ClairCity: Citizen-led air pollution reduction in cities

D4.13 User manual for app and data report

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Quality Assurance	Enda Hayes (UWE)
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Table of Content

Executive Summary

This “User manual for app and data report” contains detailed information about the development, user manual and testing of the GreenAnt system. GreenAnt has been designed to provide insight into people’s daily travel habits and their reaction to changes like closing of roads and changes in public transport. It visualizes how people’s everyday travelling causes pollution and what they can do to change this. The user can learn where to avoid using the car and (s)he can learn from others. GreenAnt can also be used by governmental organizations, NGOs, service providers and industry for strategic planning of implementation of measures.

The system has been developed by NILU. It consists of two parts – a web page for creating a user profile and acessing data, and a smartphone application for data collection. A detailed user manual provides information on how to register, create a profile, use and interpret data. The GreenAnt system have been developed during the cause of the project presented at the annual meetings for feedback and was finished in January 2019.

The system has been tested extensively at NILU and selected project partners as the system was developed. The system has been continuously tested in the development period by program testing procedures and on real lifeuse. In November 2019 an intensive testing phase was performed to get information on the use of GreenAnt in different locations,different brands of smartphones and mobile networks. GreenAnt was tested in the different ClairCity partner cities/regions (Amsterdam (NL), Bristol (UK), Ljubljana (SI), Sosnowiec (PL), the CIRA/Aveiro Region (PT), and the Genoa/Liguria Region (IT)). A range of supplementing materials have been designed in local languages to communicate, promote and facilitate the testing activities: user manual, youtube video, promotional flyer and texts for email/social media to recruit volunteers for testing GreenAnt. The translations were provided by the partnercities and regions.This work has been supported by ClairCity’s communications team (UWE). UWE and NILU developed a user evaluation survey, created to obtain feedback from the testing.

The testing phase in November 2019 revealed a number of technical issues that required immediate fixing. There where weekly meetings with the testers (ClairCity partners) to facilitate information flow and solve problems for the testers and dayly meetings at NILU with the App team to deal with the feedback dayli, keeping direct communication with the users that reported the issues. The testing activities led to a number of concerns about privacy related issues in different locations. Based on the ClairCity data protection policies, concerned participants have been assured that it was not possible to identify individual participants and that their data were stored and treated in a safe and adequate manner. The users participating in the testing period have also been asked to complete an online evaluation survey to help the ClairCity project to improve the GreenAnt system.

The report at hand describes the iterative feedback loops that were put in place to improve the GreenAnt system and enable its further development. GreenAnt has reached a TRL6, aiming at moving towards TRL7 at the end of the CLairCity project. The next version of the GreenAnt will be used at the ClairCity Final Conference in Brussels in March 2020.

1 Introduction

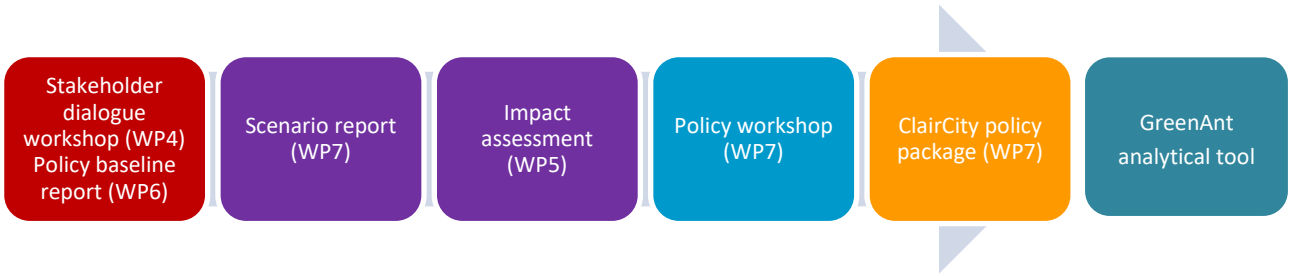
This report is part of the ClairCity ('Citizen Led Air pollution Reduction in Cities') project, funded by the European Union under the Horizon 2020 Research and Innovation Programme (Grant agreement nr 689289). ClairCity aims to apportion air pollution emissions and concentrations, carbon footprints and health outcomes by citizen behaviour and day-to-day activities in order to make the challenge relevant to how people chose to live, behave and interact within their city environment. Through an innovative engagement and quantification toolkit, ClairCity stimulates the public engagement necessary to allow citizens to define a range of future city scenarios for reducing their emissions to be used for supporting and informing the development of bespoke city policy packages out to 2050.

The overall goal of GreenAnt is to provide a service that will motivate people and organizations to change and become more environmentally friendly. The GreenAnt is a large and complex system designed to analyse the contribution to air quality and carbon footprint from individuals groups of people, such as citizens, industries, service providers and public authorities. The GreenAnt consists of a web tool for initialization, administration and data analysis. GreenAnt will run on smartphone devices (Android version 6.0 and newer; and iPhone 5 and newer) for collecting data within designated areas.

The GreenAnt system gives a possibility to undertake a pre- and post-action intervention assessment to actually quantify the changes in citizen behaviour (e.g. travel behaviour) caused by decisions made such as infrastructure changes, parking restrictions, and behaviour change campaigns etc. This gives support to the actual decision/change and a real-time quantification of the effect of the change in activity. It is also the ambition of GreenAnt to empower citizens' to adopt new behaviour through awareness of personal contributions to air quality and carbon footprint, and indicate how this effects personal health.

This report is Deliverable D4.13 "User manual for app and data report" and is developed within Work Package 4, Citizens and Stakeholder Engagement (WP4), Task 4.3 – ClairCity App.

The GreenAnt system is the last part of the evidence flow in the engagement activity in ClairCity. The GreenAnt system would be able to quantify how people react to the ClairCity results and policies, i.e., it can quantify whether the implemented scenarios deliver and whether the citizens behave like they say they would.



There are already many apps on the market targeting transport and taking into consideration citizens' behavior, transport mode, impact on climate change and air quality and citizens' exposure to local air quality. To our knowledge there is, however, no system available to the public that can provide personalized information or information on groups on all these aspects. IPCC and EEA report on these matters, but this is general information and not specific for citizens or groups of citizens and specific measures. This is why we developed GreenAnt.

The GreenAnt system consists of webpages and a smartphone application. It has been developed by ClairCity partner NILU-Norwegian Institute for Air Research. The initial version has been amended further based on feedback from engagement activities with potential users from the different partner cities/regions (Amsterdam (NL), Bristol (UK), Ljubljana (SI), Sosnowiec (PL), the CIRA/Aveiro Region (PT), and the Genoa/Liguria Region (IT)).

The objective of this deliverable is to provide insight into the GreenAnt system and the data it can provide. It contains the GreenAnt user manual (chapter 2), which is also accessible through the web pages.

The original plan was to run the whole system on a smartphone device which, however, would require extensive resources from the smartphone battery. This was assessed to be unpractical for the user and it was decided to use the smartphone only as the measurment device and instead use the web solution for viewing and analysing the data. In this way, we minimized the strain on the smartphone battery and provided the user with extensive information.

GreenAnt has been launched officially in the beginning of September 2019. We have developed a flyer to promote GreenAnt and two videos to show how to install and use the system on computer and smartphone. The videos are available on https://greenant.nilu.no/ and on YouTube. The flyer has been translated into the local languages of the participating partner cities/regions (for the English version and an example translation, see Annex 1). The partner cities /regions did also promote and run the tests locally. Additional dissemination material has been created by UWE to support the dissemination activities in each city/region, also on social media. Examples of this work can be found at Annex 2. Together with UWE, the NILU team has also developed an evaluation survey to obtain information on the users' experience (in the testing phase, November 2019) and how useful they found GreenAnt for them or for other users. The survey has been translated into local languages of the partner cities/regions and was accessible online at https://greenant.nilu.no/ or the smartphone app. The questions are attached in Annex 3, both in English and an example translation.

GreenAnt was tested by the partner cities Amsterdam, Bristol, Ljubljana, Sosnowiec and the regions of Aveiro and Liguria for up to two weeks in the beginning of November 2019 (Annex 4). The contact persons of the partner cities/regions have been asked to promote GreenAnt towards their colleagues with the aim that at least 50 people in each location should test GreenAnt. The users were asked to test the system during one week and complete the evaluation survey after the testing period. The testing of the GreenAnt system did not reach the 50 users in each partner city / region. One of the reasons was concerns about privacy. Sosnowiec and Liguria region limited the number of test persons because of privacy issues. Ljubljana tested GreenAnt already before the testing period when the system was down due to changes required because of updates in the android and IOS operation systems on the phones.

A statistical overview of the obtained data can be found in Chapter 3 of this deliverable. Chapter 4 provides the feedback we received from the different partner cities/regions through the evaluation survey, as well as additional feedback concerning technical issues and concerns about privacy. Chapter 5 provides information on the way forward and Chapter 6 the conclusion.

2 GreenAnt user manual

This user manual is available for download on the GreenAnt web pages and has last been updated before the testing phase, in the beginning of November 2019.

GreenAnt has been designed to provide insight into people's daily travel habits and their reaction to changes. It visualizes how people's everyday travelling impacting air quality and what they can do to reduce negative impact. The user can learn where to avoid using for example the car and (s)he can learn from others.

The GreenAnt system comprises of

- a website for creating a user profile and accessing data
- a smartphone application for Android and iOS devices for data collection.

Chapter 2 will guide you through the process of setting up a geographical spot to collect travel information, how users can assign to this spot and start collecting data and how this data can be viewed, processed and analysed.

2.1 The GreenAnt website

2.1.1 Homepage

The website is accessible through the URL https://greenant.nilu.no/. It contains information about the GreenAnt system, the ClairCity project and it provides access to the geographical areas that the user can create to monitor his/her travel activities (Fig. 2-1).

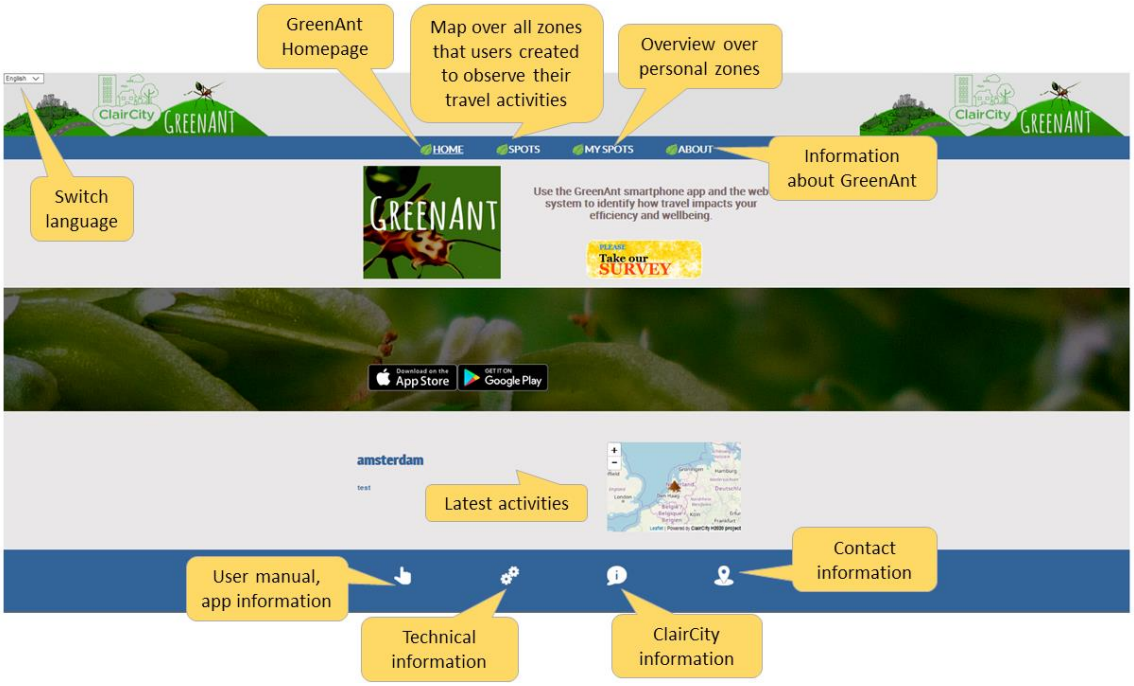


Figure 2-1: GreenAnt homepage screenshot

2.1.2 How to create a spot

For monitoring travel activities, you have to create a “Spot”, a geographical area on the online map. Go to “Spots” and you will see a map whith several small anthills. Each anthill represents the registered spot of a user (Fig. 2-2). The spot is generally an area of interest and the size of the spot is selected accordingly.

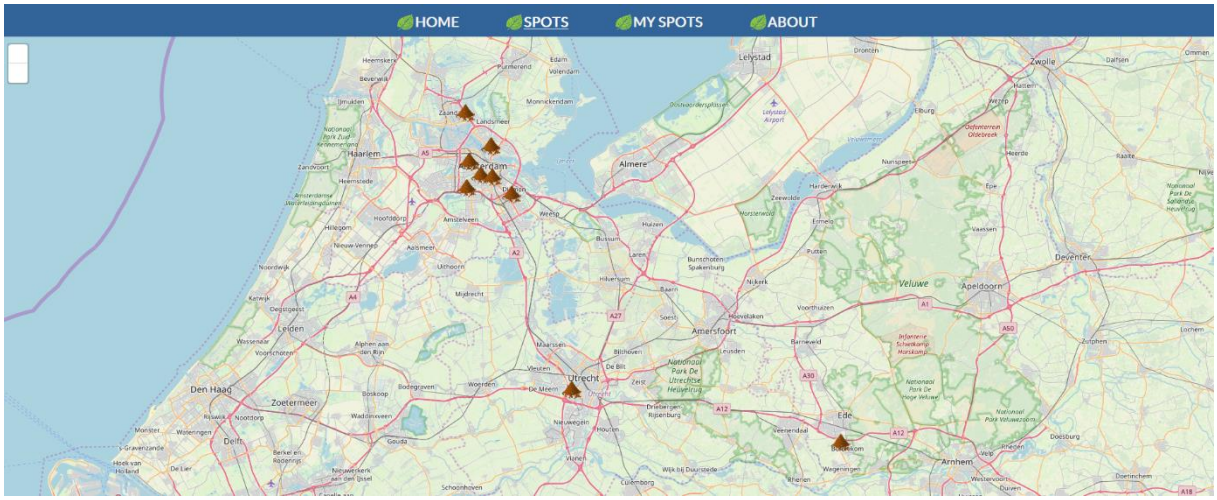


Figure 2-2: Anthills on the GreenAnt map

Once the map is open, zoom in and click once at the location of the center of the zone where you would like to monitor travel activities. An orange coloured circle will be visible. This represents the area in which travel activities can be monitored afterwards. The center of that area can be adjusted by simply clicking on the map with the left mouse key (Fig. 2-3).

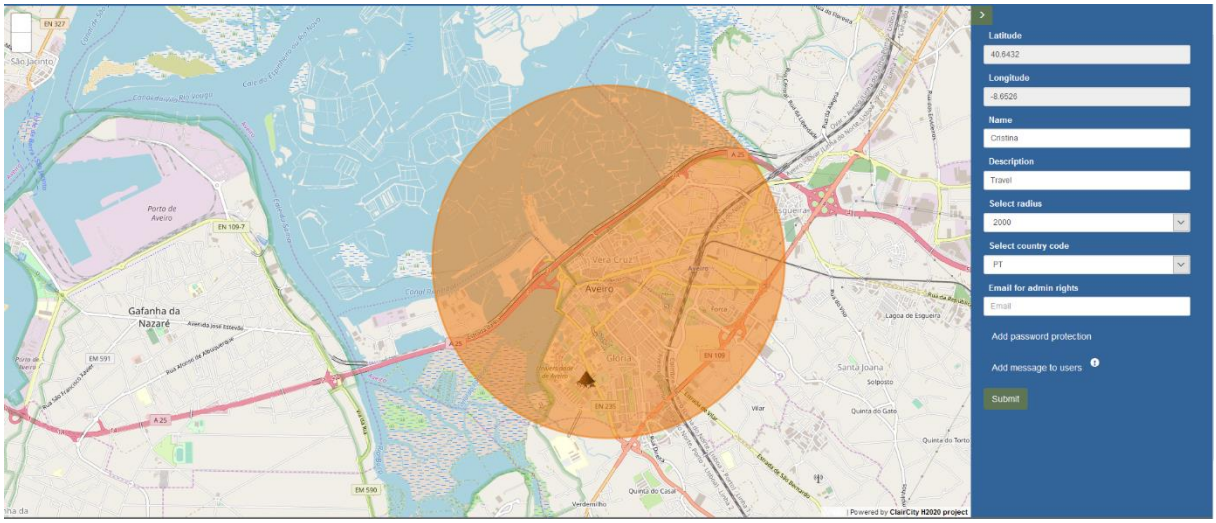


Figure 2-3: Creating a new spot

Before saving, some information has to be provided (Fig. 2-4). Latitude and Longitude cannot be changed. A name has to be inserted to make the spot unique. A description of the spot has to be added. The radius of the zone can be adjusted, anything between 500 and 10.000 m is possible. The selection of the country code will help to connect the data for the selected area to other relevant data services like air quality exposure and calculations of emissions. An email address has to be provided for administration rights.

It is optional to password protect the collected data for a spot. If a password is added, data and activities cannot be seen by other users. Only users that know the password can see the data for this zone. If no password is given anyone can assign to the spot and get access to the data.

It is also possible to include a standard message to the users. Users assigned to this area will receive this message on their smartphone app each time they enter this area. The message can be delayed by 5-10 min due to smartphone specific technicalities.

After clicking on the submit button, the new GreenAnt spot is created and will be visible as a new anthill on the map.

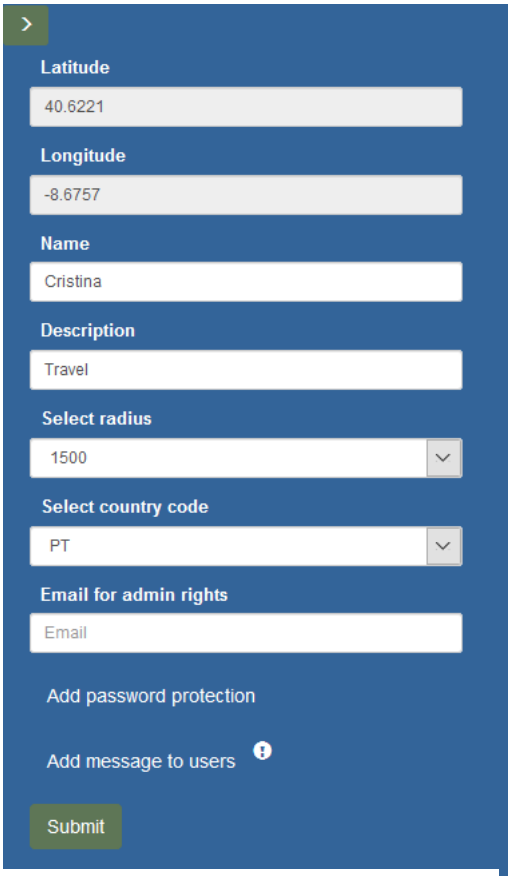


Figure 2-4: Information required to create a new spot

2.1.3 My Spots

When going to the “My spots” tab, you can see all spots you have created. By clicking on a spot, different information will be available. This section will be described in more detail below.

In order to start collecting data, you now have to download the GreenAnt app on your smartphone from the App Store or Google Play.

2.2 The GreenAnt smartphone app

The GreenAnt smartphone application. Detects a person’s transportation mode and paths (if the user is cycling, walking, running, driving electric/diesel/petrol car or taking public transport) This app can be downloaded from the https://greenant.nilu.no/ webpage. On the homepage there are links to both the iOS and the Android version available on App Store and Google Play.

The app requires access to the device’s GPS sensors and motion detection. Smartphones without these functionalities cannot use the app and it will not be available for download on App Store and Google Play.

2.2.1 Installing the GreenAnt app

The application has to be installed from the App Store or Google Play. You have to accept that the application will access your device's location when turned on. Some devices will ask if the app is allowed to keep on running in the background. This enables the collection of data while carrying the device in the pocket of a jacket or whilst driving, and the app does not need to be started manually to collect data. However, this might consume a bit more battery of the device since the app will be running in the background to find out if the user is moving into an assigned area (spot). When opening the app for the first time, you also have to confirm that you are over 16 years of age and that you are aware about the project's privacy and safety regulations.

2.2.2 Creating a user

In order to give you the option of deleting your collected data, you have to create a user. The nickname will not be stored together with the collected data if this is not explicitely chosen in the app's settings.

Since the smartphone cannot detect specific vehicle types, you have to select the type of travelling you normally use. You can choose between petrol, diesel, electric car and public transport. This selection can be changed later.

2.2.3 Assigning a spot and collecting data

All spots created on the https://greenant.nilu.no/ webpages will be available on the app. You can now assign to the availablespots in the app to be able to collect data for this spot.

When opening the app, you should go to "Add a new spot" (Fig. 2-5). All spots created on the GreenAnt webpages will be available in a list. It might take some time to update the list.

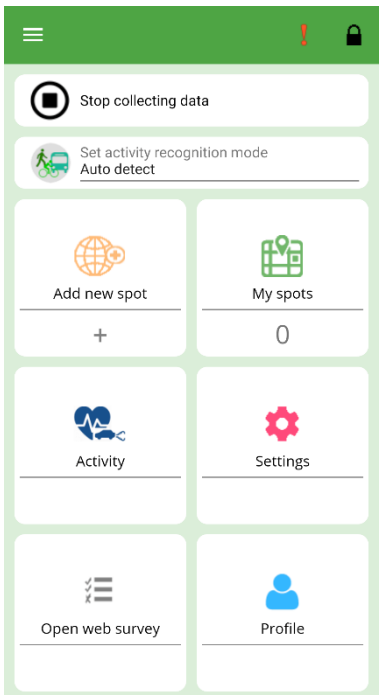


Figure 2-5: User interface of the GreenAnt app

After choosing the correct spot, you should click on the "+" symbol on the right hand side, this will add the spot to "My spots". After enabling the data collection through clicking either on "Start collecting data" in the upper lefthand menu or at the top card of the first screen, you can start collecting your travel data when traveling within "My spots".

Since some phones aren't reliable when detecting activity, you can override the autodetection of activity. In the same top card as the start button you can click on the activity list which defaults to "Autodetect activity" to select the override. This way the mode of travel can be selected manually if the automatic selection routines malfunctions on your phone. This will also save battery demands.

The app has to be turned on and the GPS location has to be enabled. Travel mode can be changed when going to "Settings" (Fig. 2-6).

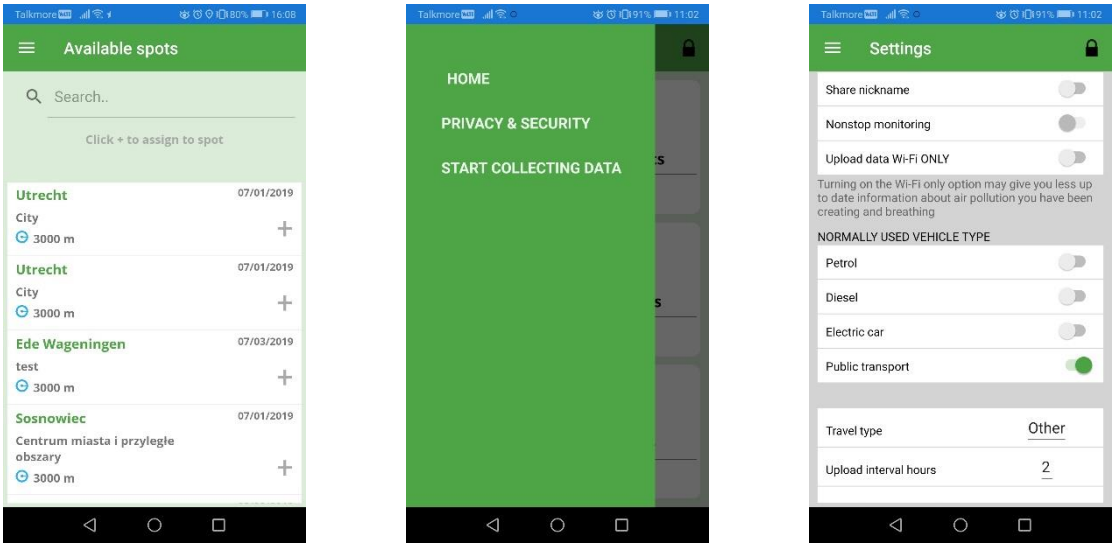
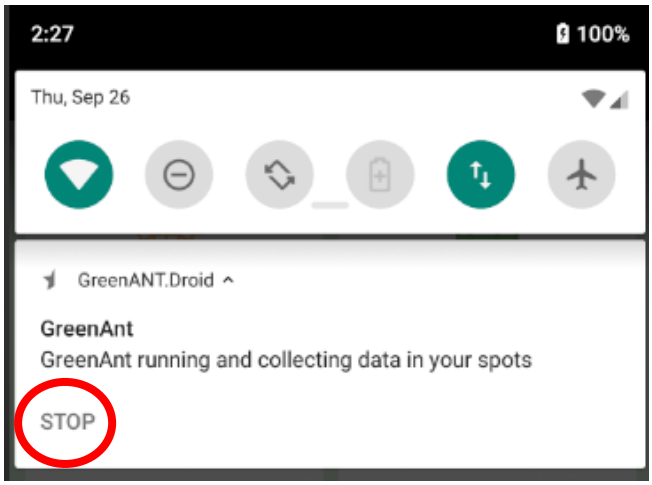


Figure 2-6: GreenAnt app

2.2.4 Keep collecting data

While collecting data, you simply use your phone as ususal; open other apps, close the phone or even remove GreenAnt from your list of running apps. However, the phone itself can decide that since you are not activily using the app and looking at the GreenAnt screen, it will shut down the app to save battery and resources. Therefore, when you are in an area where you want to collect data, please make sure that a “half-a-star” icon is present at the phone’s top bar (Fig. 2-7).

Figure 2-7: “Half-a-star” icon at the phone’s top bar



Clicking the Stop button will stop the app from collecting data. However, you might be alerted when you enter an area you are assigned to, that you need to reopen the app to collect data again (Fig. 2-8).

Figure 2-8: Stop button for stopping data collection

A note about Huawei phones

Huawei has an intensive power saving regime on their operating systems. This means that apps that are inactive over a longer period will be shut down automatically. There are, however, some things you can do to keep apps running for a longer time period.

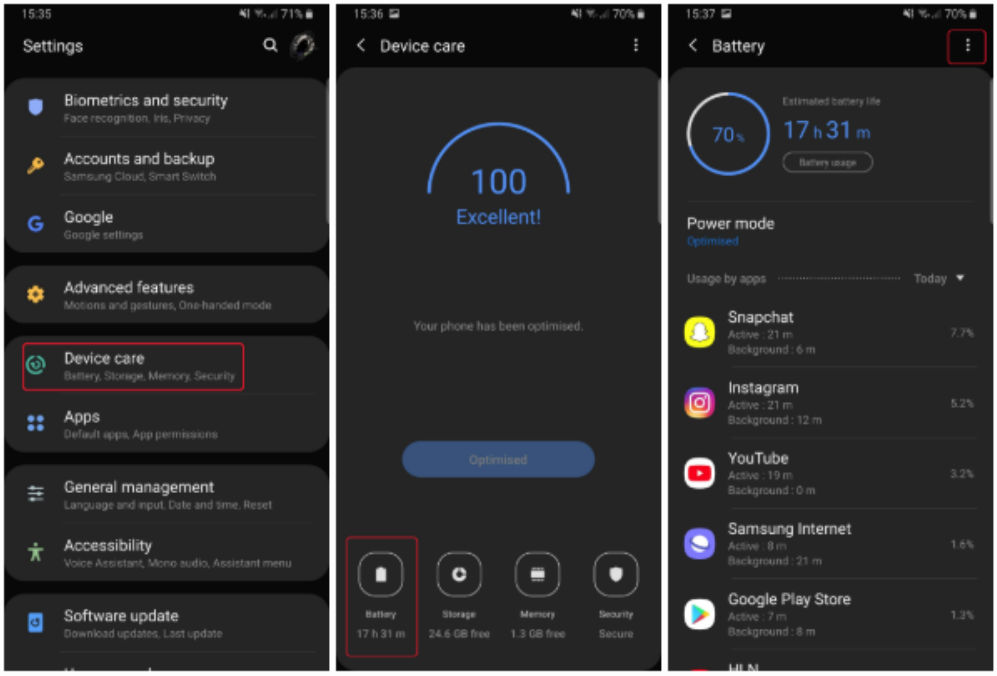
Go to Phone Settings → Battery→ App Launch.

Find the GreenAnt app in the list, click on it and change the option for “Manage all automatically”.

Keep the settings for Auto-launch, Secondary launch and Run in background.

Useful information for Samsung phones (Galaxy S9/10)

- If you have problems with Samsung phones stopping the GreenAnt app automatically, please try the following (Fig. 2-9):Disable Put unused apps to sleep
- Disable Auto-disable unused apps
- Remove your app from the list of sleeping apps
- Disable background restrictions for your app



1. Start **Device care** from phone settings

2. Tap Battery

3. Tap the 3-dot menu > Settings

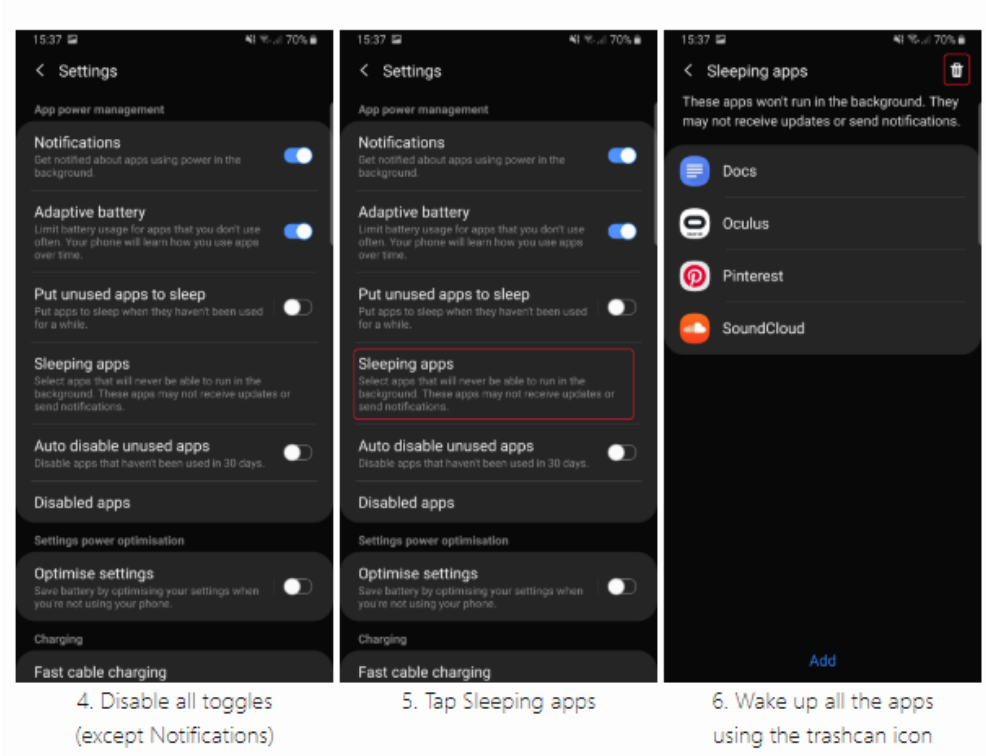


Figure 2-9: instructions for Samsung smartphones (source: dontkillmyapp.com/Samsung)

2.2.5 Further functionalities of the app

Figure 2-10: Basic information available on the app

Main information portal for detailed analysis of collected data are the https://greenant.nilu.no/ web pages. However, basic information is available on the app (Fig. 2-10). You can access this information by choosing “Activity” at the start screen (Fig. 2-5). There, the list shows how many kilometers you have been travelling with the different transport types during the day.

The “Profile” displays your nick name and the opportunity to delete your user profile and all your collected data (Fig. 2-5).

The “Open web survey” gives you the opportunity to provide feedback on the GreenAnt app (Fig. 2-5).

2.3 Analysing collected data

After establishing a “spot”, you can go to “My Spots” at https://greenant.nilu.no/ and view and analyse data collected through the app (Fig. 2-11).

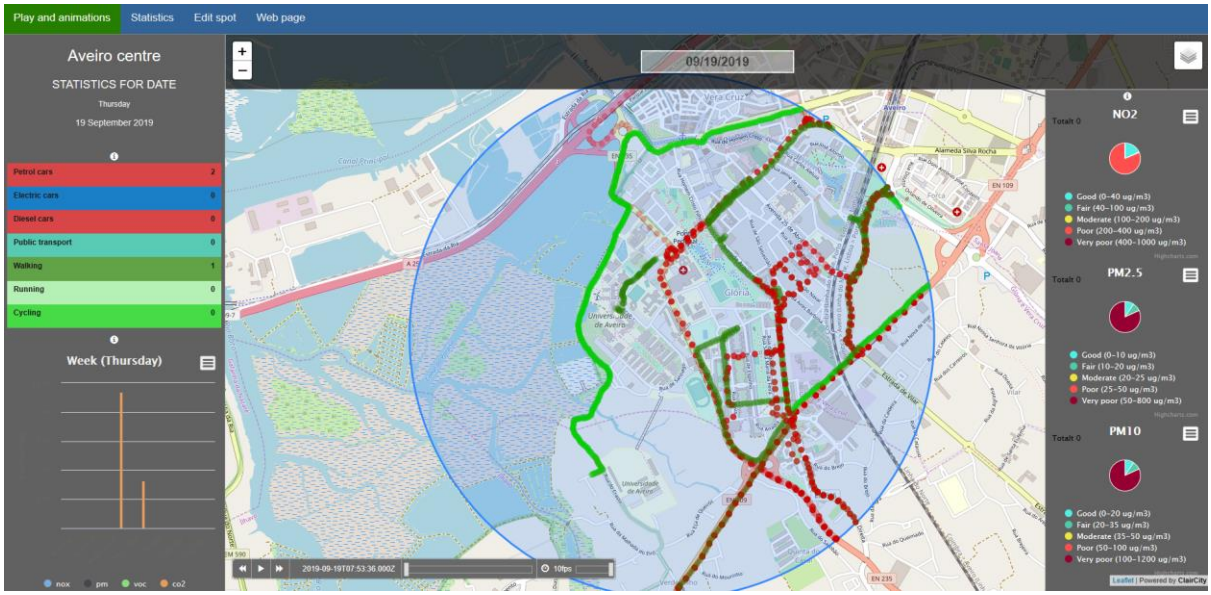


Figure 2-11: Data analysis – “My spots”

2.3.1 Play and animations

Here you can look at data from specific dates. The left side of the screen provides information about the number of journeys carried out by different type of cars, public transport or other types of activity. It also provides information about potential emissions for each journey. They are calculated based on the country code that has been selected for the spot.

Exposure to air pollution is displayed on the right side of the page. This data is based on meteorological statistics calculated based on country and city specific background air pollution maps, in combination with adjustment factors for day of the year and weekday.

The layer option can be used to start plotting data on the map, the “Player” function shows the activities during the whole day.

2.3.2 Layer options

This tool enables you to plot all activities during a day on a map. You have to click on the layer symbol in the right corner of the map to distinguish between activity types and display underlying air pollution maps (Fig. 2-12).

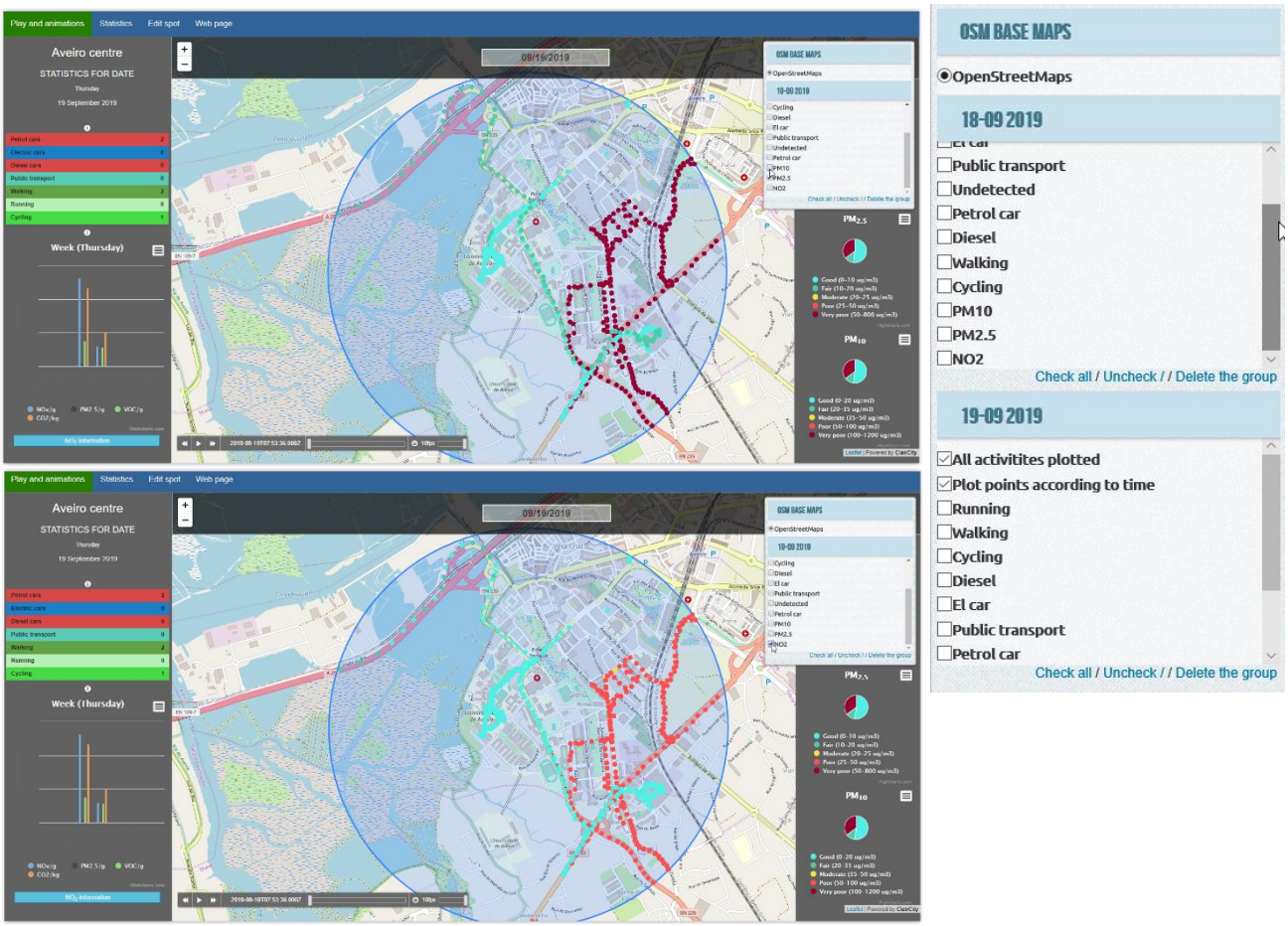


Figure 2-12: Layer options (right side), PM2.5 data (left, upper) and NO2 (left, lower)

It is also possible to compare different dates by changing the date in the main window. This will then automatically be added as a new layer. This functionality can be used to compare daily statistics.

2.3.3 Statistics

This functionality enables you to compare different days by selecting dates in the calendar (Fig. 2-13).

Figure 2-13: Statistics function

2.3.4 Edit spot

This tab provides you with the possibility to edit information about the spot and to delete it. You can also see when the spot has been registered and when it was last updated (Fig. 2-14).

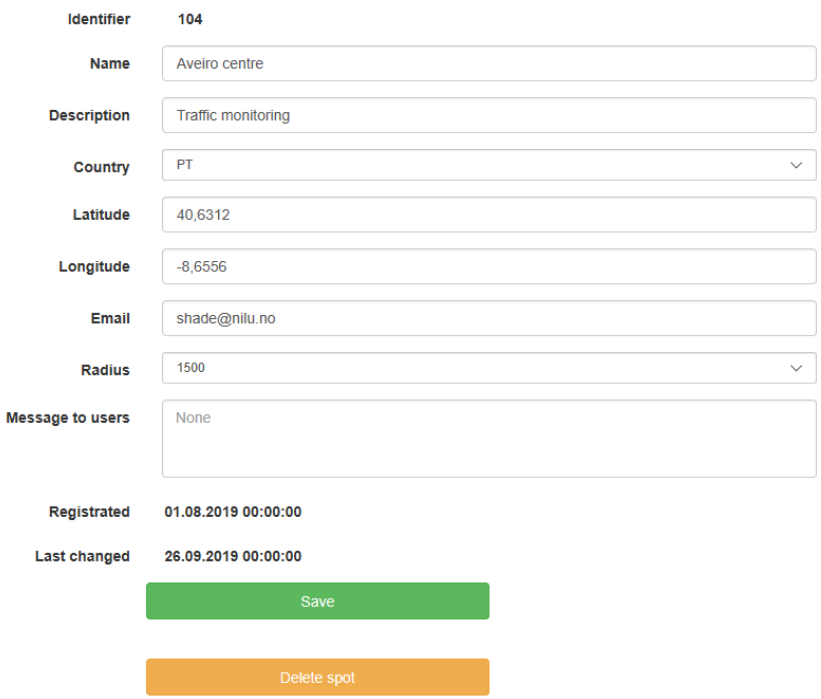


Figure 2-14: Edit spot function

2.4 Data security and privacy

The smartphone app is designed to provide anonymity while collecting data. The app will not collect any data except of what is described in the Privacy & Security section in the app.

For the users' privacywe only upload data containing an id, a latitude and longitude, a timestamp and an activity and transport type identifier.The id is not created based on any personal information and is not visible online.

This is an example of a data record collected by your device and uploaded to the server: [59.9753, 11.053, 1512731751, 0, d2c7e014-45d0-4096-b791-7804651c87c6, 0]. The values correspond to the following format: [lat, lon, time in epoch, activity type (number for walking, running, vehicle, cycling), guide, type of travel (id for other, school, work, leisure)].

All records are visualized on the web-based map as round markers on a map, with a color that indicates if the users have been waking, running, cycling or traveling by a vehicle.

If a user has chosen to share his/her nickname, the nickname will be added to each of the collected records for this nick name and visualized online.

Users can always delete their records on the GreenAnt server at any time by using the "Delete me" option found in the menu. Users can choose to delete all their records or let NILU keep data for scientific use and just delete his/her user.

3 Data from the testing phase

3.1 Testing of the GreenAnt system

The GreenAnt application has gone through different stages of testing during the ClairCity project. The process can be divided into four different test levels.

1 – Unit testing (continuously)

Single modules and parts of the system have been tested separately during the development to ensure that the smaller parts of the system work independently of each other. These tests have been carried out by the NILU developers after implementation of different elements required. This includes separate tests of the interfaces between the main modules (in for example each Web API end points which are requested from both the web page and the smart phone app) and functionality tests (button clicks, page loads, data retrieval, database storage routines, database triggers).

Separating functionality of the system into logical modules and test them separately helps to ensure stability and a cleaner code base.

2 – Integration testing (continuously)

This level of testing has been performed to ensure that the different modules work together smoothly and that the communication flow between all the parts that make up the GreenAnt system, is functioning.

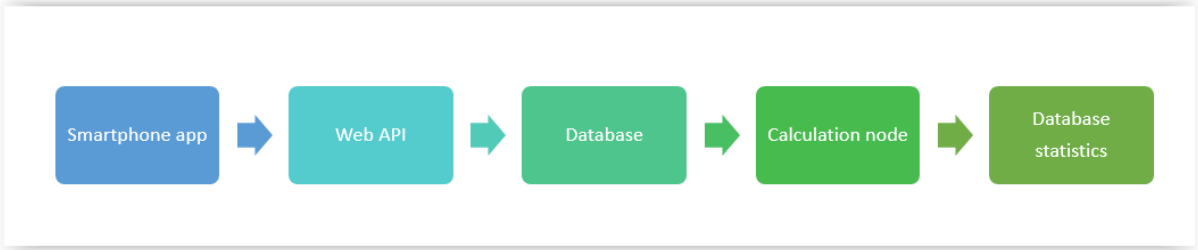


Figure 3-1: Simple communication and data flow for testing

Integration tests have been processed continuously by the development team at NILU to ensure that all functionality and modules are working correctly on two major smartphone platforms: iPhone and Android. The GreenAnt smartphone application uses device/OS specific resources such as gyroscope, clock, GPS and activity recognition. The app is therefore developed by separating code modules into shared code and platform specific code. Large test environments have been created to do integration testing for both platforms but also to do integration testing on different devices within the two platforms using a wide range of device emulators[1] including iPhone 5s, iPhone 6, iPhone 6 Plus, iPhone 6s, iPhone 6s Plus, iPhone.

[1] An emulator describes an application on your computer that enables testing a smartphone application on the computer directly instead of having to update the smartphone application each time and test it on the smartphone.

7, iPhone 7 Plus, Nexus 5x, Nexus 6p, Samsung Galaxy S6, LG G4, Sony Xperia E5, Samsung models, Huawei, Motorola.

Smartphone emulator environments have restricted functionality for testing device specific hardware and real-life situations like bad GPS signal coverage, loss of network connections and hardware issues. To be able to verify that the app also works under these conditions, the development team has done extensive field tests on module integrations

3 – System testing

System testing has been performed to evaluate the functionality of the full application and testing requirements compliances. The system testing of GreenAnt has been performed on three different levels:

Emulator tests (2017-2019)

Different emulators for data collecting have been established to stress-test the complete system with larger data sets and to monitor how the system handles multiple requests at the same time and heavy data load. These emulators also tested the system for longer time periods of multiple usage, up to a couple of months.

In addition, these emulator environments were used during the Acceptance testing to monitor the system and to give instant feedback of system failure in any of the different modules to ensure a better performance during the acceptance test phase.

Internal field tests (2016-2019)

Due to restricted test capabilities of real-life situations on emulators, internal in-field tests have been conducted on personal devices of friends and family members. These tests were carried out as local campaigns for 2-3 weeks. Experiences, technical issues and other feedback has been collected during the periods. GreenAnt was updated accordingly and then the smaller field test campaigns were run again.

Date	**Phone**	**OS**	
17.07.17	Iphone 6s	10.3.2	
Spots	Skedsmovollen NILU Toy r us Drammen Slagentangen		
Route			
Tuesday	From/To NILU		
Wednesday	To NILU NILU-Alnabru Alnabru-Breivold Breivold-Drammen		
Thursday	Drammen – Slagentangen (Tønsberg)		
Friday	Back to NILU		
Comment	Maybe Smedstad, vigernes, Skøyen		
Result	Data from NILU and Skedsmokorset really fine. Battery used during night: starting 90% woke up 60%. Location manager did not collect data in the other spots. Weird since it collected data again on Friday when arriving at NILU spot. Could be that one area has an outer radius that covers where she lived. But locationmanager does not sleep. ??		

Figure 3-2: Internal field test note, gathering feedback

Different parts of the GreenAnt systems have also been tested in different countries by the ClairCity project members during project meetings in Amsterdam (November 2016), Szentendre (May 2017), Ljubljana (October 2017), and Sosnowiec (April 2018).

External field tests

External field tests have been performed on three different occasions:

- Test campaign at NILU (November 2017)
    - About 50 registered users
    - Predefined NILU spot with radius of 1500m
    - Campaign period for 1 week

- Test with UWE (May 2018)
    - UWE ClairCity team
    - Maximum 10 people
    - Two areas were created in Bristol one around the university area and one around the city hall

- Test Summer 2019
    - 2-5 people from each city
    - Goal:
        - test that the air pollution exposure module and calculations work
        - get the users to know the system and therefore is able to assist the other users when launching the GreenAnt system and doing the acceptance test
        - check misspelling and translations

Testing of the GreenAnt system with concentration data was possible from late June 2019. A test with concentration information was arranged in early summer 2019 with all modules. Prior to this, GreenAnt has been tested, focusing on its core functionalities like automatic activity type detection (walking, cycling, running and in a vehicle), data collection about movements in areas, geographical processing of data from the database, statistics calculations and visualization tools.

During and after each system test, GreenAnt has been evaluated, redefined and further developed to meet the feedback, creating solutions for issues raised by users on functionality, concerns on security and privacy and critical system.

4 – Acceptance testing (2019)

Acceptance testing has been conducted in November 2019, within a 2 week period.To be able to have a full test of the user acceptance in this short period, in addition to collect as much data as possible for a prompt analysis of the possible usage of such data, the test campaign was formally defined by a testing protocol, including timeline and milestones (see Annex 4).

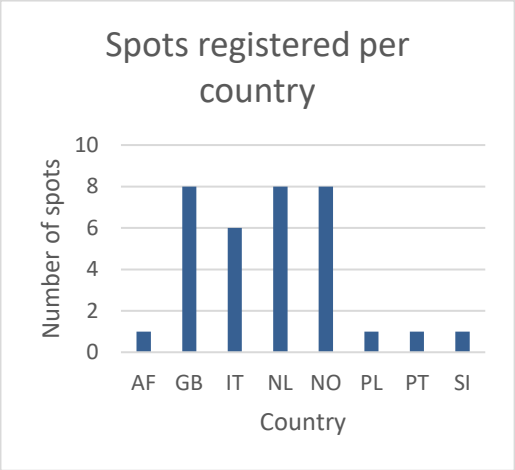
Prior to the test campaign, all city partners were offered a one-to-one meeting with the development team to learn how to use the smartphone app and the web site, analyse results and learn different strategies for how to approach users.

NILU produced a set of supporting products like YouTube videos (see https://greenant.nilu.no/), a flyer (Annex 1) and user manual (chapter 2 of this deliverable). The cities/regions translated the texts into local language. The city and the region partners then identified organisations/communities/user groups who should be asked to test the GreenAnt system in addition to promote the system to their employees and families. The aim was to have about 50 users per city/city region.

Weekly telecons have been arranged prior, during and right after the testing phase between the GreenAnt management, the development team and the city/ region partners, to update on progress in each location, discuss technical and other issues and to give support. The development and management team at NILU had daily meetings during the data collection period of 2 weeks, to quickly be able to detect problems and support the users.

3.2 Results of testing

During testing in November 2019, 24 new areas for data collection ("anthills") have been registered. 95 users created their profile on the GreenAnt smartphone app. A total of more than 2 million data records were collected. One record contains one GPS position, a timestamp and an activity type that describes the type of movement detected. The more users of one "anthill", the better for our testing purposes, since we wanted to explore how many different users could use one "anthill" at the same time.



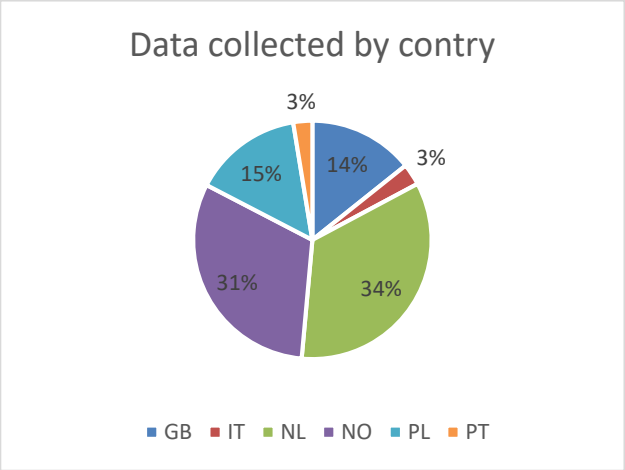


Figure 3-3: Zones registered by country

Figure 3-4: Data volume collected by country

Of the participating countries, the Netherlands have registered the highest number of zones and has also collected most data, more than 50% of all records are from zones in the Netherlands. As Figure 3.5 shows, the zone belonging to Amsterdam GGD has contributed with most datarecords (more than 800.000) during the acceptance testing phase in November 2019.

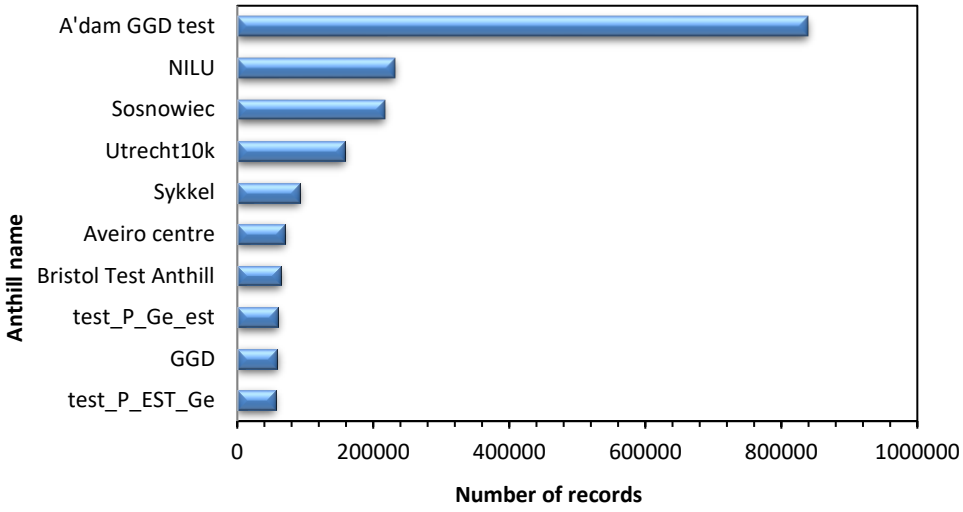


Figure 3-5: The 10 zones with most collected datarecords.

The following graph shows the percentage of type of activity for each country. It is clear that the majority has either been walking or traveling by using public transport during the testing period.

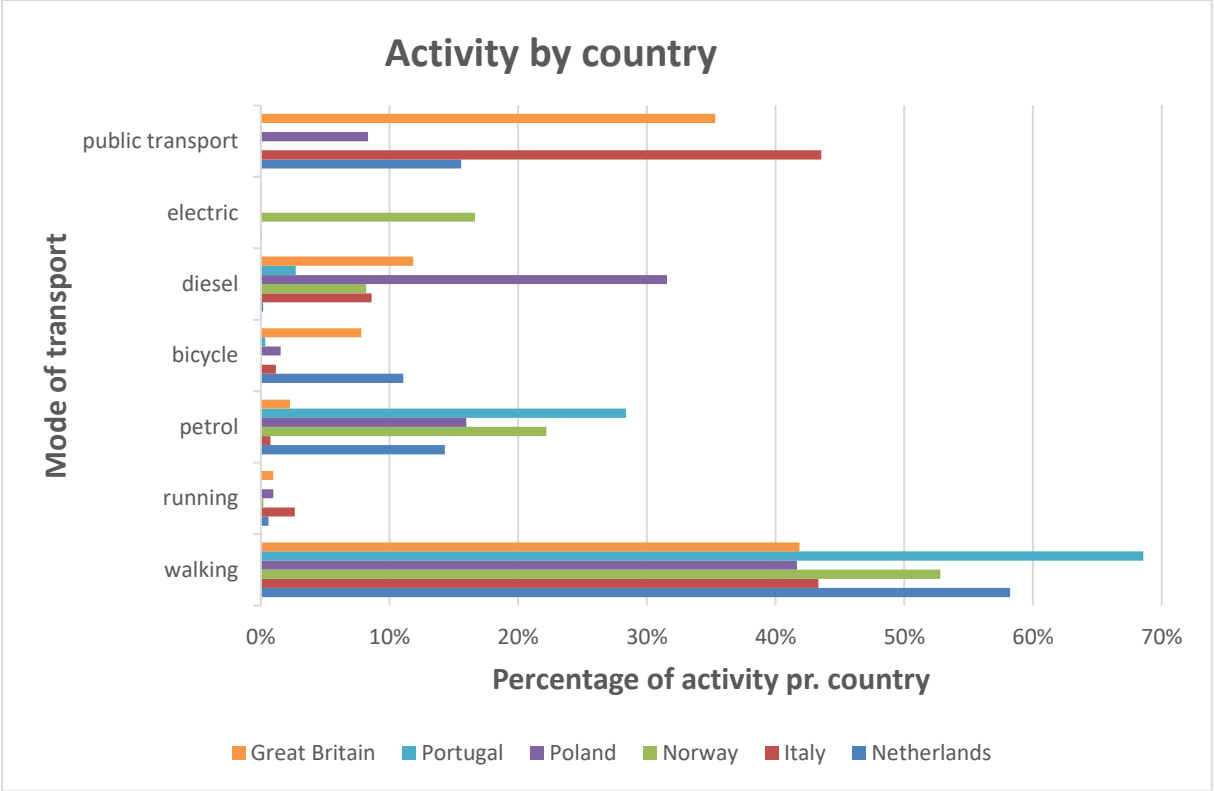


Figure 3-6: Percentage of type of activity per country

The total number of all active zones (i.e., “anthills” where data has been collected) during all testing phases is 36 with 131 users actively collecting data using their smart phone. Up until now (December 2019), there 3,5 million records have been collected in total, covering the

whole testing phase. Slightly over 50% of the travels registered was walking and slightly less than 20% was using public transport.

3.3 TRL of GreenAnt

The GreenAnt application started at a TRL2 in the beginning of the ClairCity project, where the concept was formulated and described in the project proposal. The GreenAnt concept was adjusted and redefined during the early stages of the project to include comments and whishes from the user groups. An updated concept was agreed upon and presented on multiple project meetings together with information about the development of the prototype. The feedback at the annual meetings was overvelmingly positive. GreenAnt modules and the complete system were tested both in a emulator environment and in a real life environment before it was demonstrated and tested in each city.

The GreenAnt system is now evaluated to satisfy TRL6 and is moving towards TRL7. The system has been tested with real life users in six locations as described in the previous chapter. The changes requried to satisfy the user needs and expectations from the testing are in the process of implementation (for more information on the user feedback, see Chapter 4). The exploitation of GreenAnt after the project end will be described in detail in the ClairCity Impact and innovation plan, and in the business plan providing the details of exploiting the GreenAnt system. In order for GreenAnt to reach TRL7, we first need to finish the work of implementing the comments and recommendations from the testing in TRL6. Then the system has to be tested by a wider audience. The tests are required to obtain feedback from both individual users and organizations/user groups. The system has to be operational over a longer period and tested in various environments. One of the main obstacles in the testing under TRL6 was privacy. The GreenAnt system is in alignment with the EU General Data Protection Regulation, GDPR. We are working with this aspect and changing the system in accordance with how users feel about privacy. When the system has been updated, testing on a larger relevant group of users in the field must be done. The system will then be near to a planned operational system.

4 User feedback and evaluation from testing phase

The feedback on the GreenAnt system we received from the users during the testing phase was treefold:

1. Feedback via email;
2. Feedback via an online evaluation survey in the local language that users were asked to complete at the end of the testing phase in November 2019;
3. Weekly meetings with testers.

Immediate attention was taken to tackle technological issues and concerns about data protection. NILU established a “task force” that met on a daily basis to discuss the feedback received, prioritise efforts and update each other on progress. The NILU team was in direct contact with the users that sent their issues to provide immediate user support.

4.1 Technology related issues

A detailed overview of the technology related issues that were sent to NILU is attached as Annex 5. The issues can be summarized as follows:

Problem reported by the users	**Actions**
1. The app drains battery	- An option to select transport mode manually and to start and stop collecting information is implemented to limit the load on the battery. - Improve algorithm for inactive use is developed
2. Some parts (both in the app and the web pages) were missing translation to the respective local languages	- Fixed in latest version
3. Modes of transport were not discovered automatically/correct by the smart phone and reported use of transport was often providing wrong numbers;	- Manual selection of transport mode is implemented - Problem started with latest release of android, test to see if updates on this relase fixes the issue or not is planned for 2020
4. Troubles to see associated pollution concentrations; in addition, the underlying air pollution maps provided different air quality data than real-time measurements	- Found that at least one spot did not have correct country code registered. This needs to be correct to be able to find the underlying background pollution map - Add a quick lookup on latitude/longitude to suggest correct country code - Provide a possibility to add external air pollution sources is a possibility but will not be included in the next version. - The underlying air pollution maps are not based on online measurements

	or modelling but statistics from a yearly average map. This means that the map is the most probable from statistics (climatological map). Differences are expected.
5. Difficulty to interpret graphs and data on the web pages	- Should continue to create graphs in a co-design phase the suggestions that emerged in the test periods will be implemented.
6. Difficulty for some users to create a new “anthill”	- Need to check if this is a user misunderstanding or if there are technical problems. Will be done in the beginning of 2020
7. The app stops automatically	- There are known issues with android/iOS and long running processes - Have added several user dialogs to notify user and encourage to reopen the app - Need to investigate for app crashes - Issue found for possbile app crash on android devices. This has been fixed in latest version

4.2 Privacy concerns

Several city/region contacts reported concerns from the municipalities about a sufficient protection of the users’ privacy. They were afraid that the user’s identity could be revealed through their transport route.

The concerns have been taking serious by both NILU and UWE, who is the data officer for the ClairCity project. We explained that by providing a nickname for each “anthill” and no further personal information, the user’s identity would not be revealed. In addition, each “anthill” can be password protected. It is not possible to identify individuals since there is no personal information displayed on the map. In this way, even in an “anthill” that was not password protected, but open to be used by any GreenAnt user, individual users’ identity cannot be revealed due to the non-existence of personal information. The layout and content of the GreenAnt system have been presented to the consortium in the annual meetiogs. The issues All user information can be deleted by the user.

It was important to not create one big “anthill” with a large diameter, but rather several smaller ones at hot spot areas or areas of special interest. In this way, it is not be possible to identify a user by his/her full travel route between home and work, since the route that would be visible would only be short and would not reveal the direction where the user came from/went to. However several users wanted large “anthills” to view a larger area. The size of the “anthill” is therfore user defined.

The advice we provided was also in line with the overall data protection policy of the ClairCity project.

The municipality of Sosnowiec (PL) have strict rules on the privacy declaration and the general text in the privacy declaration did not satisfy these demands. In order to test the GreenAnt system in Sosnowiec, we had to provide the following information on the GreenAnt web pages in Polish:

IMPLEMENTATION OF THE INFORMATION OBLIGATION IN CONNECTION WITH THE REQUIREMENTS OF ARTICLE 13 REGULATION (EU) 2016/679 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL (GENERAL DATA PROTECTION REGULATION - GDPR)

YOUR DATA WILL BE PROCESSED with your CONSENT within ARTICLE 6 (1) (A) OF THE GDPR, with regards to your nickname, geographical location, and views on using the GreenAnt system. This data will be used to inform the research project ClairCity and the development of an app to find out more about air pollution in cities.

THE ADMINISTRATOR OF YOUR PERSONAL DATA IS Head of IT Morten Pedersen. YOU CAN GET INFORMATION ON THE PROCESSING OF YOUR PERSONAL DATA on the ClairCity webpage (GreenAnt link).

Data will be processed and stored according to security conditions in the GDPR, and will be held in (NILU offices Postboks 100, 2027 Kjeller, Norway). Results from the project will be grouped for reporting on the research project, so that no individual user is identifiable. Results will be shared widely including on the ClairCity website and in reports to the EU.

4.3 Results from the evaluation survey

All users that have been recruited to test GreenAnt have been asked to complete the evaluation survey that has been designed by NILU and UWE. However, NILU only received a low number of usable questionnaires (i.e., 20). The Aveiro region had 19 additional survey filled in. These are not includecd here because only the comments where recorded. Ljubljana started their testing campaign already in September 2019, before the official launch and the official testing phase. Thus, the participants could not complete the evaluation survey. For Sosnowiec and Liguria, only incomplete evaluation reports were submitted. From the Bristol participants, 7 out of 10 submitted complete reports, whereas in Amsterdam, all 13 respondents submitted complete reports. For the Aveiro region 19 participants answered the survey.

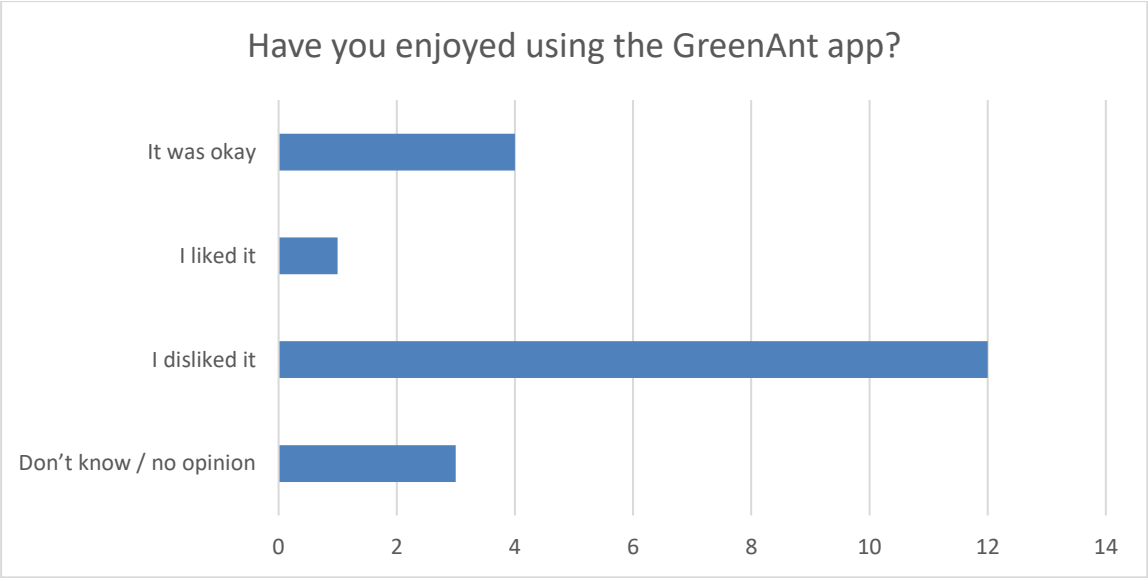


Figure 4-1: Number of participants who enjoyed using the GreenAnt app.

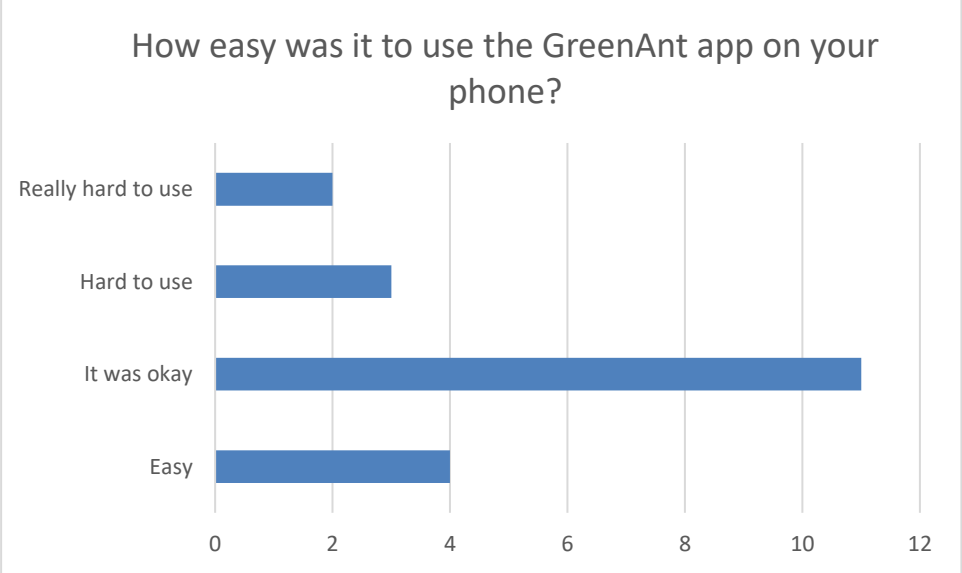


Figure 4-2: Feedback from survey from participants on use.

The majority felt that the use of the Greenant was easy and all right. However the majority reported that Greenant was not engaging. This can be connected to the motivation for using GreenAnt. The system is not primarily made for the individual user but for a group of persons or organizations.

Asked about the number of days the participants have used the GreenAnt app, the majority replied (60%) that they have been using it some days a week (Fig. 4-3).

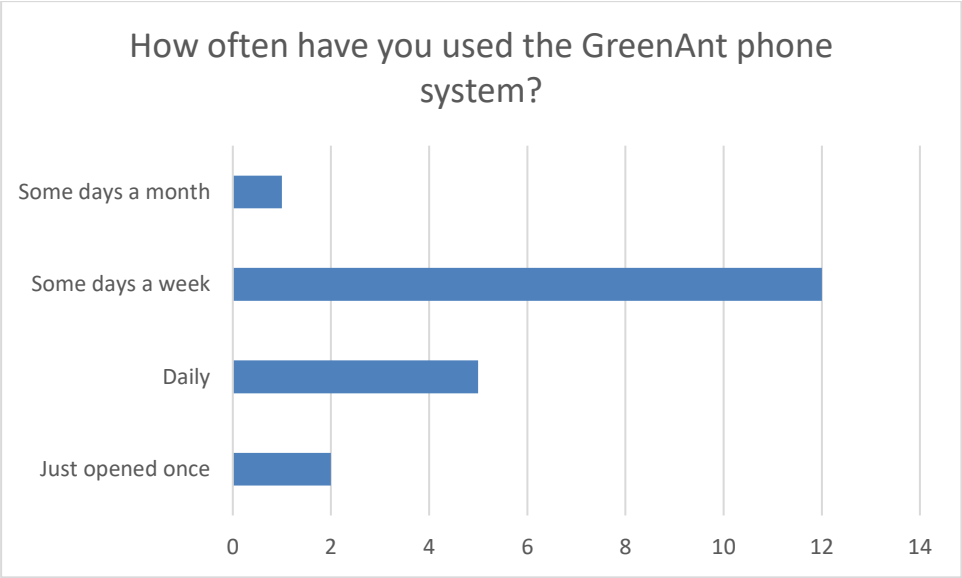


Figure 4-3: Number of days that participants have been using the GreenAnt app.

The NILU team believes feedback from the users may be often negative because is easier to comment on things that do not work than things that work. Nevertheless the feedback received is useful for the further improvement of the app inspite of that the testing was not representative. The participants had questions around accuracy, functionality and use for air quality management. In addition to the comments from the evaluation survey, we also received comments directly through email and trough weekly meetings. We categorised the comments by city/region:

Summary of comments from the test users in Sosnowiec:

- the app consumes too much battery and takes too much space on the phone
- it is too complicated, not intuitive
- it gives wrong results – it doesn't recognize mode of transport correctly and gives false number of kilometers travelled
- it often stops working all of a sudden and you must restart it
- once the application has been downloaded, two icons appeared on the "Home" of the device instead of one
- doubts about privacy
- concentration data on Green Ant website are completely different from our data measured in the city, differences reach 50%
- the pie chart on website doesn't show correct data
- the survey was in English
- the app does not show how one can influence the reduction of air pollution
- the application is unattractive
- the app is not helpful

Summary of comments from the test users in Amsterdam

Comments on accuracy & functionality:

- Choice of modes: When registering you have to pick between petrol, diesel, EV or public transport. Most people in Amsterdam only/mostly use their bicycle. Can the cycling option be added?
- Inaccurate modes registered:
    - GreenAnt registers public transport km when in fact those should have been car km. Part of the public transport kms should have been car kms – the app doesn't seem to distinguish between modes;
    - The app registered cycling km on a daily basis (next to public transport & walking, which the user was doing) whereas the user did not use his bike;
    - The walked km recorded were often way too many
- Air quality information isn't clear. It is not clear whether it shows the time spent in each pollution category or whether it means something else. To be of use for the individual user it should state in much more detail what the figures actually mean. In addition it seems that the individual app user can't look back at air pollution of past days.
- "Generally, the app was easy to download and functional, but didn't provide a lot of information." "The fact that distances travelled via different transportation options are the only metrics (sometimes inaccurate) that one can access on the app is not ideal"; "I thought that the 'health' function would indicate something along the lines of pollutants I've been exposed to - but no data regarding this is shown on my phone"

Comments on user-friendliness:

- The fact that creating locations can only be done on the website and not in the app is cumbersome
- The website interface (with the map) isn't very user friendly. It seems to react very slowly and then and when trying to move the map, it quickly draws one to Poland or the UK while we wanted to take a look at the Netherlands. Furthermore it can show a lot of the registered data in various ways (it even shows for each day where and how you actually moved). That could be interesting, but I am not sure for whom. Seems we can't look at everything; For instance PM_{10} is located under NO_2 and $PM_{2.5}$, and we can't seem to slide the screen upward, although there are a lot of slides on the screen.
- "The manual provides useful but somewhat limited information. Even when I logged onto the site as suggested in the manual, I couldn't find info on pollutant exposure/air quality/other data"
- "The selection of 'spots' is very confusing- there were multiple 'Amsterdam maps' to choose from and it was unclear which parts of Amsterdam the monitoring covered";
- "It would be good to connect maps together instead of loading individual maps. For example, if there was a way to track my movement between Rott-Ams without having to install 2 separate maps";

Summary of comments from the test users in Bristol

- "The app didn't work on my phone"
- "The app didn't work for me/I already feel quite aware (so no need for the app)"

- “Felt that personal data were not protected enough
- “Difficult to scroll down through the exposure levels pages without the graphs opening up”
- “Simplistic, not very intuitive, needs more guidance”
- “Mix of languages within the app”
- “Adding spots was confusing”

Summary of comments from the test users in Aveiro region

- People were already taking measures to reduce air pollution, but not as a result of the app
- The app is not working correctly. The distances are not being correctly accounted in the different categories and emissions are not based on real-time values
- In some cases, no data was saved
- At the current stage, the app is not prepared for public use, it’s not user friendly. It crashed several times and the text needs further editing
- Still some bugs for some phones or it didn’t work at all (e.g., Xiaomi Redmi Note 4, Mi A2 Lite) or it wasn’t available in the Play Store
- The app is not intuitive and user friendly; old-fashioned design
- Privacy concerns

Summary of comments from the test users in Liguria region

- The app does not correctly record the data or does not record data at all
- The app does not sufficiently protect personal data
- The app does not provide correct information on the pollution of my streets
- A “spot” is still visible in the app after deleting it
- The app stopps by itself

These comments have been summarized and the solutions are given in Chapter 41.

5 Way forward

The GreenAnt system has many potential uses, not only for the use in ClairCity. It can also be used for all applications where local and individual information is needed. The system needs further development to reach a TRL9 where it will be a product that is ready to be used commercially. NILU will develop the GreenAnt system further to make this possible. Contacts have already been established with Kjeller Innovation (the local TTO technology transphere office to take GreenAnt further). This work will continue after the project is closed and it will be described in D2.10 :Delivering the vehicle for innovation after project end

There are many possible uses of the GreenAnt system. The most obvious one is the analysis of behavior and change of behavior, where transport modes and routes can be mapped before a change is implemented and after the changes have taken place. This could be done to get a test scenario to map the consequences before the actual implementation is permanently put into place. Testing consequences could also be done in a city's digital twin. This would help urban planners and local administrations to make sustainable decisions.

Another potential field of application could be the avoidance of emissions in hotspot areas (for e.g., bicyclists, joggers or pedestrians). By initialising changes in infrastructure GreenAnt could visualise the consequenses on emissions and indicate which actions would be most effective to reach the planned travel endpoint.

The GreenAnt system can also be used to make better exposure estimates by combining the GreenAnt system to surveys and thereby estimates of health effects by combining self reported health effects and well beeing. GreenAnt could also be used for mapping differences in exposure and possible health effects of the different population groups (gender, professional drivers, etc). Information from GreenAnt could also be used in a Smart City context where the results are included in for instance settings with digital twins.

The way forward on exploitation of the GreenAnt system will be described in detail in D2.10: Delivering the vehicle for innovation after project end.

6 Conclusions

Planning and development of the GreenAnt system has been quite time consuming. It has been an iterative process, undergoing several feedback loops with input from the ClairCity consortium. Additionally, we had several rounds of testing, both with individuals and user groups.The GreenAnt is designed to look at differences on behavior for user groups and empower users to change their behaviours. The GreenAnt is not meant to be a system For individual use only, but but groups of users, govenmental bodies, service providers and industries. To facilitate group information it is necessary with individual users. This makes the GreenAnt system dual in its nature. The system needs to motivate the individual user and collect information usable for analysing group behavior and change in behaviour over time. This is done by making the system attractive for the individual user and make the user motivated by the information the system gives back to the individual and the group. GreenAnt is also directed towards organizations arranging campaigns where different solutions are tested and the audience is encouraged to use the system and by this use make available information on the different solutions.

Despite all testing and re-designing, the results show that there are still obstacles that have to be overcome in order to make GreenAnt more attractive for the users. There are technical issues emerging that needs attention. The direct communication to convince the user will need attention to ensure their concerns about data security and privacy. Measures have been implemented and actions will continue to secure trust in the GreenAnt system. Additional resources will be required to keep ClairCity updated and fix bugs beyond the end of the project.

The experience in developing GreenAnt is that the smart phone operation systems get updated regularly. It seems that the trend is to restrict the possibility to keep apps alive for longer periods of time. This is made more and more difficult to do. Using the accselero meters in the Smartphone also made some trouble in the detection of transportation mode , partly from the difference in make, but also from the changes made in the subroutines made available from IOS and Android. The conclution on this is to make the Greenat and other systems like GreenAnt as independent as possible of the Android and iOS operation systems

In the further development of GreenAnt focus should be on making the system more attractive to the individual use. The use of GreenAnt to for instance investigate the behavior and change in behavior of different changes in infrastructure such as closure of a road is dependent of sufficient users and therefore attention. This will also lead to a further progress in TRL. GreenAnt is currently on TRL 6 but it requires further work and the trust of users and their understanding on how to use the system best to move to TRL 7 and with that guarantee for its commercialisation and thus, its continuation. This would also require further endeavors of communication and dissemination activities of ClairCity.

To put it in a nutshell, in order for GreenAnt to live a sustainable project afterlife, continuous technical support would be required in combination with steady user communication to co-create use-cases that are requested by the users and to guarantee for technical stability to reach TRL 7. The delivery “D2.10: Delivering the vehicle for innovation after project end” will describe this process in detail.

Annex

Annex 1 – GreenAnt promotion flyer (English version and an example translation)

Who should use GreenAnt?

GreenAnt offers many advantages for a broad range of users. Discover how people travel and what mode of transport they use. Raise awareness about emissions and open for new solutions.

Suggested application areas:

Urban planning – travel patterns can provide information about healthier routes, heavily polluted areas, alternative parking or travel options.

Transport – study transportation challenges and how they contribute to greenhouse gas emissions. Make companies greener by applying smarter transportation modes.

Interest groups – people with certain health issues can follow the information on pollution levels along the roads they use for commuting/travelling and can change travel habits to avoid exposure.

Consciousness – assess your carbon footprint from traveling. See how your choices of transport modes change your personal emissions of greenhouse gasses and the indications of health effects.

Contact information

The GreenAnt system has been developed by NILU-Norwegian Institute for Air Research
www.nilu.no

For any questions related to GreenAnts, please contact: Svein.Knudsen@nilu.no

GreenAnt is a product developed within the EU H2020 funded project ClairCity
http://www.claircity.eu/

For any questions related to the ClairCity project, please contact the coordinator: Hans.Bolscher@trinomics.eu

ClairCity partner organisations:

Learn from the ants - become a smart and green traveler!

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 689289

GreenAnt…?

Ants are amazing animals. They are constantly on the move, covering long distances by foot. They can find the smartest route to reach their aim. They can also learn from each other.

We made these amazing abilities available for you by developing the GreenAnt system.

GreenAnt helps you to visualize how our everyday travelling causes pollution and what you can do to change this. You can learn where to avoid using the car and you can learn from others.

On the GreenAnt web pages, you can create your user profile and access your data. The smartphone application detects your transport mode, location and movement.

GreenAnt website with user manual: https://greenant.nilu.no/

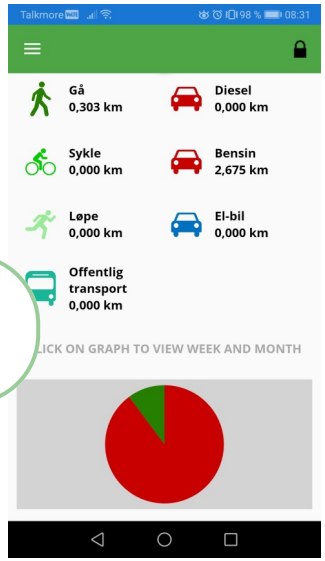
Mobile application: GreenAnt

GET IT ON Google Play

Download on the App Store

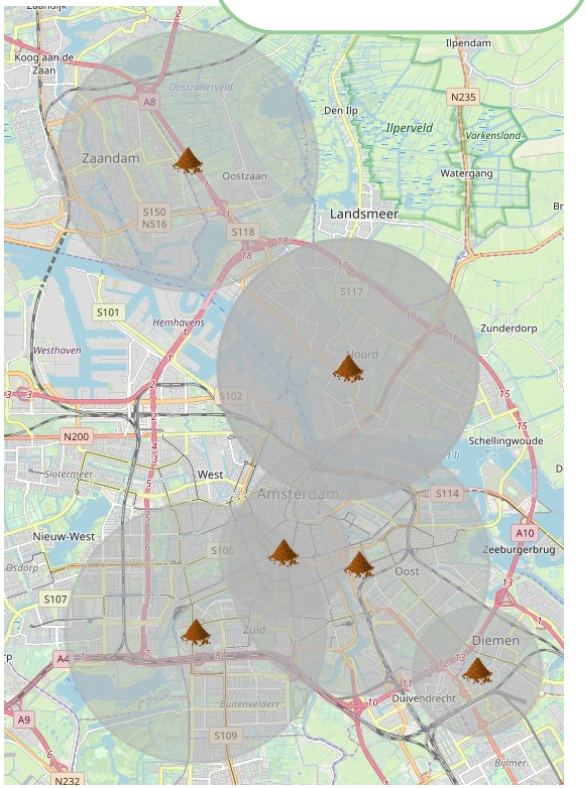
That's all you have to do:

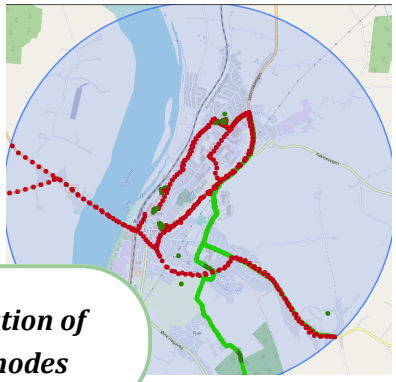
1. Register a zone ("spot") on the online map where you want to receive information on travels, carbon footprint and air quality
2. Add that spot on the GreenAnt app and ensure the app is turned on each time you travel through this zone
3. Visit the GreenAnt web page to obtain information about your travel behavior, carbon footprint and the air quality. Compare your results with other GreenAnts travelling through the same zone



GreenAnt app

6 Spots in the larger Amsterdam area





Visualization of travel modes

Quem deve usar a GreenAnt?

A GreenAnt oferece um conjunto de vantagens para uma ampla gama de utilizadores. Descubra como as pessoas viajam e que meios utilizam. Tome consciência da sua pegada de carbono e abrace novas soluções.

Áreas sugeridas de aplicação:

Planeamento urbano – padrões de mobilidade podem fornecer informação sobre percursos mais saudáveis, áreas poluídas, parques de estacionamento ou trajetos alternativos.

Transporte – analisar os desafios associados aos transportes e perceber a contribuição destes para a emissão de gases com efeito de estufa (GEE). A utilização de meios de transporte inteligentes tornará as empresas mais verdes.

Grupos de interesse – pessoas com problemas de saúde podem seguir a informação sobre os níveis de poluição ao longo das estradas que utilizam e podem alterar os seus hábitos para reduzir a sua exposição à poluição.

Consciencialização – avalie a sua pegada de carbono. Poderá avaliar como as suas escolhas de mobilidade alteram as suas emissões de GEE e consultar as indicações dos efeitos na sua saúde.

Informações de contacto

O Sistema GreenAnt foi desenvolvido pelo NILU -Norwegian Institute for Air Research
www.nilu.no

Para alguma questão relativa ao GreenAnt, por favor contacte: Svein.Knudsen@nilu.no

GreenAnt é um produto desenvolvido no âmbito do projeto ClairCity, financiado pelo programa EU H2020
http://www.claircity.eu/

Para alguma questão relativa ao projeto ClairCity, por favor contacte o coordenador:
Hans.Bolscher@trinomics.eu

Organizações parceiras do ClairCity:

Aprenda com as formigas, transforme-se num viajante verde e inteligente

O projeto ClairCity recebeu financiamento da União Europeia através do programa de investigação e inovação Horizon 2020 através do contrato de subvenção No.

GreenAnt...?

As formigas são animais incríveis. Elas estão sempre em movimento e percorrem longas distâncias. Elas conseguem encontrar o melhor caminho para alcançar o seu objetivo e aprendem umas com as outras.

Através do desenvolvimento da GreenAnt, estas caracteristícas fantásticas estão ao seu dispor.

A GreenAnt ajuda-o a perceber como as suas viagens diárias contribuem para a poluição atmosférica e o que pode fazer para alterar esse comportamento. Poderá descobrir como evitar o uso do automóvel e aprender com as experiência de outras pessoas.

Na página web da GreenAnt, poderá criar o seu perfil de utilizador e aceder à sua informação. A aplicação de *smartphone* identifica o seu meio de transporte, localização e movimento.

Manual de utilização da GreenAnt:

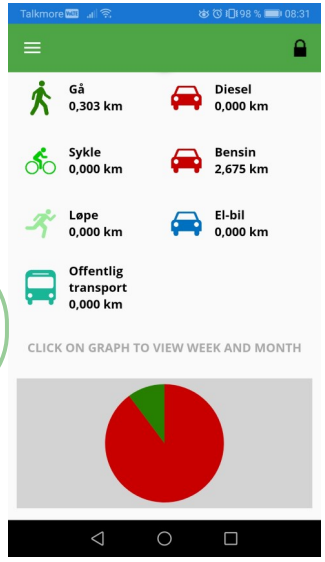
https://greenant.nilu.no/

GET IT ON Google Play

Download on the App Store

Tudo o que precisa de fazer:

1. Registar no mapa a área - 'spot' - onde pretende receber informação sobre transportes, pegada de carbono e qualidade do ar.
2. Adicionar essa zona à aplicação GreenAnt e garantir que a aplicação está ligada sempre que percorre a zona escolhida.
3. Consulte a página web GreenAnt para obter a informação do seu histórico de mobilidade, pegada de carbono e qualidade do ar. Compare os seus resultados com outros utilizadores GreenAnt a viajar na mesma zona.



Aplicação GreenAnt

 # zonas na Região de Aveiro

Visualização dos modos de transporte

Annex 2 – Dissemination material from UWE

GreenAnt App sharing toolkit

Thank you for sharing our GreenAnt app 😊

GreenAnt is a free app for mobiles (Apple and Android) alongside a web system that allows users to become citizen scientists, through monitoring their own and others' transport activities. In doing so, the system encourages users to make changes to the way they or their organisation get around the city. It is part of the ClairCity project aiming to involve citizens in decisions about tackling air pollution, carbon emissions and citizen health for the city.

The project is funded by the European Union Horizon 2020 funding, and both Regione Liguria and Techne Consulting are partners on the project. Please help us to share this as soon as possible with:

- Anyone in the Liguria Region, with specific focus on businesses, service providers, the transport industry and municipalities
- Anyone over 16 years old

Contents of this toolkit

In this toolkit you will find:

- A brief background and explanation of GreenAnt
- Suggested
  - Text for newsletters, short blog or news items or email lists
  - Text for Facebook and Twitter posts
  - Images for use in any media

This project has received funding from the European Union's Horizon 2020 research and innovation progreamme under grant agreement No. 689289.

If you need to edit the text to suit your audience or to make this relevant to your work, please feel free. For any queries about the GreenAnt App or the ClairCity project, please contact patrizia.costi@regione.liguria.it or rita.vaccaro@techne-consulting.com.
www.claircity.eu/liguria/green-ants-app

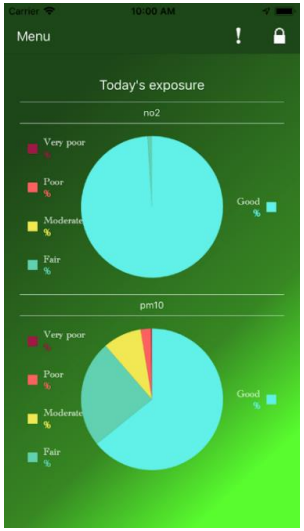
Ants tread lightly and find the quickest route from A-B. Can you?

Drawing upon this simple idea, ClairCity have developed a mobile app that allows users to monitor their daily commutes and routes around the places they live, work and play. Users can opt in to record their data to become citizen scientists. GreenAnt enables citizens to encourage others, whilst also contributing to ongoing research into ways to reduce air pollution and carbon emissions in cities.

This project has received funding from the European Union's Horizon 2020 research and innovation progreamme under grant agreement No. 689289.

How does it work?

Users download the app and register their details. They can explore external air quality data and if they opt in, can start recording data about their behaviours in an area they select from a GPS map. Their continuous monitoring will generate charts to show daily, weekly and monthly statistics (see right-hand images).



Who will this benefit?

1. If the user opts into recording data, they will be given daily, weekly and monthly statistics on their activities, emissions and pollution expose. Awareness to their impact can nudge **individual** behaviour change.
2. With consent, **organisations** could choose to gather data from employees, as a way to encourage behaviour change through a bit of healthy competition – think pedometers 3.0 – or use the data to campaign for improvements to road infrastructure and sustainable transport options.
3. **Municipalities, service providers (e.g. urban planners) and industry** could investigate how user behaviour changes if a road closure or infrastructural changes occur, with the resulting impact on emission levels, thereby helping to improve the effectiveness of the transport sector.
4. **People with specific health conditions**, helping them to avoid travelling through high emission zones on a given day.
5. **Campaign organisations** can find out emissions' hot spots and times in their area.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 689289.

Where does the data come from?

GreenAnt uses three kinds of data:

1. External air quality data such as annual emissions and air pollution exposure to nudge users towards lower impact travel for their health and the health of the planet.
2. User data, if users opt in, to understand more about their own travel behaviours, in a given area, and monitor it over time.
3. Crowdsourced data, of all registered users, to show group travel patterns during different times of day

To view crowdsourced data for their area, users can login to the online portal.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 689289.

Newsletter/email

Newsletter medium text	**ClairCity GreenAnt App – tread lightly, like an ant** We all know our travel choices impact our health, but do you know by how much? ClairCity have released a new, free app and web system that allows you to find out. Download the free app, crowdsource data on how we get around the city to reveal the impacts this has on human and planetary health and use this information to encourage citizens to change the way we move. Play as an individual, compete with friends and colleagues, or use in your organisation, and see what impact we can make to the quality of the air we breathe and the amount of emissions we produce over time. Ants tread lightly and find the quickest route from A-B. Can you? Download the app for Apple or Android.
Newsletter short text	**ClairCity GreenAnt App – tread lightly, like an ant** A brand-new free app for smartphones might be the nudge we need to change how we travel. It's simple. Download the free app, crowdsource data on how we get around the city to reveal the health impacts of our decisions, and use this information to encourage yourself, staff, friends or colleagues to change the way we move. Ants tread lightly and find the quickest route from A-B. Can you? Download the app for Apple or Android.
Newsletter more environmental/technical	**Tread lightly, like an ant** Download ClairCity GreenAnt App and see how travel choices impact the places you live, work and play. The free app and web system (available for Apple and Android) allows users to monitor both collective and individual travel choices and routes, and how these impact on carbon emissions and air quality over time. Air quality data such as annual emissions and

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	air pollution exposure comes from external sources; behaviour data is generated from the pool of users that have registered to become citizen scientists. Users choose specific areas to monitor – areas that they typical travel through on a regular basis – and input data about their daily behaviours. They get feedback in the form of daily, weekly and monthly charts on the impact they are having, and can explore the online platform to find out how they compare to the pool of other monitors in their area. Allowing users to see their daily impact, and that of other people in their community, helps to nudge people towards pro-environmental behaviours. The app in not only beneficial to individuals: • Organisations can encourage staff to monitor their commutes, or travel throughout the working day, providing information that can be used to reduce exposure to air pollution, lessen the organisation's carbon emission contributions – contributing to CSR – and promote active travel and therefore staff health. • Municipalities, service providers and industry could investigate how user behaviour changes if a road closure or infrastructural changes occur, with the resulting impact on emission levels, helping to improve the effectiveness of the transport sector. Ants tread lightly and find the quickest route from A-B. Can you? Download the game for Apple or Android.

This project has received funding from the European Union's Horizon 2020 research and innovation progreamme under grant agreement No. 689289.

Facebook

You can tag us @ClairCity or link to www.facebook.com/ClairCity

Facebook post 1	Ants tread lightly and find the quickest and cleanest route from A-B. Can you? Download ClairCity's NEW GreenAnt App for Apple or Android to find out more.
Facebook post 2	New app – want to make a difference in the climate emergency? Download ClairCity's GreenAnt App for free and find out how we can improve air quality and air pollution exposure locally. Find the app on Apple or Android.
Facebook post 3	Could you improve how we get around the city? Download ClairCity's GreenAnt App for free and see how and where your travel impacts human and planetary health. Download the app for Apple or Android.
Facebook post 4 (general/enviro)	Want to make your city a healthier place to live, work and play? Become a citizen scientist to investigate how. ClairCity's GreenAnt App allows you to monitor your travel behaviour and the behaviour of your community, to take practical action on air quality and climate change. Download the app for Apple or Android.
Facebook post 5	Challenge your friends, neighbours or colleagues to travel in healthier, more environmentally friendly ways! ClairCity's GreenAnt App allows you to become a citizen scientist, monitoring how you travel and how those decisions impact you and the city. See how you compare and encourage one another to tread more lightly, like an ant. Download the app for Apple or Android now!

This project has received funding from the European Union's Horizon 2020 research and innovation progreamme under grant agreement No. 689289.

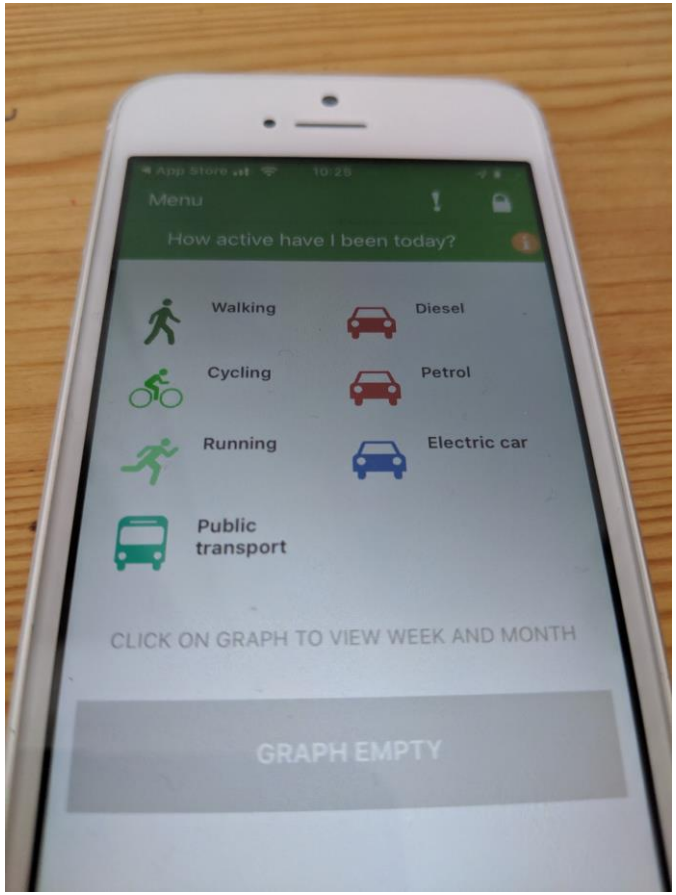
Twitter

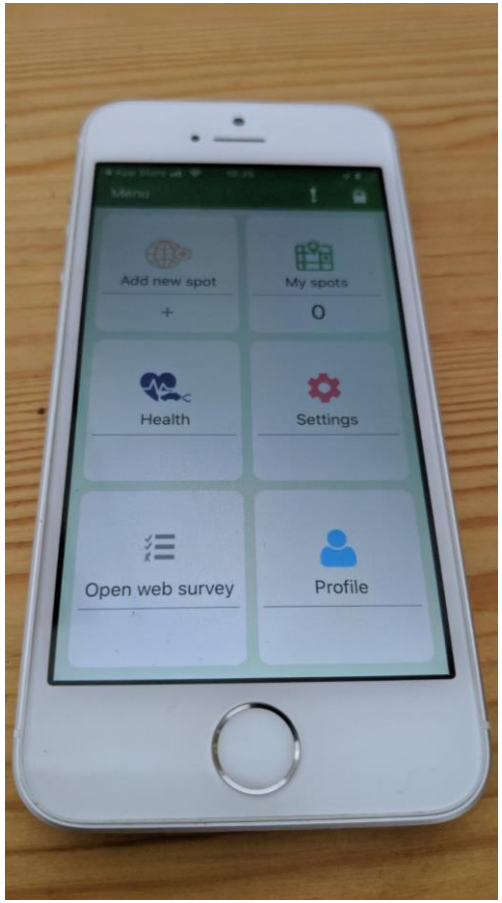
You can tag us @ClairCity

Twitter 1	Ants #TreadLightly and find the quickest route from A-B. Can you? Download @ClairCity's NEW GreenAnt App claircity.eu/green-ants-app/
Twitter 2	New app – want to make a difference to the #climateemergency? Download @ClairCity's GreenAnt App for free and find out how we can improve #airquality #carbonfootprint and #airpollution exposure locally. claircity.eu/green-ants-app/
Twitter 3	Could you improve how you get around the city? Download @ClairCity's GreenAnt App for free and see how and where you travel impacts human and planetary health. claircity.eu/green-ants-app/ #TreadLightly
Twitter 4	ClairCity's NEW free GreenAnt App allows users to monitor how they get around the city to empower them to take action on local #airquality and #airpollution exposure. Like the sound of it? claircity.eu/green-ants-app/
Twitter 5	#Citizenscience app that allows users to monitor how they travel and spur them into action on local #airquality and #airpollution exposure. claircity.eu/green-ants-app/#TreadLightly
Twitter 6	How will you live, work and travel in the future? See how your travel choices are influencing you today to shape your decisions in the future. claircity.eu/green-ants-app/#TreadLightly
Twitter 7	If you knew about air pollution exposure in your area, would you change the way you travel? Download @ClairCity's NEW GreenAnt App claircity.eu/green-ants-app/ to find out. #TreadLightly
Twitter 8	If you knew how your travel choices impacted air pollution, would you change the way you travel? Download @ClairCity's NEW GreenAnt App claircity.eu/green-ants-app/ to find out. #TreadLightly

Thanks for your help in sharing AntsApp. We hope it helps you and your organisation to #TreadLightly

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 689289.





UWE Bristol University of the West of England

This project has received funding from the European Union's Horizon 2020 research and innovation progreamme under grant agreement No. 689289.

Annex 3 – Evaluation survey (English version and an example translation)

ClairCity App Survey

Ethics Consent

A 'tick box to proceed' option should be programmed into the app. This should include words to this effect:

I agree that by using this app my choices will inform the ClairCity project about policymaking research into air pollution.

I understand data about my travel choices will be held under GDPR in the EU.

I confirm that I am over 16 years of age.

Embedded in entry information:

This app is about air pollution, carbon emissions and health in cities. How would you rate your knowledge about air pollution before using the app:

☐ Expert
☐ Well-informed
☐ Knew a little
☐ No knowledge

Are you: Male Female Prefer not to say

Age (years): 13-15 (with consent box) 16-24 25-34 35-49 50-64 65+

Location: Bristol, Aveiro Region, Liguria Region, Sosnowiec, Amsterdam, Ljubljana, Other city (please specify with open box)

Business or individual?

Information on the About or Credits page of the app should include:

ClairCity is asking citizens how they want to work and live in the cities of the future, and based on that, investigating ways of providing more effective air pollution and climate change policies for a healthy city. The project also aims to raise awareness about air pollution, carbon emissions and health in our cities, looking at how we can all contribute towards solving the problems.

Six partner cities and regions will directly shape the project; they are Amsterdam in the Netherlands; Bristol in the UK; Ljubljana in Slovenia; Sosnowiec in Poland; the Aveiro region in Portugal and the Liguria region in Italy. Residents will get involved through an online game, app, city events, a schools competition, and local workshops. The end product of the project will be a tailored Policy Package for each city, detailing the potential solutions for a future with clean air.

We would like to find out more about your travel choices and your reactions to change, through using this app.

The personal information collected through this app will be processed by the ClairCity project in accordance with the terms and conditions of the EU General Data Protection Regulation. We will hold your data securely and not make it available to any third party unless permitted or required to do so by law. Your choices will be anonymised so they are not identifiable to you and will be grouped thematically with other app users.

Overall outcomes from the evaluation will be published in reports to the European Commission, on our website www.claircity.eu, and through wider media.

It is up to you to decide whether or not to use the app. By using the app you are agreeing to us using your choices in our research. This study was given ethics consent by the Research Ethics Committee of the University of the West of England, UK researchethics@uwe.ac.uk.

ClairCity Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 689289.

box

Research participation survey information

Words to this effect:
You are being invited to give your views on the ClairCity GreenAnt app, which aims to understand more about our travel choices and travel behaviour. This research study involves thousands of people in cities across Europe, enabling us all to decide the best local options for a future with clean air and lower carbon emissions.

We would like to evaluate your experience through a few questions, which will take no longer than 10 minutes to complete. This is anonymous and data will be stored securely.

This study was given ethics consent by the Research Ethics Committee of the University of the West of England, UK researchethics@uwe.ac.uk.

Thank you for your time.

Survey questions

GreenAnt phone app

1. **How often have you used the GreenAnt phone system?**

Daily

Some days a week

Some days a month

Just opened once

Never

2. *How easy was it to use the app on your phone?*
   - ☐ Really easy
   - ☐ Easy
   - ☐ It was okay
   - ☐ Hard to use
   - ☐ Really hard to use
   - ☐ Don't know / no opinion

3. *Have you enjoyed using this app?*

   - ☐ I loved it
   - ☐ I liked it
   - ☐ It was okay
   - ☐ I disliked it
   - ☐ I hated it
   - ☐ Don't know / no opinion

4. Do you have any further comments on how the app worked? If you encountered any issues please state which phone device you use. (open free choice)

Web pages

5. **How often have you used the GreenAnt website?**

Daily

Some days a week

Some days a month

Just opened once

Never

6. *How easy was it to use and navigate the website?*
   - ☐ Really easy
   - ☐ Easy
   - ☐ It was okay
   - ☐ Hard to use
   - ☐ Really hard to use
   - ☐ Don't know / no opinion

7. Do you have any further comments on the website? If you encountered any issues please state which browser you use. (open free choice)

GreenAnt system as a whole

8. Please rate how useful you found the GreentAnt system?

   - ☐ Really useful
   - ☐ Useful
   - ☐ It was okay
   - ☐ Not useful
   - ☐ Really not useful
   - ☐ Don't know / no opinion

9. In which context have you been testing GreenAnts? (e.g., working at municipality, member of a **cycling club, personally interested in health issues, environmentalist, school, etc)** (open free choice)

10. **Which aspect of the GreenAnt system have you been interested in most?**
    Air quality data
    Greenhouse gas emissions
    Travel behaviour
    Other:

11. Please describe what has been useful about the system for you.
12. **What do you think could be improved to make GreenAnt even more useful?**
    Open answer

13. **What do you think could be improved to make GreenAnt even more user friendly?**

Open answer

14. Who do you think this app could be useful for? (open free choice)

15. Would you like to use this system again?
Yes /no possibility for explanation

About You

16. *How would you rate your knowledge about air pollution before using the app:*
- ☐ Expert
- ☐ Well-informed
- ☐ Knew a little
- ☐ No knowledge

17. *Do you think you have more understanding about air pollution, carbon emissions, and health in cities after using the app?*

- ☐ I understand lots more
- ☐ I understand a bit more
- ☐ I have the same understanding
- ☐ I am more confused
- ☐ I am completely confused
- ☐ Don't know / no opinion

18. *Do you think you will do anything to help reduce air pollution and/or carbon emissions as a result of having used the app?*

☐ Yes. If yes, what will you do?

(please select all that apply):
- I will walk or cycle more often
- I will take public transport more often
- I will choose a greener car
- I will campaign for change
- ☐ Other: _____

☐ No If No, why not (please tick all that apply)?

- ☐ I haven't thought about it
- ☐ There is nothing I could personally change
- ☐ I feel it's too difficult to change
- ☐ It's up to local and national government to take action
- ☐ Other: _____

19. Are you: Male Female Prefer not to say

20. Age (years): 16-24 25-34 35-49 50-64 65+

21. Location: Bristol, Aveiro Region, Liguria Region, Sosnowiec, Amsterdam, Ljubljana, Other city (please specify with open box)

Thank you for your time. If you would like to receive further updates on the ClairCity project and GreenAnts then please enter your email address here.

Raziskava ClairCity aplikacije

Etično soglasje

V aplikaciji je potrebno uporabiti opcije v okencu »Odkljukajte možnost za nadaljevanje«. V ta namen je potrebno uporabiti:

Strinjam se, da bom s pomočjo te aplikacije svoje odločitve posredval ClairCity projektu za oblikovanje politik na področju raziskav onesnaženosti zraka.
Razumem, da bodo podatki o mojih potovalnih odločitvah varovani skladno z EU Uredbo o varstvu podatkov.
Potrjujem, da sem starejši od 16 let.

Uvodne informacije

Ta aplikacija govori o onesnaževanju zraka, emisijah ogljika in zdravju v mestih. Kako bi ocenili svoje znanje o onesnaženosti zraka pred uporabo aplikacije:

☐ Strokovnjak
☐ Dobro informiran
☐ Poznam nekoliko
☐ Brez znanja

Ste: Moški Ženska Ne želim povedati

Starost (leta): 13-15 (s strinjanjem) 16-24 25-34 35-49 50-64 65+

Lokacija: Bristol, Aveiro Region, Liguria Region, Sosnowiec, Amsterdam, Ljubljana,

Drugo mesto (prosim, navedite katero):

Podjetje, šola ali posameznik (obkrožite)

Informacije na strani o aplikaciji ali o kreditih bi morale vsebovati:

ClairCity sprašuje državljane, kako želijo delati in živeti v mestih prihodnosti, in na podlagi tega razišče načine zagotavljanja učinkovitejših politik onesnaževanja zraka in podnebnih sprememb za zdravo mesto. Namen projekta je tudi ozaveščati o onesnaženosti zraka, emisijah ogljika in zdravju v naših mestih, pri čemer bomo pogledali, kako lahko vsi prispevamo k reševanju težav.

Šest partnerskih mest in regij bo neposredno oblikovalo projekt: to so Amsterdam na Nizozemskem; Bristol v Veliki Britaniji; Ljubljana v Sloveniji; Sosnowiec na Poljskem; regiji Aveiro na Portugalskem in Ligurija v Italiji. Prebivalci se bodo vključili prek spletne igre, aplikacije, mestnih prireditev, tekmovanja v šolah in lokalnih delavnic. Končni izdelek projekta bo prilagojen sveženj politik za vsako mesto s podrobnimi informacijami o možnih rešitvah prihodnosti s čistim zrakom.

Z uporabo te aplikacije želimo izvedeti več o izbiri potovanja in o vaših reakcijah na spremembe.

Osebne podatke, zbrane s to aplikacijo, bo obdeloval projekt ClairCity v skladu s pogoji splošne uredbe EU o varstvu podatkov. Vaše podatke bomo varno hranili in jih ne bomo dajali na razpolago tretjim osebam, razen če to dovoljuje ali zahteva zakon. Vaše odločitve bodo anonimizirane, tako da vas ne bo možno prepoznati in bodo tematsko razvrščene z drugimi uporabniki aplikacij.

Skupni rezultati ocene bodo objavljeni v poročilih Evropski komisiji, na našem spletnem mestu www.claircity.eu in v širših medijih.

Odločite se, ali boste aplikacijo uporabljali ali ne. Z uporabo aplikacije se strinjate, da lahko uporabimo vaše odločitve v naši raziskavi. Za to raziskavo je etično soglasje dobil Odbor za raziskovalno etiko Univerze v zahodni Angliji, Združeno kraljestvo, researchethics@uwe.ac.uk.

Projekt ClairCity je prejel sredstva raziskovalnega in inovacijskega programa Evropske unije Obzorje 2020 v skladu s sporazumom o donaciji št. 689289.

Informacije za udeležence v raziskavi

Vabljeni ste, da predstavite svoje poglede na aplikacijo ClairCity GreenAnt, katere cilj je razumeti več o naših izbirah potovanj in vedenju na potovanju. Ta raziskava vključuje tisoče ljudi v mestih po Evropi, kar nam omogoča, da se odločimo za najboljše lokalne možnosti v prihodnosti za čist zrak in manjše emisije ogljika.

Želeli bi oceniti vašo izkušnjo z nekaj vprašanji, kar ne bo trajalo več kot 10 minut. Anketa je anonimna in podatki bodo varno shranjeni.

Za to raziskavo je etično soglasje priskrbel Odbor za raziskovalno etiko Univerze v zahodni Angliji, Združeno kraljestvo researchchethics@uwe.ac.uk.

Hvala za vaš čas.

Vprašanja

GreenAnt aplikacija za telefon

1. **Kako pogosto ste uporabljali GreenAnt aplikacijo za telefon?**
   - Dnevno
   - Nekaj dni tedensko
   - Nekaj dni mesečno
   - Samo enkrat
   - Nikoli

2. **Kako enostavna je bila uporaba?**
   - Zelo enostavna
   - Enostavna
   - Bilo je v redu
   - Težko za uporabo
   - Zelo težko za uporabo
   - Ne vem/brez mnenja

3. **Ali ste bili zadovoljni z uporabo?**
   - Zelo mi je bila všeč
   - Všeč mi je bila
   - V redu je bilo
   - Ni mi bila všeč
   - Nisem je maral
   - Ne vem/brez mnenja

4. **Ali imate kak dodaten komentar na uporabo aplikacije? Če ste imeli kako težavo, prosim povejte, Kateri telefon ste uporabljali. (napišite)**

Spletne strani GreenAnt

1. **Kako pogosto ste uporabljali GreenAnt spletno stran?**
   - Dnevno
   - Nekaj dni tedensko
   - Nekaj dni mesečno
   - Samo enkrat
   - Nikoli

2. **Kako enostavna je bila uporaba in navigacija po spletni strani?**
   - Zelo enostavna
   - Enostavna
   - Bilo je v redu

- Težko za uporabo
- Zelo težko za uporabo
- Ne vem/brez mnenja

3. **Ali imate kak dodaten komentar na uporabo spletne strani? Če ste imeli kako težavo, prosim povejte, kateri brskalnik ste uporabljali. (napišite)**

_____

GreenAnt sistem kot celota

1. **Prosimo, ocenite kako uporaben je GreenAnt sistem?**

- Zelo uporaben
- Uporaben
- Bilo je v redu
- Neuporaben
- Zares neuporaben
- Ne vem/brez mnenja

2. **V katerem kontekstu se testirali GreenAnts? (delam za lokalno skupnost, član kolesarskega kluba, osebno zainteresiran za zdravstvene vidike, okoljevarstvenik, šola, …, itd.)**

_____

3. **Kateri vidik GreenAnt sistema je bil za vas najbolj zanimiv**
- Podatki o kvaliteti zraka
- Emisije toplogrednih plinov
- Potovalne navade
- Drugo:

4. **Prosimo opišite, kaj je bilo za vase uporabno v sistemu** (napišite).

_____

5. **Kaj mislite, da bi bilo potrebno izboljšati, da bi bil GreenAnt bolj uporaben?** (napišite)

6. **Kaj mislite, da bi bilo potrebno izboljšati, da bi bil GreenAnt bolj prijazen do uporabnika?**
   Napišite

   _____

7. **Za koga bi bila ta aplikacija uporabna? (napišite)**

_____

8. **Ali bi želeli ponovno uporabiti sistem?**
   Da/Ne
   Pojasnilo

O vas

1. **Kako bi ocenili vaše znanje o onesnaževanju zraka pred uporabo aplikacije:**

- strokovnjak
- Dobro informiran
- Nekoliko poznam
- Brez znanja

2. **Ali menite, da imate sedaj več razumevanja in znanja o onesnaženju zraka, izpustih nevarnih plinov in zdravja v mestih?**

- Veliko več razumem
- Nekaj več razumem
- Enako vem
- Sem bolj zmeden
- Sem popolnoma zmeden
- Ne vem /brez mnenja

3. **Menite, da boste kaj ukrepali za zmanjšanje onesnaženja zraka ali ogljičnih izpustov na podlagi uporabe aplikacije?**

- Da. Kaj boste naredili?
  (prosimo, izberite, lahko več odgovorov):
  - Več bom hodil oziroma uporabljal kolo
  - Bolj pogosto bom uporabljal javni prevoz
  - Izbral bom avto z manj izpusti
  - Boril sem bom za spremembe
  - Drugo:_____

- Ne, zakaj ne (označite vse, kar mislite)?
  - Nisem razmisli zadosti
  - Osebno ne morem ničesar spremeniti
  - Imam občutek, da je pretežko karkoli spremeniti
  - Ukrepi morajo biti sprejeti s strani mesta in države

- Drugo: _____

4. **Spol:** Moški Ženski Ne želim povedati

5. **Starost (leta):** 16-24 25-34 35-49 50-64 65+

6. **Kraj:** Ljubljana, Ostala mesta in kraji (prosimo, navedite)_____

Hvala za vaš čas. Če želite dobiti dodatne informacije o projektu ClairCity in GreenAnts, potem prosimo navedite vaš elektronski naslov.

_____

Annex 4 – Test protocol to define the GreenAnt test campaign

GreenAnt testing protocol and timeline

Testing protocol

1. Cities/city regions identify organisations/communities/user groups to work with. Aim: 50 users per city/city region

2. Cities/city regions introduce GreenAnt system and offer training session for the users; if requested NILU will assist

3. ClairCity partner organizations promote GreenAnt amongst their employees and offer training; if requested NILU will assist

4. User test (i.e., data collection) for 2 weeks in the period between 1.-15. November 2019

5. Cities/city regions encourage users to take the evaluation survey at the end of data collection phase

Timeline of the testing period

		Oct	NOV				Dec				Jan				
Activities		**28/10-3/11**	**4-10**	**11-17**	**18-24**	**25-30**	**1-8**	**9-15**	**16-22**	**23-29**	**30/12-5/1**	**6-12**	**13-19**	**20-26**	**27-31**
Translation of the GreenAnt flyer, other docs															
Final version of the translated documents															
Preparation fortesting in cities and regions															
	Amsterdam														
	Aveiro R.														
	Bristol														
	Ljubljana														
	Liguria R.														
	Sosnowiec														
Testing GreenAnt															
	Amsterdam														
	Aveiro R.														
	Bristol														
	Ljubljana														
	Liguria R.														
	Sosnowiec														
Reporting/feedback-testing															
Evaluation of the testing in the 4 cities, 2 regions															
Summary of the outcome of testing of GreenAnt															
Drafting the deliverable D4.13															
Submission of the deliverable D4.13															
Milestones		M1		M2		M3		M4				M5			M6

Milestones of the testing period

Milestones		**Responsible**
Testing set up with target 50 users	M1	Cities/regions
Testing finishet with target of 50 users answering t	M2	Cities/regions
Reporting back of the results: UWE needs to send the results from the survey to the city/region partners for translation of the free text comments. The partners need to send the	M3	City/regions/UWE
Summary of the GreenAnt testing	M4	NILU
D4.13 final draft distributed to the EMG members for comment and proofing.	M5	NILU
D4.13 Submitted	M6	NILU/Trinomics

Responsible contact persons for each city/city region during the testing period

Contact persons for the cities/regions	
Amsterdam	Rob van Strien, Imke van Moorselaar
Aveiro R.	Sandra Rafael
Bristol	Ben Williams
Ljubljana	Nadja Zeleznik
Liguria R.	Patrizia Costi
Sosnowiec	Natalia Dziurowicz

Annex 5 – Additional user feedback

Comments about GreenAnt

Technology issues

UWE (30.10.)

App

- Drains battery

- Some words still in Norwegian, e.g. says Ferdig instead of Finished

- Need to add 'back' option on some pages (e.g. profile)

- Remove code from profile and add option for avatar or similar + add back button

- Add option for cycling/walking as main mode of transport

- Once you add a spot a message appears without a scroll bar or 'x' button to remove. Can you add these?

- At the bottom of the health page there is a command to “swipe left to see emissions…” but you can’t swipe left

- I can’t see my emissions data at all on this app. If this is the case, and you can only see travel mode, it is no different to the health app on Apple

- for at least one user we’ve tested so far their mode of transport doesn’t show up and neither does their associated air pollution concentration.

Website:

- Don't understand the graphs on the website and don't feel they are reliable (for example it says on my phone that I've used multiple modes and on the website only walking)

- Do the graphs on the right-hand side of the map relate to today's levels or my exposure?

- Is it possible to view stats from longer time periods?

- Can we log our 'ant hill' on the phone rather than heading to the website. Too many demands; makes me disengage

Liguria – Techne (29.10.)

First of all, I make a 48 hours test last week in Genoa and while the app register my activity I don’t see any results for emissions generated and polluted air breathed.

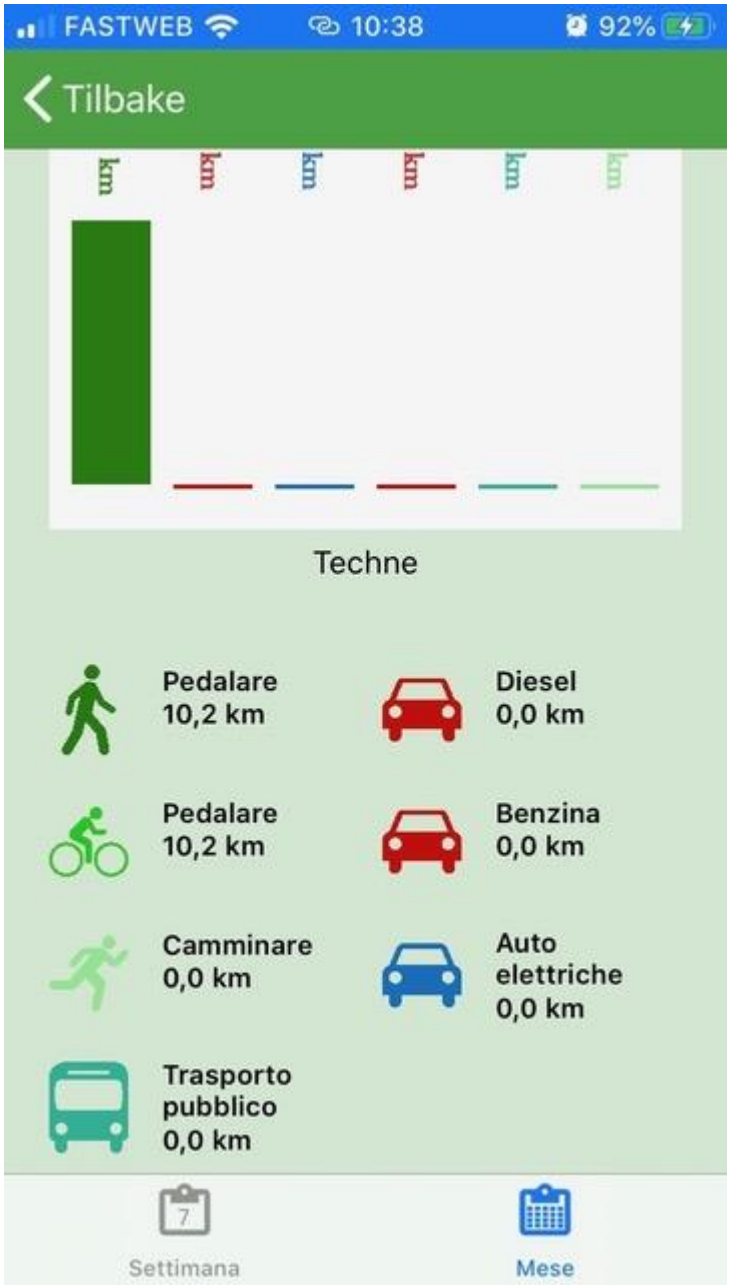
Next:

1) in all the activity (see for example IMG_01 annexed) Pedalare is reported twice: the correct label on left from top to down: Camminare, Pedalare, Correre

2) In month (mese) summary the same activity is reported twice for pedalare while the activity is only for the first one on left from top to down (a man in the picture with wrong label Pedalare, the correct one is Camminare)

3) the label to go back is in danish (!?) “Tilbake” while the correct is “torna indietro” o simply “indietro”

Thanks


FASTWEB
10:38
92%
Tilbake
km
km
km
km
km
km
Techne
Pedalare
10,2 km
Diesel
0,0 km
Pedalare
10,2 km
Benzina
0,0 km
Camminare
0,0 km
Auto
elettriche
0,0 km
Trasporto
pubblico
0,0 km
7
Settimana
Mese

Liguria – Ligura Region (29.10.)

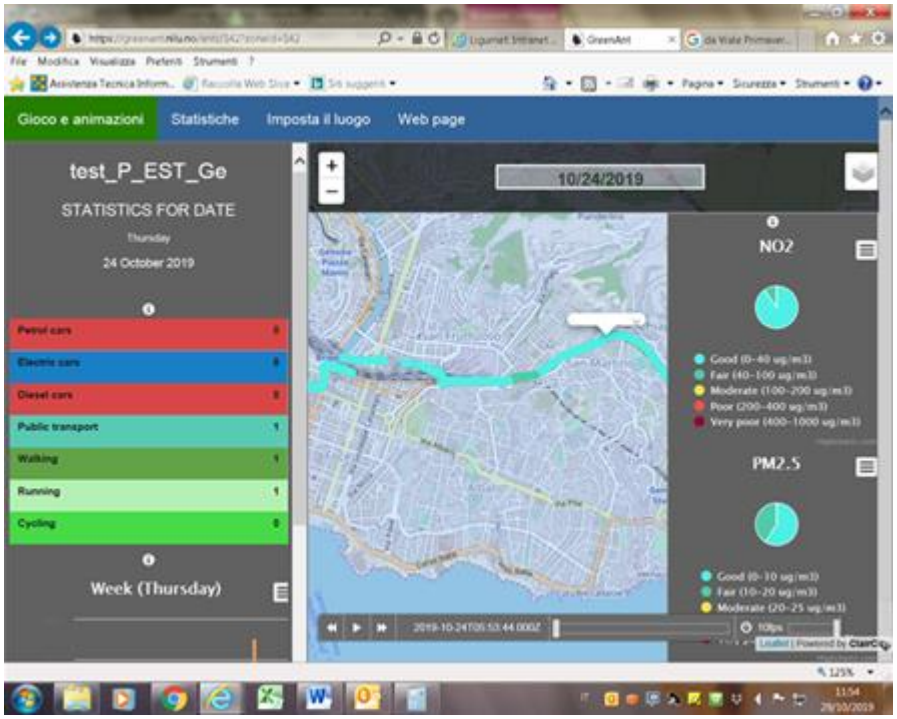
However Liguria Region does not agree the information that the app provides regarding the exposure of the population to pollution.

It seems that air quality is good in Genoa but it is not true for NO2 (exceeded annual mean limit value).

Moreover the data of the models are very different from those recorded by the measurement stations.

The app don't help citizens to understand rather gives citizens wrong message. How do we do about it?

Is it possible to remove the statistics related to NO2 concentrations, PM10 e PM2,5 concentration (mg/mc) for Liguria Region?



Reply from NILU (29.10.)

Dear (…)

I will attend the problems that Mikro Valle is sending. When it comes to privacy each anthill or Spot can be password protected. This mains that only persons with the password can access the data and registrations. If the user does not want anybody to see the information a private spot can be made and nobody else can see the data. In addition to this the user can use a nick name. This means that the user is not identifiable in the data sets. When the spot is not covering a large area the user is very difficult to identify. This is the reason for having spots and not only a coverage over the whole region of Liguria.

When it comes to the concentration data. Yes this is not the actual situation in Liguria. This is a climatological map. A yearly average that is scaled according to Month of yes, day of week and time of day. This reflects the climatological concentration. As you point out it would have been better to have a map that was done for this specific hour. This is possible if this information is available but it is not and therefore we use the climatological map and make an indication.

I hope that this answers your question

Reply from Liguria Region (30.10.)

We believe that the user is identifiable by his or her movements.

Then privacy policy is very important.

You say that for protecting your privacy you have the nickname protection, the password and the size of the anthill.

We think it Is not enough.

The app users (perhaps citizens) choose from a list of anthill but they know nothing about them. They don't know who manages the anthill and for what purpose. Anyone could create an anthill.

With regard to concentrations and citizens exposition:

In consideration that we have only indicative informations that are not adequate to suggest the best route for citizens, the Liguria Region believes it is better not to provide the concentration data.

The maps used produce misinformation. In addition to being short-term concentrations, they are also underestimated compared to the measurement stations.

It seems that air quality is good everywhere.

It's a data communication problem that we know very well, from our experience.

By telling Genoese citizens every day that the air is good, citizens are not aware of the problem-

The app instead can be useful to encourage active travel and reduce the carbon footprint.

To this we add that there are errors in the automatic data collection.

Furthermore, in particular using multiple spots, it seems that the app does not correctly record data, and data are not displayed correctly in the spots.

In conclusion it seems to us that the app is not ready for our test.

However, let's listen to what the other cities think about the app.

Liguria Region (Mirko – 29.10.)

In general:

1. The application during the test phase, was not able to correctly record the data and to establish and detect the various types of transport.

There was made two types of test:

a) Leaving only one item set (understood as the type of usual vehicle);
b) Selecting the type of vehicle each time the transport method is changed.

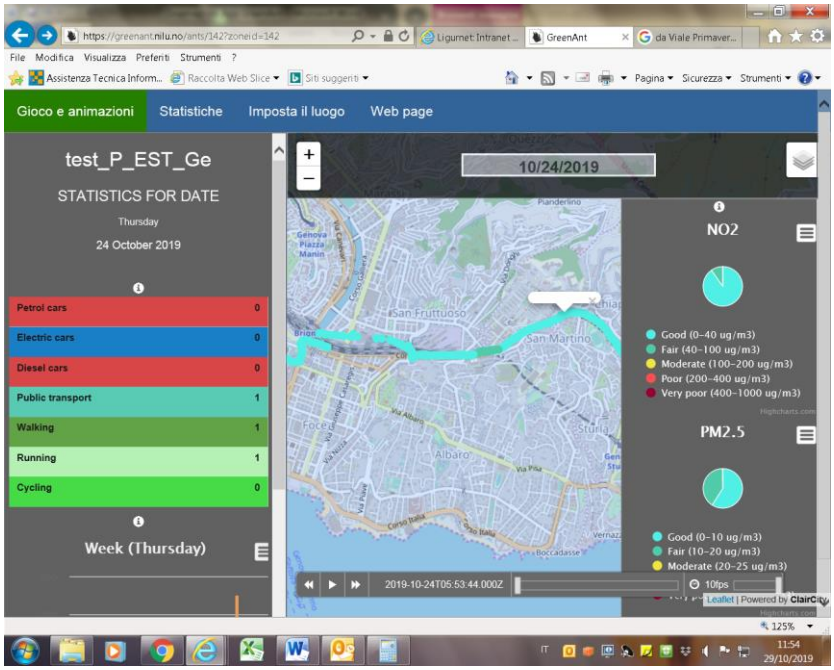
However, in both cases the application has not recorded the desired results, recording distances and routes in wrong categories.

Feedback:

a) Some walking movements have been recorded in the public transport category;
b) Transports by diesel and petrol cars have been registered in public transport category (vice versa);
a) On 28th October the App registered about 20km of walking while the correct distance was about 5km.

We don't find any correspondence between the statistics of my Spot in the smartphone and the website https://greenant.nilu.no/

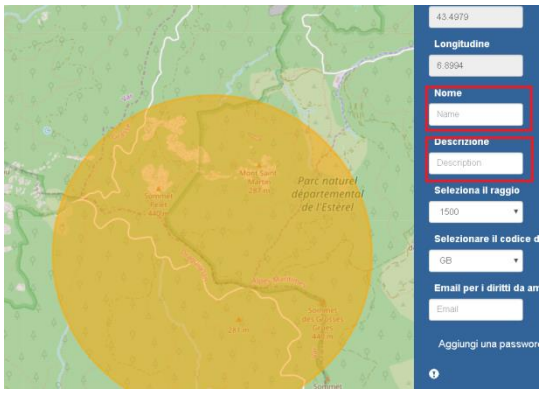
We do not share the information provided by the app regarding the exposure of citizens to pollution. GreenAnt seems that air quality in Genoa is good but it is not true for NO2 (exceeded annual mean limit value). The app gives citizens wrong message and this cannot be accepted (see stamp below).
In the estimation of the IQA (Air Quality Index) the origin of the data on the concentrations of pollutants in the air is not clear. With which models have been estimated? And if they are updated every hour based on the data of the measurement stations. It is considered necessary to use official data. Furthermore the models have a large margin of error and estimate the concentrations on a 200 metres.



Problems on GreenANT NILU site web:

<u>It would be nice if the manual of instructions was integrated on the App under the “Settings or Profile”.</u>

1. When registering the area on the website it is not clear what the requested "name" is and if it is a reference to the place or name of the user accessing. It’s necessary for privacy reasons, to insert the word "Nickname" since once the area and the name have been registered, these are visible to all users.



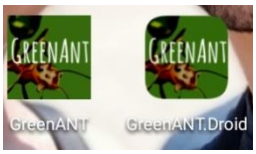
a) Is not clear wich name we must write (personal name or name of the area);
b) It would be nice to specify the informations we must insert in the description area.

See picture below

2. Once registered the place on the web portal, no verification and confirmation email is sent to the address entered. This represents a privacy problem since everyone could register an area with an e-mail address linked to another person. (See picture below).

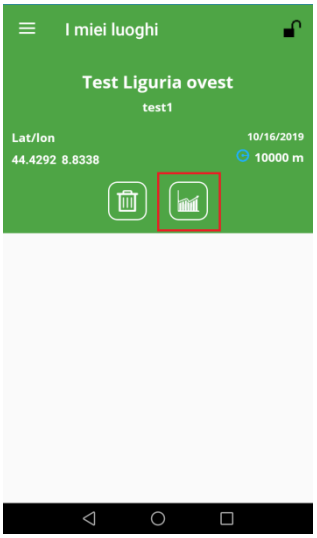
Problems on GreenANT NILU App for smarthphone:

1. Once the application has been downloaded from the App Store (in this case Google Play Store), two icons appeared on the "Home" of the device instead of one with two different names: 1.) ***GreenANT.Droid*** 2.)***GreenANT*** (but there isn't any difference).
   (See screenshot below).



1) GreenANT
2) GreenANT.Droid

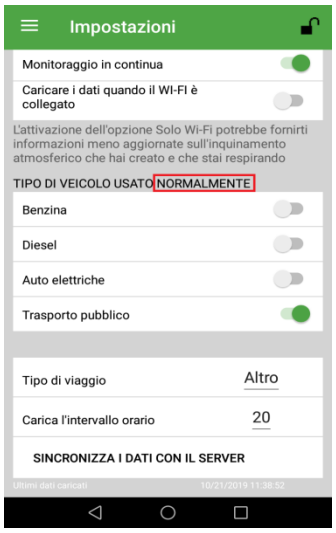
2. It was frequently found that the App, on the "My Places" section, stops automatically once this icon is selected. (See screenshot below).



Sometimes, selecting this icon the application stops automatically and needs a further restart.

In other cases the App stops automatically in the Health section.

3. In the "Settings" section under the heading "Normally used vehicle type" it is not clear if you need to enter the vehicle you normally use or the vehicle you are using at a given time "x". It should be clarified in the manual of instrctions. (See screenshot below).



It is difficult to understand if this category should be changed every time a different type of transport is used or if he must set vehicle he normally use.

4. In the section "Settings" under the heading "Type of vehicle normally used", no distinction is made between public transport (buses, trains, tram, metro, ecc.), but they present different results in terms of pollution and emission. (See screenshot below).

5. In the Italian version there are some translate errors: (See screenshot below).

The first and third icon have a translate error:

1°) Pedalare (ride bike)->Camminare (walking)

3°) Camminare (walking)->Correre (running)

6. The distance of the journeys made on foot and / or by bicycle are mistakenly reported twice in two different icons, so it is not clear whether these data are mistakenly added or not.

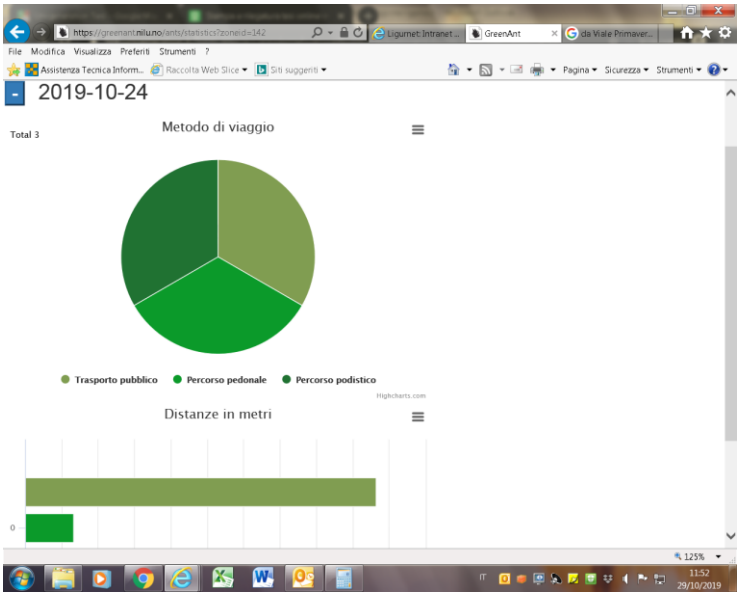
7. It's not possible to choose the modes "walking/running/ride a bike" .
   The distinction of the three areas is not valorised as it should.

The three modes aren't selectable in "*Settings*".

8. The statistics doesn't show the emissions of NOx, COV PM.

9. The pie chart doesn't show correct data (See image below).

Approximately 10 km have been made by public transport and a few km on foot but the App has registered the same percentage in each mode.



Data protection issues

Liguria region (29.10.)

In the instruction manual it is not clear if there is the possibility to see my movements and my statistics in an area that I haven't registered. They could be seen by unknown people and therefore could represent a privacy violation. Of notable importance is the fact that when registering the place, the name of the user accessing is requested, which is therefore visible to all users, the privacy of the end users is not guaranteed. For this problem everyone (like a thief) could intercept the name and the address.

How the system assigns the mode of transport?

The App is not intuitive and easy to use for various fundamental aspects, both related to the lack of instructions and settings, and to data recording. It's very difficult to understand wich what are the criteria adopted for recording journeys in the spots and through the various modes (electric car, diesel, walking, bicycle, ecc.), since isn't possible to set manually the different kinds of transports.

Isn't possible to select and record with precision every activity during the day. The types of transports should be set manually.

Example: Start activity with diesel/petrol car/finish activity with diesel/petrol car– Start walking/finish walking –Start activity by Bus/finish activity by Bus).

Bristol city (29.10.)

I'm still very uncomfortable with the privacy of this app, particularly if we link people to an anthill that they haven't created, primarily because they can't see their data and they can't be given access because they'll see other people's data. In my conversations with Svein and in filling in the feedback forms I'll keep raising it.

I would prefer if we could encourage people to create their own anthills so they view their own data which would mean rejigging the e-mail template again (sorry). In our evaluation I don't think we need to see people's movements (please correct me if I'm wrong), but we can critique our own experience too.

Apologies for coming around late to this issue, I've been out of the loop for a long time and I'm only just back in it as of a few weeks ago, but I think it's a really important one.

My position would be to change the e-mail template back to the original one, make people set up their own anthills and avoid a data protection issue. It wouldn't be a big change, just a messaging one and would put a lot of people at greater easy. Are you happy with this suggestion?

Reply from UWE (29.10.)

I agree. And I think it is worth addressing now so we don't come up against this issue when we launch GreenAnts, so thanks for raising! Was their consensus that all cities should be setting up a community Anthill? I wasn't privy to this if that was the case. And what would be the benefit of a community vs. individual data during the test period?

We could say that if teams of people want to set up their own community AntHills then they can create their own passwords and use it that way? However, as mentioned before, is there a way to ensure that the data won't be traceable (e.g. to someone's house)? It might be off-putting if users knew their teammates could see how they travelled… or could motivate them to travel in less polluting ways. Either way, we'd need to clearly explain if data is traceable.

Svein, perhaps we could speak on the phone tomorrow morning – perhaps in advance of the meeting – to discuss, so we have a clear position statement?

Does anyone else have thoughts on this?

Reply from NILU (29.10.)

Dear (…)

The reason behind setting up a common anthill available to all user is to show the group of 50 people in one plot. The users can subscribe to this anthill or not. If the user doo not subscribe the data will not be accessible in this anthill. I recommend that the user creates a password protected anthill in addition to the common anthill with yourself only to log the data under this anthill. I also recommend that groups of users make their own anthill. One user can be subscribed to more than one anthill. Password protected or not. The user always have the possibility to delete their membership of the anthill and the data will not be shown on this anthill anymore (current and historical). The owner of the anthill needs to give out the password to users that is wanted in this specific anthill. You will only see the total of all members and which nickname is going where will be difficult to identify when many users are using the anthill. You will see the development but not one and one user.

This means that the user can decide themselves on what level they want their data to be seen. The reason for having the of the anthill and keeping it small is to avoid the fear that Ben has with knowing who is in the dataset by knowing where this nickname travel.

For protecting your privacy you have the nickname protection, then the password and lastly the size of the anthill.

The anthill is meant to investigate hotspots or places of special interest. Comments where that the possibility of only 3 km radius was too small made us to increase the maximum to 10 km. This is however up to the user to choose the size of the anthill.

For me it is not important but convenient to have an anthill that all attend and without password protection. I think that the user should have a choice.

I am sorry that I cannot have telephone conversation tomorrow. I will not be available until Wednesday next week. Sorry for that. Sonja will facilitate the discussions tomorrow.

I hope that this clarified things.

Reply from UWE (30.10.)

Thanks for this explanation. I understand what you are saying. However I am not sure enough safeguards have been put in place for us not to be able to identify users.

To give an example, the Anthill I have set up doesn't appear to have done a very good job of tracking my journeys. Instead, there is just a big green dot directly over my house!

https://greenant.nilu.no/ants/143?zoneid=143

If there is a chance to raise issues during the call then I will, otherwise I'll put them in the feedback form. I feel uncomfortable promoting the app beyond our close friends, family and colleagues until this is remedied. Several testers I've spoken with share similar ethical concerns, and don't feel we are clear enough about how their data is being used.