communication plan in Norway

10.3.1 Context

What are your organization's assets and challenges that may impact on your Pilot Communications Plan (budget, staffing, resources, reputation, etc.)? (Table 10.2).

Table 10.2 – NILU's assets and challenges for pilot communication plan in Norway.

Assets NILU has done a few citizens' observatories projects and we have personnel that is working on communication and has expertise in risk communication.	Challenges

What is already happening outside your organization that may impact on your Plan (timing, other activities, potential obstacles or opportunities, Table 10.3)?

Table 10.3 – NILU's existing activities for pilot communication plan in Norway.

Assets	Challenges
Cooperation with the Oslo Science Park can be used for communication purposes Cooperation with the NAAF can be used for communication purposes Cooperation with the HIOA can be used for communication purposes Cooperation with the UiT can be used for communication purposes	Very similar initiative in Tromsø already active: http://www.lektor2.no/ NILU and UiT are seeking the synergy between hackAIR pilot in Norway and Lektor2 in Tromsø.

10.3.2 Objectives

In the overall framework described above, what are your (specific, measurable, achievable) communications objectives (Table 10.4)?

Table 10.4 – Pilot communications objectives in Norway.

Communication objective	Target number
Recruitment	90-3000
Information	3000-5000
Engagement	90-3000

What are additional objectives for your organization (Table 10.5)?

Table 10.5 – Additional objectives for NILU for pilot communication in Norway.

Strengthen the cooperation with other research institutes and universities. Expand network and cooperation with schools, NAAF and Friend of Earth in Norway. Expand knowledge about NILU's presence to people/organizations that might not have been aware of us before.

10.3.3 Target audiences

In the Engagement Profiles for Pilot distributed in D6.1 (Engagement Plan), you were asked to identify four core audiences covering different age groups (e.g., children, adults, elderly, etc.). For each of them, please briefly describe your existing organizational capacity to reach the audience (Table 10.6).

Table 10.6 – Target audiences for pilot in Norway and the existing channels to reach the target audiences

Target audience	Existing channels
What are your core target audiences for the pilot?	What ways of reaching the audience do you already have?
Pro-environmental citizens, including retired people	Email lists, face-to-face meetings

Citizens with respiratory issues	Email lists, face-to-face meetings Facebook page Twitter account	
Environmental organizations	Email lists, face-to-face meetings Facebook page Twitter account	
Students, experts and academics	Email lists, face-to-face meetings	

10.3.4 Communication activities

What communication activities will you use to actively recruit users to your pilot? Please provide information for each of your target audiences. Examples for activities could be partnerships, workshops, media outreach, direct email, etc. Please consider both online and offline activities (Table 10.7).

Table 10.7 – Communication activities planned for pilot in Norway

Activity	When/How	Audience/Channel
Face-to-face meetings, emails	October 2017 – December 2017	Teachers at technical high school(s) in Oslo
Email	November 2017 – December 2017	Email contact with professor(s) at Oslo and Akershus University College for Applied Sciences (HIOA)
Email/social media outreach	January 2018 – March 2018	Email contact with the Norwegian Asthma and Allergy association (NAAF) and Friends of the Earth in Norway; sharing content on social media
Email, media outreach	April 2018 – June 2018	Email and media outreach towards environmental professionals at Oslo Science Park and pro-environmental citizens
Face-to-face meetings	November 2017-March 2018	Personal contact with interested retired people through *bydeler* (district offices)

How will you provide information to users that have questions that keep them from participating in the pilot? Examples could be translations of tutorials, an email address/social media contacts for support, active participation in the hackAIR forum, maintenance of a FAQ, etc. (Table 10.8).

Table 10.8 – Contact channel for supporting the pilot participants in Norway

Activity	When/How	Audience/Channel
Tutorials/videos; Email contact for support	November 2017-October 2018	Pro-environmental citizens; retired citizens
Tutorials/videos; Email contact for support	November 2017-October 2018	Citizens with respiratory issues
Tutorials/videos; Email contact for support	November 2017-October 2018	Environmental organizations
Tutorials/videos; Email contact for support	November 2017-October 2018	High school students, University college students, experts and academics

How do you plan to keep users engaged after they've participated once? Examples could be additional workshops, campaigns, feedback on their data, etc. (Table 10.9).

Table 10.9 – Activities for maintaining the pilot participants in Norway

Activity	When/How	Audience/Channel
Feedback on their data	November 2017 – October 2018	Pro-environmental citizens

Citizens with respiratory issues
Environmental organizations
Students, experts and academics

10.3.5 Timeline

What is your tentative timeline for the communication activities of the pilot (Table 10.10)?

Table 10.10 – Tentative timeline for the pilot communication activities in Norway

Date	Activities
August 2017	Communication with the University of Tromsø to explore a potential joint event to engage citizens in Tromsø to contribute to the hackAIR pilot in Norway.
September-October 2017	Communication with high schools and joint preparation of the workshops there.
October 2017	Communication with potential participants, especially the participants from NTNU (Norwegian University of Science and Technology) at NTNU Sustainability and Science conference and explore the potential joint event to engage citizens in Trondheim to contribute to hackAIR pilot in Norway.
October-November 2017	Communications with Oslo and Akershus University College for Applied Sciences (HIOA) to invite and prepare the workshop with students and professionals there.
November-December 2017	Communication with FriskBy in Bergen to explore the potential joint event to engage citizens in Bergen to contribute to hackAIR pilot in Norway.
November 2017-March 2018	Communication with retired citizens and other potentially interested citizens to join the hackAIR activities
January-February 2018	Communication with NAAF and Friends of the Earth in Norway to prepare workshop and to inform/invite people.
April-May 2018	Communication with Oslo Science Park to prepare workshop and to inform/invite people there and pro-environmental citizens.
June-August 2018	No communication activities planned during the summer vacation period.
October-November 2018	Final information about hackAIR project and the data obtained in Oslo.

10.3.6 Monitoring and evaluation

What are your targets for the following indicators (Table 10.11)?

Table 10.11 – Planned events and the target for pilot in Norway

Event	Target
Number of events organized as part of the pilot	5
Total number of participants in events	2 classes in two technical high schools, each class has 20 students, in total, 40 students
	Other four workshops, each workshop aiming at 15 participants, in total, 60 participants
Number of events participated in as part of the pilot	5-8
Number of registered users by March 2018	500-1000
Number of registered users by September 2018	3090
Number of articles about hackAIR	2
Number of press releases/newsletters sent	2/200
Number of leaflets/brochures distributed	200
Number of social media posts	20-30

10.4 Pilot communication plan in Germany

10.4.1 Context

What are your organization's assets and challenges that may impact on your Pilot Communications Plan (e.g., budget, staffing, resources, reputation, etc.) (Table 10.12)?

Table 10.12 – BUND's assets and challenges for pilot communication plan in Germany.

Assets	Challenges
BUND has a large membership base of currently around 580,000 sustainability interested citizens. Air quality is one important subject of work for many of its regional and local offices. It's a grass-roots organization that has around 2,000 local groups. It's one of the two largest environmental NGOs in Germany and as such well-known.	

What is already happening outside your organization that may impact on your Plan (timing, other activities, potential obstacles or opportunities) (Table 10.13)?

Table 10.13 – BUND' existing activities for pilot communication plan in Germany.

Assets	Challenges
	Very similar initiative in Germany already active: www.luftdaten.info Uses different hardware option that is cheaper than hackAIR. Challenge is competitiveness. hackAIR is already in conversation with the project and will integrate their data by September.

10.4.2 Objectives

In the overall framework described above, what are your (specific, measurable, achievable) communications objectives (Table 10.14)?

Table 10.14 – Pilot communications objectives in Germany

Communication objective	Target number
Recruitment	200-5000
Information	5000-8000
Engagement	200-5000

What are additional objectives for your organization (Table 10.15)?

Table 10.15 – Additional objectives for BUND for pilot communication in Germany

Outreach to new members and supporters of BUND through hackAIR
BUND uses hackAIR as an offer for its members

10.4.3 Target audiences

In the Engagement Profiles for Pilots distributed in preparation of D6.1 (Engagement Plan), you were asked to identify four core audiences. For each of them, please briefly describe your existing organizational capacity to reach the audience (Table 10.16).

Table 10.16 – Target audiences for pilot in Germany and the existing channels to reach the target audiences

Target audience	Existing channels
What are your core target audiences for the pilot?	What ways of reaching the audience do you already have?
Pro-environmental citizens	Personal contacts Newsletter lists Twitter, Facebook
DIY builders	Personal contacts

Environmental organizations	Email lists
	NGO network / personal contacts
	Twitter account
	Facebook
DIY communities	Personal Contacts

10.4.4 Communication activities

What communications activities will you use to actively recruit users to your pilot? Please provide information for each of your target audiences. Examples for activities could be partnerships, workshops, media outreach, direct email, etc. Please consider both online and offline activities (Table 10.17).

Table 10.17 – Communication activities planned for pilot in Germany

Activity	When/How	Audience/Channel
Workshops	In cooperation with regional offices and local groups	BUND members / Pro-environmental citizens
Media Outreach	Beginning of the pilot, in response to AQ events	General Public
Social Media	Continuous	General Public, BUND members, environmental organizations
Partnerships	Setup in September 2017	DIY communities
Workshop participation	Ongoing	Environmental organizations

How will you provide information to users that have questions that keep them from participating in the pilot? Examples could be translations of tutorials, an email address/social media contacts for support, active participation in the hackAIR forum, maintenance of a FAQ, etc. (Table 10.18).

Table 10.18 – Contact channel for supporting the pilot participants in Germany

Activity	When/How	Audience/Channel
Tutorials /Support Website	November 2017-December 2018	Pro-environmental citizens
		Environmental organizations
		Pro-environmental citizens
		DIY communities / DIY users
Email contact for support	November 2017- December 2018	Environmental organizations
		Pro-environmental citizens
		DIY communities / DIY users
Social Media	November 2017- December 2018	Pro-environmental citizens
		Environmental organizations
		Pro-environmental citizens
		DIY communities / DIY users
active participation in the hackAIR forum	November 2017- December 2018	Pro-environmental citizens
		Environmental organizations
		Pro-environmental citizens
		DIY communities / DIY users

How do you plan to keep users engaged after they've participated once? Examples could be additional workshops, campaigns, feedback on their data, etc. (Table 10.19).

Table 10.19 – Activities for maintaining the pilot participants in Germany

Activity	When/How	Audience/Channel
Feedback on their data	November 2017 – December 2018	Pro-environmental citizens DIY users
Additional Workshops	2018	All

10.4.5 Timeline

What is your tentative timeline for the communications activities of the pilot (Table 10.20)?

Table 10.20 – Tentative timeline for the pilot communication activities in Germany

Date	Activities
September-October 2017	Gathering regional offices and setting up communication with users, outreach to partners
September 2017	Setting up of communication material and placing orders for parts
October-November 2017	First workshops with interested regional offices
November 2017	BUND national assembly presentation hackAIR
November-December 2017	BUND outreach to all members
December-February 2018	Full outreach to broad public
May-June 2018	Possibly AQ and citizen science workshop bringing together stakeholders in Germany
July-September 2018	No any communication activities planned during this summer vacation period
October-November 2018	Final information about hackAIR project and the data obtained in BUND. Support for further possible measuring activities of BUND members

10.4.6 Monitoring and evaluation

What are your targets for the following indicators (Table 10.21)?

Table 10.21 – Planned events and the target for pilot in Germany

Event	Target
Number of events organized as part of the pilot	6
Total number of participants in events	Per workshop we plan to engage between 10 and 15 participants. Overall the workshops are planned to reach between 60 and 90 participants.
Number of events participated in as part of the pilot	2-3
Number of registered users by March 2018	4000-5000
Number of registered users by September 2018	5200
Number of articles about hackAIR	2
Number of press releases/newsletters sent	1
Number of leaflets/brochures distributed	200
Number of social media posts	20-30

11 Conclusions

This deliverable provides a detailed plan about the hackAIR activities that will be performed in Norway and Germany. The activities will be carried out in five phases, including testing, implementation and evaluation. We have identified different target groups for engagement, based on the DoA. Involvement of different groups in society is vital for the success of the project and, thus, giving and obtaining feedback from them will be a continuous procedure.

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Annex – Key performance indicators for hackAIR platform assessment

Introduction

WP7 has developed a set of KPIs (Key Performance Indicators) to evaluate the level of the success for the hackAIR platform including the indicators to evaluate the main toolkit towards its planned objectives. The KPIs will be assessed only by those hackAIR consortium members that developed the tools (DRAXIS and CERTH) and those who have tested the tools in practice and used them in their pilot activities, e.g., NILU and BUND. It is not aimed to be assessed by the external users.

The KPIs will be evaluated after all the tools have been tested within the hackAIR consortium members and before they are used to engage citizens to contribute to the pilot in Norway and Germany. The outcome of the KPIs assessment will be feedback to the hackAIR platform developers for them to make necessary update for the tools to make sure that all the tools work as they are expected in the pilot.

Key performance indicators

In hackAIR, the following seven tools have been chosen to be evaluated:

1) Arduino node
2) PSoC node
3) COTS
4) hackAIR mobile app
5) hackAIR web app
6) hackAIR data flow chain (data communication from sensors/mobile app/web app, to data storage platform, to hackAIR knowledge base)
7) Data fusion maps

The KPIs for each tool include two obligatory questions about consortium members' feedback for the tools' co-creation development process and their functionalities, one optional comment and consortium members' role in the project (e.g., project tools developer or user or both), as following:

Q1: To what extend were the project internal stakeholders and users involved in this tool (i.e., any of these seven tools) development process?

Q2: To what extend was this tool (i.e., any of these seven tools) performing as expected?

Q3: Any comments you may have with regarding to this tool?

- o What aspect of this tool has been most useful/satisfying?
- o What aspect of this tool has been most disappointing?
- o Other comments

Q3: Consortium members' role in the project

- o Are you developer or user or both of this tool?
- o Other, please specify

Key performance indicators assessment methods

The KPIs' score include five completion scales (Table A1), 5 = excellent or complete success, and 1 = low or relatively poor achievement of the objectives defined. The total score for each tool is averaging up all completion scale values from each question for the tool.

Table A1. The KPIs evaluation score and completion scale.

Level of success	Score (%)	Completion scale
Excellent or complete success	90-100	5
Very good or very effective success	80-90	4
Good or effective success	70-80	3
Fair or moderate achievement of goals defined	60-70	2
Low or relatively poor achievement of the objectives defined	<60	1

The KPIs assessment takes 5 -10 minutes to complete. You are free to choose any tools you want to evaluate.

The KPIs assessment is planned to be carried out at the hackAIR consortium meeting in Amsterdam, 4-5, October 2017.

Key performance indicators assessment form

Arduino node

- To what extend were the consortium members involved in the Arduino node development process?

◯ 5	◯ 4	◯ 3	◯ 2	◯ 1

- To what extend was the Arduino node performing as expected?

◯ 5	◯ 4	◯ 3	◯ 2	◯ 1

- Any comments?
  - What aspect of the Arduino node has been most useful/satisfying?

  _____

  _____

  _____

  - What aspect of the Arduino node has been most disappointing?

  _____

  _____

  _____

  - Other comments

  _____

  _____

  _____

- What is your role in the project?
  - Are you Arduino node developer or user or both?

    ◯ Developer

    ◯ User

    ◯ Developer and user

    ◯ Other, please specify

PSoC node

- To what extend were the consortium members involved in the PSoC node development process?

◯ 5	◯ 4	◯ 3	◯ 2	◯ 1

- To what extend was the PSoC node performing as expected?

◯ 5	◯ 4	◯ 3	◯ 2	◯ 1

- Any comments
  - What aspect of the PSoC node has been most useful/satisfying?

  _____

  _____

  _____

  - What aspect of the PSoC node has been most disappointing?

  _____

  _____

  _____

  - Other comments

  _____

  _____

  _____

- What is your role in the project?
  - Are you PSoC node developer or user or both?

    ◯ Developer

    ◯ User

    ◯ Developer and user

    ◯ Other, please specify

COTS

- To what extend were the consortium members involved in the COTS development process?

○ 5	○ 4	○ 3	○ 2	○ 1

- To what extend was the COTS performing as expected?

○ 5	○ 4	○ 3	○ 2	○ 1

- Any comments
  - What aspect of the COTS node has been most useful/satisfying?

    _____

    _____

    _____

  - What aspect of the COTS node has been most disappointing?

    _____

    _____

    _____

  - Other comments

    _____

    _____

    _____

- What is your role in the project?
  - Are you COTS developer or user or both?

    ○ Developer

    ○ User

    ○ Developer and user

    ○ Other, please specify

hackAIR mobile app

- To what extend were the consortium members involved in the hackAIR mobile app development process?

○ 5	○ 4	○ 3	○ 2	○ 1

- To what extend was the hackAIR mobile app performing as expected?

○ 5	○ 4	○ 3	○ 2	○ 1

- Any comments?
    - What aspect of the hackAIR mobile app has been most useful/satisfying?

    _____

    _____

    _____

    - What aspect of the hackAIR mobile app has been most disappointing?

    _____

    _____

    _____

    - Other comments

    _____

    _____

    _____

- What is your role in the project?
    - Are you hackAIR mobile app developer or user or both?

        ○ Developer

        ○ User

        ○ Developer and user

        ○ Other, please specify

hackAIR web app

- To what extend were the consortium members involved in the hackAIR web app development process?

◯ 5	◯ 4	◯ 3	◯ 2	◯ 1

- To what extend was the hackAIR web app performing as expected?

◯ 5	◯ 4	◯ 3	◯ 2	◯ 1

- Any comments
  - What aspect of the hackAIR web app has been most useful/satisfying?

  _____

  _____

  _____

  - What aspect of the hackAIR web app has been most disappointing?

  _____

  _____

  _____

  - Other comments

  _____

  _____

  _____

- What is your role in the project?
  - Are you hackAIR web app developer or user or both?

    ◯ Developer

    ◯ User

    ◯ Developer and user

    ◯ Other, please specify

hackAIR data flow chain

- To what extend were the consortium members involved in the hackAIR data communication development process?

◯ 5	◯ 4	◯ 3	◯ 2	◯ 1

- To what extend was the data communication performing as expected?

◯ 5	◯ 4	◯ 3	◯ 2	◯ 1

- Any comments
  - What aspect of the data flow chain has been most useful/satisfying?

    _____

    _____

    _____

  - What aspect of the data flow chain has been most disappointing?

    _____

    _____

    _____

  - Other comments

    _____

    _____

    _____

- What is your role in the project?
  - Are you hackAIR data flow chain developer or user or both?

    ◯ Developer

    ◯ User

    ◯ Developer and user

    ◯ Other, please specify

Data Fusion Maps

- To what extend were the consortium members involved in the data fusion maps development process?

○ 5	○ 4	○ 3	○ 2	○ 1

- To what extend was the data fusion maps performing as expected?

○ 5	○ 4	○ 3	○ 2	○ 1

- Any comments
    - What aspect of the data fusion maps has been most useful/satisfying?

    _____

    _____

    _____

    - What aspect of the data fusion maps has been most disappointing?

    _____

    _____

    _____

    - Other comments

    _____

    _____

    _____

- What is your role in the project?
    - Are you data fusion maps developer or user or both?

        ○ Developer

        ○ User

        ○ Developer and user

        ○ Other, please specify