COMPAIR

DELIVERABLE

D3.4 Dashboards Design

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List of Abbreviations

Abbreviation	Definition
PMD	Policy Monitoring Dashboard
CS	Citizen Science
CO2	Carbon Footprint Simulation Dashboard
GIS	Geographic Information System
UI	User Interface
HTML	HyperText Markup Language
UX	User Experience

Executive Summary

This Deliverable (D3.4 Dashboards Design) presents the findings of Task 3.3 (Dashboards building with Gamification). This is the third task of WP3, focusing on the dashboard implementation activities for the CS (Citizen Science) Dynamic Exposure Dashboard, the Carbon Footprint Dashboard, the Policy Monitoring and the Digital Twin dashboards. The Dashboards will use visualisation components in order to help users find interesting data and allow them to extrapolate and make sense of trends to have better insights and support decisions better.

D3.4 presents the technical and functional design of the four dashboards starting from the User Design approach that is being followed in **COMPAIR** so as to produce the necessary dashboard screens. The main idea is that these dashboards will be encapsulated under a common user interface (container UI) that will also realise common functionalities like page navigation, user login, language selection etc.

Moreover, D3.4 includes an overview of the architecture and the technologies to be used for the implementation of the dashboards. Open libraries like React will be used to create the dashboard components and visualisations.
Furthermore, the report describes the Policy Monitoring and the Carbon Footprint Dashboard in terms of functionalities and user interface.

Overall, D3.4 can be viewed as the basis for the work to be implemented throughout T3.3. It specifies the designed characteristics of the dashboards and it sets the ground for the successful integration of the different modules that comprise **COMPAIR**.

1. Introduction

Purpose and Scope of the Deliverable

COMPAIR will provide historical and real-time information directed to target groups i.e. governmental organisations, business actors, academia and citizens as have been identified in the D2.1: Value Network Canvas and D2.4: Pilots Operation Plan, focusing on awareness-raising and communication, behaviour modelling and policy creation by creating easy to understand and scientifically sound dashboards.

More specifically, **COMPAIR** will release the following four dashboards:

- **Policy Monitoring Dashboard (PMD)**: This Dashboard helps users to understand and compare how environmental situations change under different actions. By collecting a large amount of Citizen Science (CS) information in a particular setting, the Dashboard will be able to simulate future impacts for different variables e.g., time of road closures, differing routes to school, staggered start times for work or schooling.

- **Carbon Footprint Simulation Dashboard (CO2):** This Dashboard is designed to support specific experiments around carbon footprints or indeed footprint for any chosen air molecule. Visualisation of algorithms results will help users see and compare how future CO2 and other pollutants' emissions will change based upon different individual actions, e.g., washing during day or night, driving or cycling, recycling food, plastic, paper, glass, etc. The aim is to guide user behaviours towards more environmentally friendly choices like limiting waste and maximising recycling, replacing polluting stoves and ovens with less energy consuming household appliances, opting for a more environmentally friendly car use (car sharing), etc.

- **Citizen Science Dynamic Exposure Visualisation Dashboard:** This easy-to-understand visual dashboard will be used to show both city and CS data (with a GIS identifier) on a map and in various charts. Data sources include fixed city sensor data along with CS sensor data, and other citizen captured data e.g., feelings, smells, actions etc. Citizen Scientists will be able to look at and understand their own data, and at anonymised group data, so through simple but powerful visualisations they can better understand air quality information and local context.

- **Digital Twin Dashboard:** For cities with a Digital Twin (Flanders and Athens), citizen science participants generated ideas for new policies will be able to be simulated and reviewed in a systematic manner against other policies. The dashboard is targeted primarily towards policy makers but open to citizens and businesses too.

This report presents the functional and technical design of the dashboards starting from the design approach following the user interface integration used for the actual implementation of the **COMPAIR** dashboards. We provide an overview of the architecture and a description

of the technologies used for the implementation of the dashboards along with the epics[1] and mockups designed as a result of the interaction with the pilots of the project.

Taking into account the prioritisation of the requirements and the Pilots needs based on the Agile principles[2] we are following, we focus our work during the first year of the project to the implementation of the initial versions of the PMD and CO2 dashboards.

During the second phase of the project reaching MS3:Open Beta version, the team will proceed with the analysis and the implementation of the other two dashboards as well. The result of this process, as well as any updates of the PMD and CO2 dashboards, will be part of the D4.3: Digital Twin CS data integration and prototype 2/M20 and D4.5: Digital Twin CS data integration and prototype 3/M30 deliverables.

It has to be noted that the initial analysis of the requirements by the technical team show that many functionalities of the Dynamic Exposure Visualisation dashboard are covered by the PMD so it will be further examined during the second year of the project, whether the dashboard's functionalities will be merged with the PMD's or they will be implemented as a separate dashboard.

Structure of the report

The current document consists of the following Sections:

- Section 1 gives an introductory overview of the deliverable.
- Section 2 provides an overview of the dashboards design considerations in terms of design methodology and user interface integration that will be followed.
- Section 3 provides an overview of the architecture, the technologies that will be used for the implementation of the dashboards and a description of the PMD and CO2 dashboards.
- Section 4 summarises the main conclusions of the report.

[1] epics are large user stories that are expected to be too big to implement in a single iteration. They are broken up into a number of smaller user stories, whereas Features are collections of related epics (and their user stories). They are defined around parts of a system/product, major processes, product releases or developer teams.
[2] https://en.wikipedia.org/wiki/Agile_software_development

2. Design Approach

In this section we provide an overview of the dashboards design considerations in terms of design approach and user interface integration that will be used for the actual implementation of the **COMPAIR** dashboards.

2.1 User Centred Design approach

In order to address the user needs, a user-driven approach is being followed in **COMPAIR** so as to produce the necessary dashboard screens via a process of paper sketches, visual mock-ups and iterative versions of the new screens until the desired result is obtained.

The User Centred Design[3] is an approach aimed at designing interactive systems considering, on one hand the technical problems of the System-Centred Design, and on the other hand the social issues involving the users, trying to understand more precisely the scopes of the system. Human-centred systems support users and motivate them to learn. The benefits can include increased productivity, enhanced quality of work, reductions in support and training costs, and improved user satisfaction.

The International Standard ISO 13407[4] was prepared by the Technical Committee ISO/TC 159, Ergonomics, Subcommittee SC4, Ergonomics of human-system interaction and provides guidance on human-centred design activities throughout the life cycle of computer-based interactive systems. It is aimed at those managing design processes and provides guidance on sources of information and standards relevant to the human-centred approach.

According to ISO 13407, the User Centred Design processes for interactive systems is defined as: *The User Centred Design is an approach for the development of interactive systems specifically oriented to the creation of usable systems. It is a multidisciplinary activity including techniques of human factors and ergonomics. To apply the ergonomics to the system design requires taking into account the abilities, the limitations and the needs of the human beings. The User Centred systems support the users and motivate them to learn. The benefits include a higher productivity, an improvement in the working quality, a reduction of support and training costs and a higher satisfaction of the users*.

Within this design process framework, a product can be considered mature if it functions correctly, provides all the functionalities required and if it is easy to use.

Based on this approach, the prototype is the "*representation of a product, of a system, or of a part of the system, that even if it is limited, can be used for its evaluation*". It is not required that the model is completed but can also be a model that simulates the functioning of the system (mock-up).

[3] Human-centred design processes for interactive systems," 6 1999. [Online]. Available: https://www.iso.org/standard/21197.html
[4] https://www.iso.org/obp/ui/#iso:std:iso:13407:ed-1:v1:en

The prototypes below reflect the current pre first release phase of the project. The low fidelity static prototype has a low cost of development and allows the evaluation of several design-concepts. The high-fidelity interactive prototype is oriented to the final product and its scheme provides all the functionalities of the system.

For the purposes of the **COMPAIR** prototypes, several versions/iterations of low and high-fidelity mock-ups were already designed as part of the project's overall agile approach, in order to depict the user functionalities more precisely and assist them in their tasks the best way possible. The latest versions of these mock-ups are presented in the following sections.

Specifically in order to implement the user interface design of the PMD and the CO2 dashboards that follow the epics as presented in Sections 3.3.2 and 3.4.2, we decided to start by designing mockups that present the wireframes of the PMD and CO2 dashboards. A set of mockups have been developed and presented to the consortium as well as to external stakeholders in order to be discussed in detail, get feedback and update the initial designs. Several Workshops have been organised by the Pilot partners aiming to discuss the mockups as presented in Section 4 of the Deliverable D2.4: Pilots Operational Plans.

The outcome of Consortium discussions as well as the feedback received by the involved stakeholders regarding **COMPAIR** PMD and CO2 dashboards is a set of web pages which stands as the User Interface of the initial version of the PMD and CO2 dashboards, as is presented below.

2.2 UI Integration

As mentioned in the introduction of the current document, the user interfaces of the project consist of four main dashboards. The main idea is that these dashboards will be encapsulated under a common user interface (container UI) that will also realise common functionalities like page navigation, user login, language selection etc.

Considering that the overall user interface of the final application will consist of different UI components, the development of the frontend can follow an approach utilising the micro frontend technique.

The micro frontend technique can be defined as "*an architectural style where independently deliverable frontend applications are composed into a greater whole*"[5]. In the micro frontend world, the user interface of an application is broken down into smaller pieces that can be developed by different teams and even with a different programming framework. This approach has several advantages, including:

- It enables parallelization of work since different teams can work in different parts of the UI without interference;

[5] C. Jackson, "https://martinfowler.com/articles/micro-frontends.html ," Martin Fowler, 19 06 2019

- It facilitates greater flexibility in upgrades and updates since the smaller UI components allow faster implementation as well as more focus on specific pieces in terms of UX, within the agile process;
- The deployments of the micro frontends can be done independently, since the changes affect only a specific part of the UI, allowing the rest to remain stable;
- There is greater adaptability, since any part of the application can be easily replaced by another micro frontend even developed in a different framework.

2.2.1 Integration approaches

In general, a common architecture among all the integration approaches relies on the existence of a single container UI application that has the following responsibilities:

- Encapsulating the rest of the micro frontends;
- Rendering common UI elements like footer and header;
- Providing common functionalities like authentication, navigation etc.

The integration approaches are summarised in the following options:

Server-side template composition
In this case the UI is broken down into multiple smaller fragments or templates. These fragments are included in one or more container pages using server side in order to render the individual HTML files. A web server is used to set up configuration for every page fragment and make the integration in the common UI more flexible. Individual pipelines can also be set up in order to deploy the fragments in the same or even different web servers.

Built-time integration
With build-time integration, the different micro frontends are defined as software packages and the container UI includes them as library dependencies. This produces a single Javascript file that can use the functionalities implemented in the library dependencies.

Run-time integration with the help of iframes
Iframes allow an easy construction of a page by using one or more independent sub-pages, providing at the same time some degree of isolation in terms of styling and global variables without interference.

Run-time integration with the help of Javascript
In this approach, each micro-frontend is included in the container page using a script tag. The container UI then decides which micro-frontends will be “mounted” and informs them on when and where they should be rendered in the page. This technique provides more integration options, as it also allows for more dynamic approaches regarding the communication with the micro-frontends.

Run-time integration with the help of Web Components
With web components, the container UI doesn’t define a global function like in the case of the Javascript integration, but instead it instantiates HTML custom elements. This approach

became more popular after the advent of more modern frontend development frameworks like React and AngularJS.

In the context of the **COMPAIR** project, we will use a combination of the run time integration methods to bring together the various dashboards of the system.

2.3 Overall UI design

This section presents general UI components and principles relevant for the visualisation purposes of the project. At the bottom of each interface page we will include a footer section, holding elements such as Disclaimer, Privacy, etc., while at the top we include the menu items of each dashboard.

The presented items in this document are the base for the further development of a high-fidelity mockup of the **COMPAIR** frontends. In general, the dashboards of the system will be following the Google Materials Design principles, so elements such as tabs, cards, etc. are designed with that principle applied.

Google Material Design[6] is an adaptable system of guidelines, components, and tools that support the best practices of user interface design, including accessibility guidelines. Backed by open-source code, Material streamlines collaboration between designers and developers, and helps teams quickly build beautiful products.

Everyone should be able to access and enjoy the **COMPAIR** dashboards. The UI should have: 1) clear visible elements, 2) Sufficient contrast and size, 3) A clear hierarchy of importance, 4) Key information that is discernable at a glance. All users benefit from well-structured, clearly written, standards-compliant content, regardless of their physical and mental abilities and their familiarity with technology.

According to Europa Web Guide[7] there are six simple tips to help us create web content that is more accessible to all:

1. Alternative text – provide it for all images,
2. Hyperlink labels – explain what lies behind the link,
3. Video and audio – provide a transcript,
4. Headings – format sections and subsections as headings (H1, H2, H3),
5. Lists – use list formatting, do not just use numbered lines or paragraphs,
6. Tables – use table formatting for tables, make sure rows and columns are correctly marked up.

It is important to ensure that our content is accessible to all users.

[6] https://material.io/
[7] https://wikis.ec.europa.eu/display/WEBGUIDE/02.+Content+accessibility+checklist

3. The COMPAIR Dashboards

As described in the introduction of the current document, in the **COMPAIR** project there are four dashboards each with a specific role in the context of the project. In this section we provide an overview of these dashboards, presenting the architecture and the technologies used, the dashboards' main purpose, the agile epics that they need to realise as well as the latest mockups designed as a result of the interaction with the pilots of the project.

Based on these interactions, we have identified epics for the individual dashboards but also epics that describe user requirements common for all the dashboards. These epics are presented in summary in the table below and in more detail in the D2.1: Value Network Canvas. Each epic is assigned with a unique id[8] and is described as a more generic user story that can be broken down into more detailed user stories and tasks. The same approach is followed in the presentation of the two dashboards in Sections 3.3 (PMD) and 3.4 (CO2).

Table 1: List of epics for all dashboards

ID	EPICS
AllNf01	As a citizen, I want to use fast and efficient dashboards, so I can analyse situations well
AllExp	As a citizen, I want to be able to export the data from the dashboards in a number of formats, so I can share and work on the data outside the COMPAIR tools
AllL&f	As a citizen, I want to use pleasing, clear, consistent dashboards, so I can analyse situations well
AllDis	As a citizen, I can access information about air quality, best practices, ... from the COMPAIR tools and dashboards
AllUMa	As a user, I can login to the tools, so my settings and personal info is used

3.1 Overview of the Solution Architecture

The **COMPAIR** solution architecture (Figure 1) relies on a distributed pattern, where the different components of the system are deployed to individual server nodes, each dedicated to specific tasks. In the **COMPAIR** project we have four server nodes, as presented in the figure below:

1) the TELRAAM and SODAQ platforms which provide traffic and air quality data based on their sensor readings,depicted with the dark yellow and light orange boxes,
2) the Air Quality platform,, that integrates and calibrates air quality data from SODAQ and external sensors and data from reference stations, depicted with the light blue box,

[8] As explained in the D2.4: Pilot Operations Plan in order to make it easier to figure out what software the requirement is about, we have used a string as an identifier and not a number. The first part of the identifier points to the software (Co2 for CO2 dashboard, PMD for Policy Monitoring Dashboard, DyD for Dynamic exposure Dashboard). Epics that are linked to multiple software will have 'All' as the first part. The second part of the identifier is a three letter abbreviation of the functionality that is requested.

3) and the **COMPAIR** main node, depicted with the big green box which hosts the necessary mechanisms for data collection and transformation, user management and visualisation.

The dashboards are part of the main node and along with the mobile application provide the interaction point with the system to the users in order to accommodate their needs. It has to be noted that this is an initial version of the architecture which will be further described and elaborated in the Deliverable D4.1: Solution Architecture Report which will be submitted on M12 (October 2022).

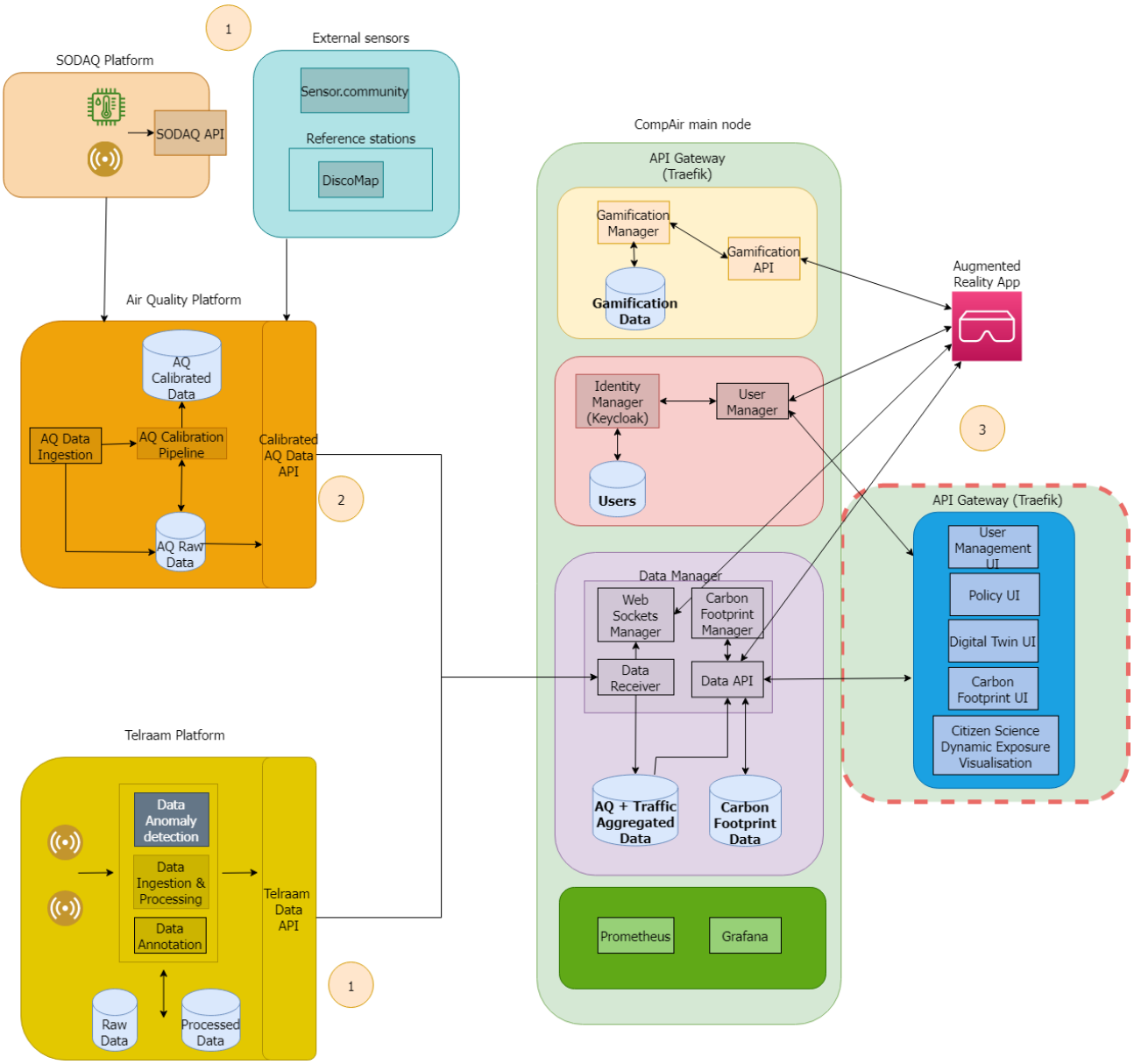

Figure 1: Architecture Overview

3.2 Technologies

For implementing the user interfaces of the dashboards, the React JS framework will be used. React JS[9] is a JavaScript library for building user interfaces, introduced to the public in 2015. React JS can be paired with other Java Script libraries like Redux, a fact that contributed to gaining a lot of popularity and becoming one of the first trends for web development. The React JS version to be used is 18.0.

The design and implementation of the UI elements is based on the Material UI library. Material UI[10] is an open-source React component library that implements Google's Material Design principles and techniques. It comprises a set of pre-build components and layouts, featuring also a customization suite that enables the extension of these components and layouts.

3.3 Policy Monitoring Dashboard

3.3.1 Purpose and Main Function

The Policy Monitoring dashboard (PMD) enables users to interact with the citizen science (CS) data coming from different sensors in order to help users understand and compare how environmental situations change under different actions.

The PMD is described as a tool that manages and processes air and traffic datasets and enables the concise reporting, access, visualisation and analysis of the data. As a result the users are able to generate data reports, visualise and share the data. The Policy Monitoring dashboard is customizable to specific user requirements and presents an easier way to apply analysis to data, interpret data from different sources and disseminate data appropriately - all of which assist with important project decision making.

The benefits of PMD include: 1) The ability to summarise and present operational and analytical data in a way that is easily interpreted and aids the decision making process, 2) The presentation of complex datasets in a visual format that allows quick insight of data trends and current status, 3) Seamless integration of multiple datasets from a number of sources into a single platform where it can be viewed simultaneously, 4) Providing ease of access to multiple users through open or controlled access, improving collaboration and the sharing of important data and the ability to formulate policy norms and thresholds.

In the following subsection the main functionalities to be implemented along with the user interface of the PMD are presented.

[9] https://reactjs.org/
[10] https://mui.com/material-ui/getting-started/overview/

3.3.2 List of epics for the Policy Monitoring Dashboard

The following table presents the initial epics for the Policy Monitoring Dashboard. The implementation of these epics will be carried out gradually based on the priorities of the agile process that we follow in the project, so the mockups presented below will be further elaborated and enhanced with more functionalities as the project progresses.

Table 2: List of epics for the PMD

ID	EPICS
PMDCom	As a citizen, I want to compare the output from different projects using the policy monitoring dashboard against each other
PMDAir	As a citizen, I want to see realtime and historical information about air pollution, so I can assess the impact of policy decisions
PMDCon	As a citizen, I want to see context data like weather, roadworks, so I can take this context into account when assessing the impact of policy decisions
PMDMap	As a citizen, I can use a map interface to see the location of sensors so I have an understanding where measurements are done
PMDTra	As a citizen, i want to see realtime and historical information about traffic, So I can assess the impact of policy decisions
PMDGam	As a Pilot admin, I can trigger behaviour using the dashboard by using gamification techniques, so I can increase take up of the dashboard
PMDMan	As a Pilot admin, I can manage dashboards during the lifecycle of projects so people can use the dashboards to assess impact of policy decisions
PMDUI	As a user, I get a user friendly, pleasing, intuitive UI, so I know how to use the dashboard and I'm motivated to use it

3.3.3 User Interface Design

In this section we present an initial set of web pages which stands as the User Interface of the first version of the PMD. These web pages are mainly focused on the functionalities derived from the epics: PMDAir, PMDMap and PMDTra.

Homepage

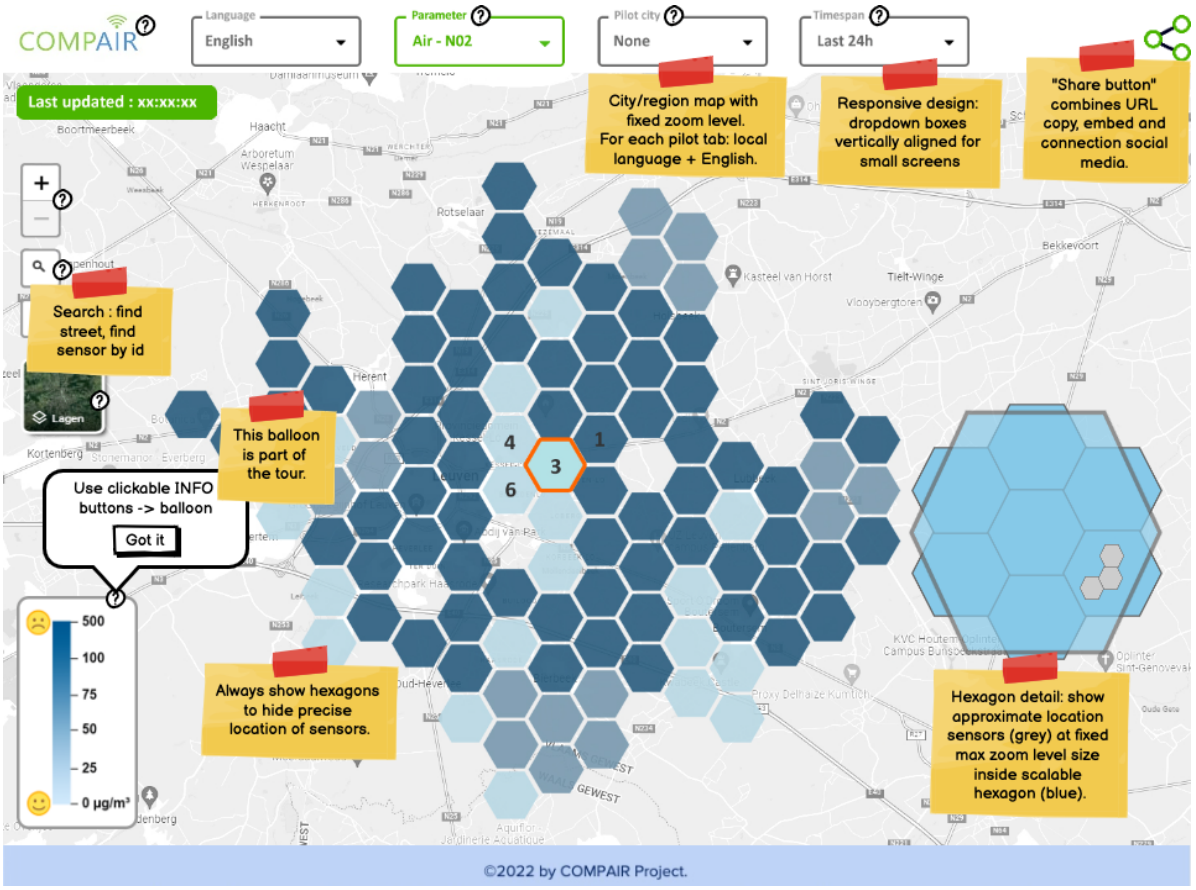

Figure 2: Homepage

The main page includes a map consisting of hexagons representing the current sensors included in a specific area. One hexagon contains multiple sensors. The approximate position of the individual sensors is always visible as a hexagon with fixed zoom level, as shown in Figure 2 (fixed grey hexagons).

The user can select the following in dropdown lists from the menu that is available on the top of the page:

- Language: the user can select the language of their preference (English and Pilot country languages will be available); As the project progresses, more languages will be added.
- Parameter: selecting a specific parameter i.e. Air-NO2 the map will display the sensors related to this parameter;
- Pilot City: Selecting a pilot city will show the pilot region map at a fixed zoom level with preset settings;
- Timespan: a timespan can be chosen (last 24h, last week, last month).

Information ⍰ buttons will be available in the Pilot language and English.

The user can find a location by using the search functionality. It has to be noted that other search criteria will be available as well, such as the sensor ID.

Upon selection of a sensor type, the scale adjusts automatically as depicted in Figure 3.

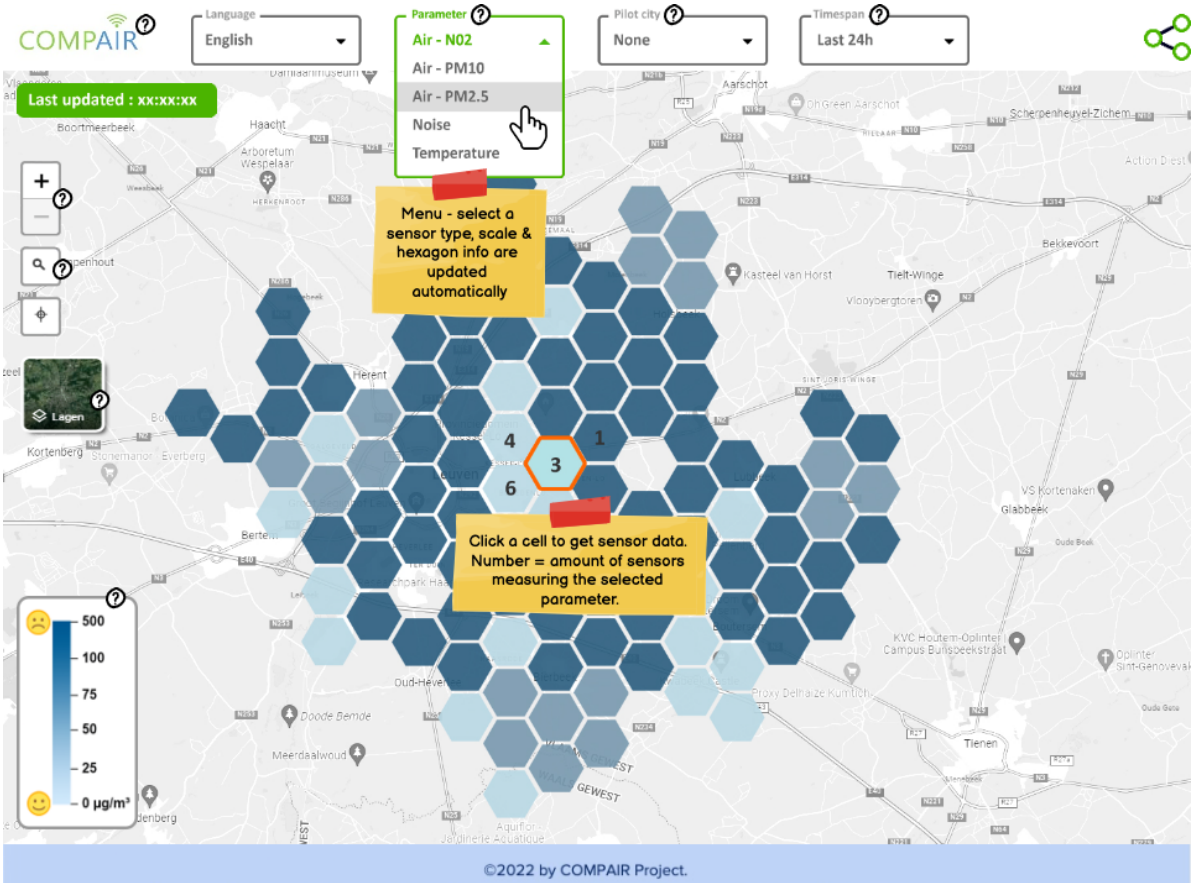

Figure 3: Select a sensor type

Share dashboard

By clicking the share button that is available in the top right side of the page (Figure 4), the user can copy the url with the current view, get the embedded code or share the url on social media or by email.

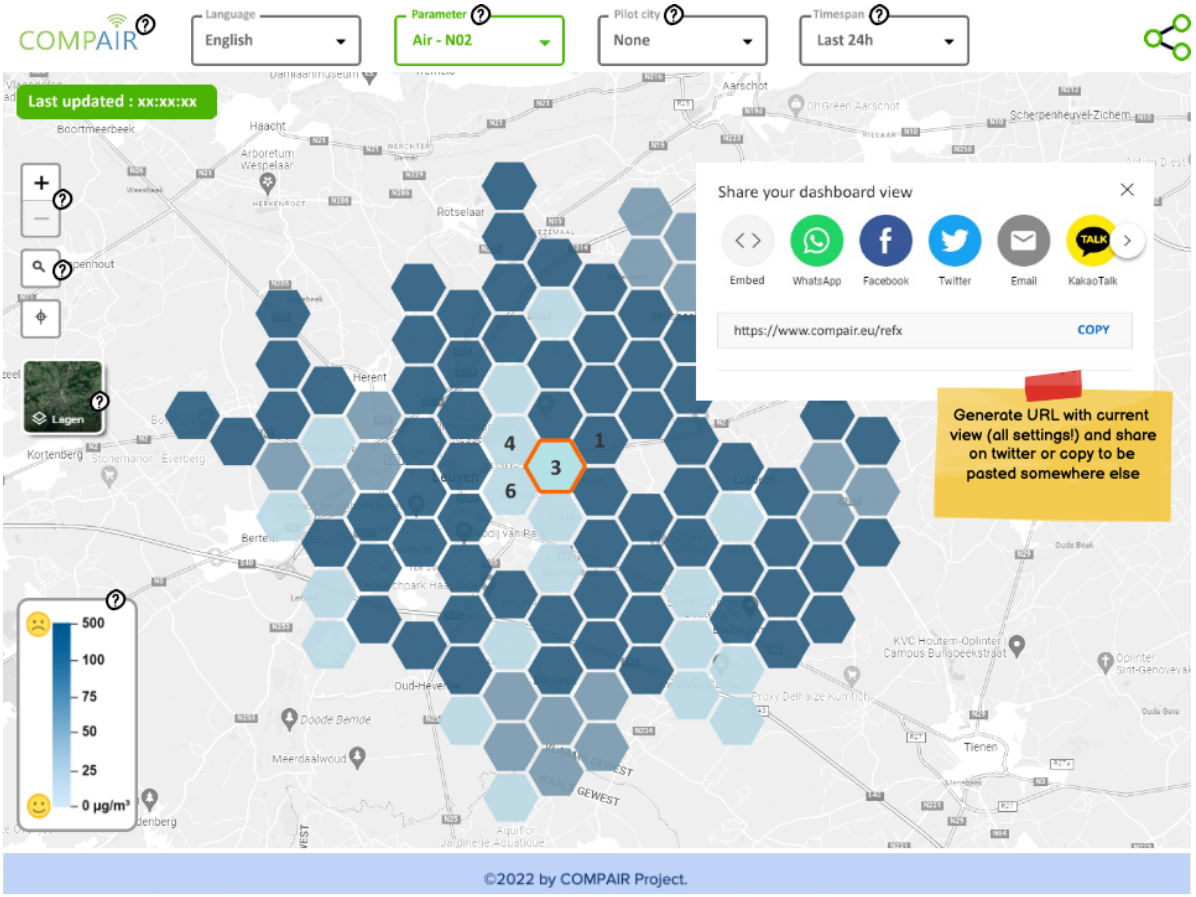

Figure 4: Share dashboard view

Information

The user can learn more for each visualisation by clicking the available information buttons. Clicking the buttons, a pop-up will be displayed showing background information. Also a movie or an online instructor will be used with voice over.

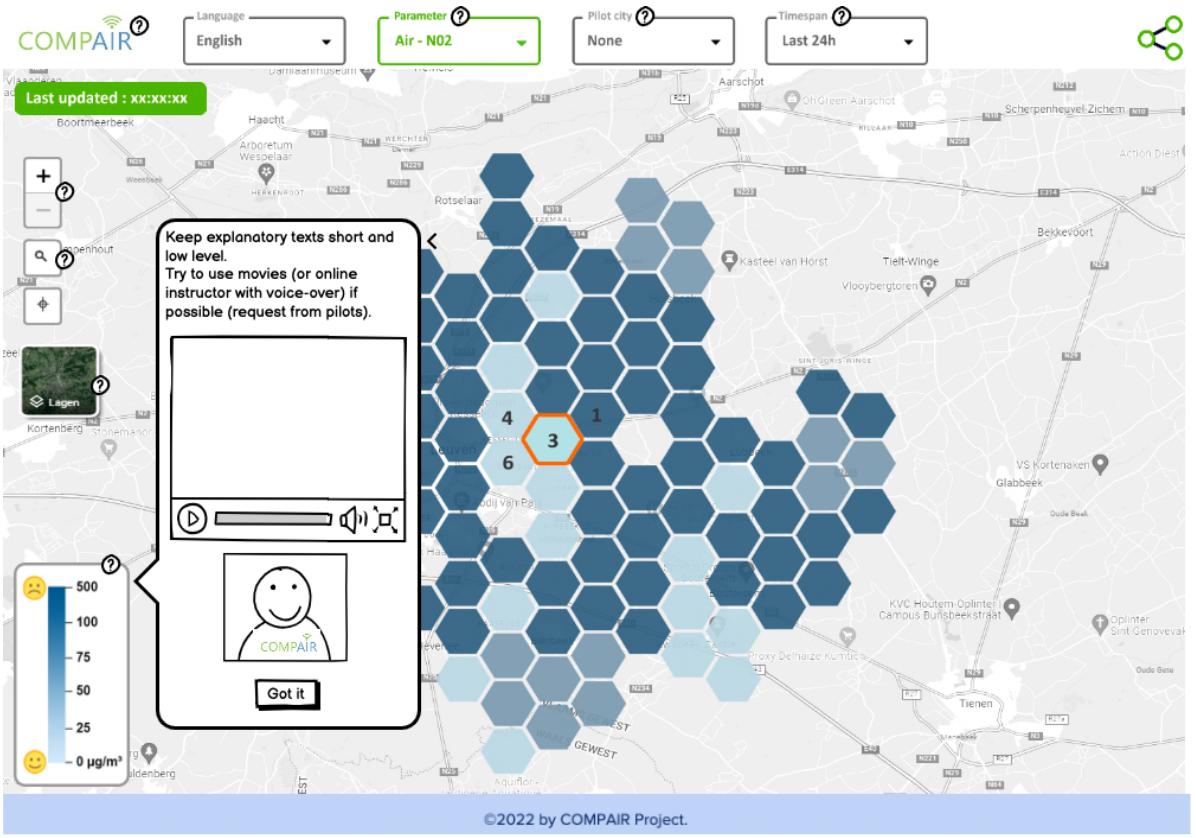

Figure 5: Information

Select a hexagon

The user can see the number of sensors that are available in each hexagon (Figure 6). By clicking on a hexagon, the user has two options: 1) select information for one sensor, or 2) select information for a group of sensors. The selected hexagon has a coloured border for those that are using smaller screens.

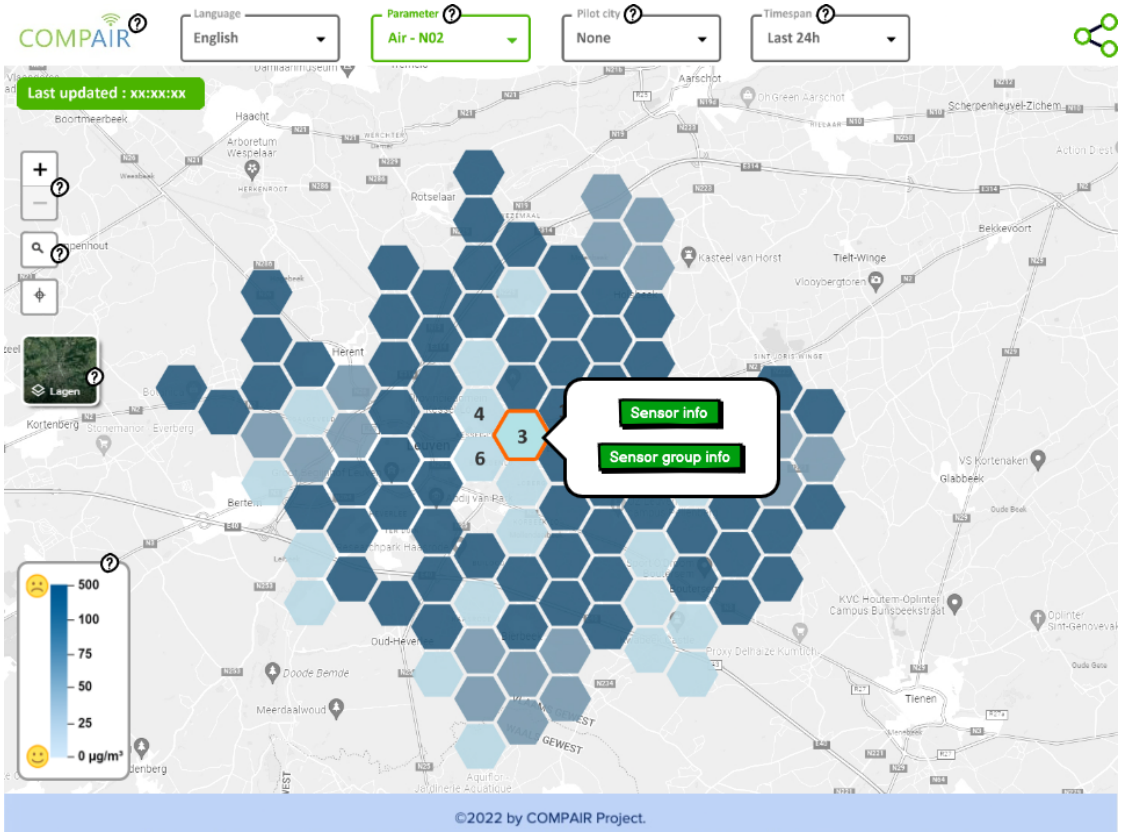

Figure 6: Select a hexagon

Upon selection of the “Sensor info” button, a pop-up appears presenting information about the sensors included in the hexagon as depicted in Figure 7. Upon selection of the “Sensor group info” the list of sensors belonging to this specific group will appear.

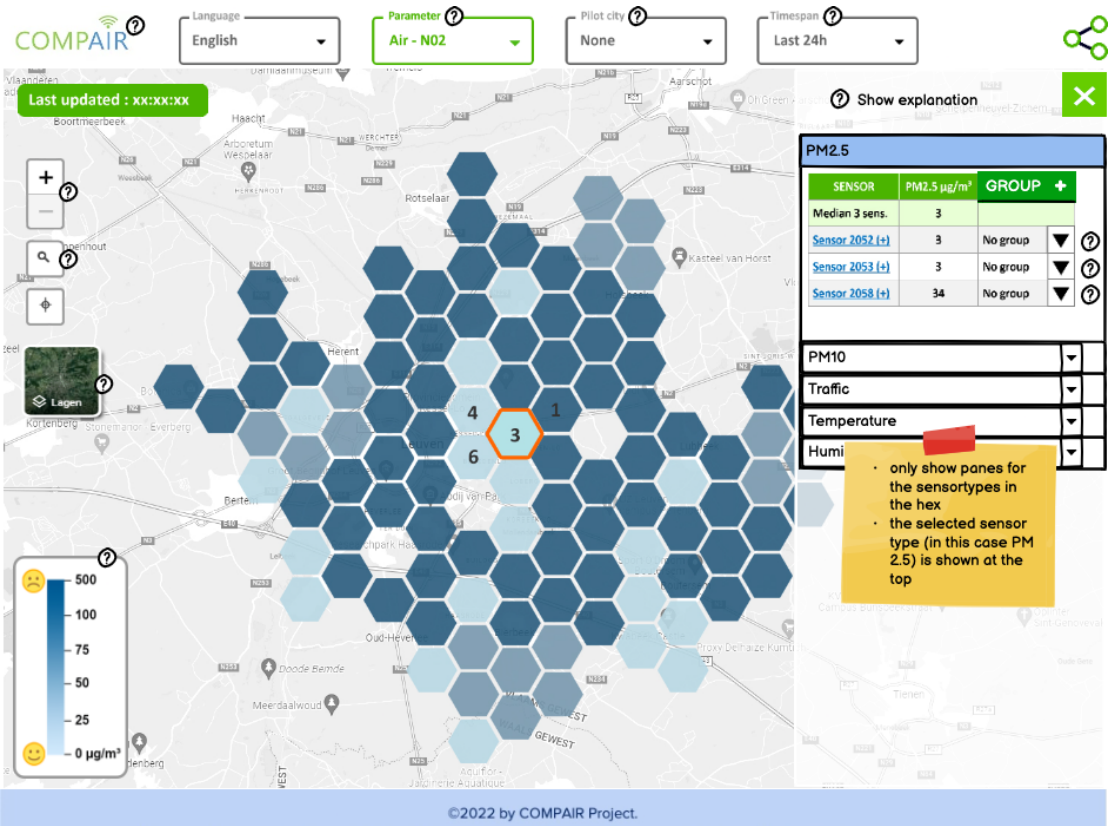

Figure 7: Select sensor info

Information for one sensor

By clicking a sensor in the list of sensors (Figure 8), a graph will appear in the side menu showing detailed information about the measured data. Based on the settings, the information will be shown covering the selected timespan.

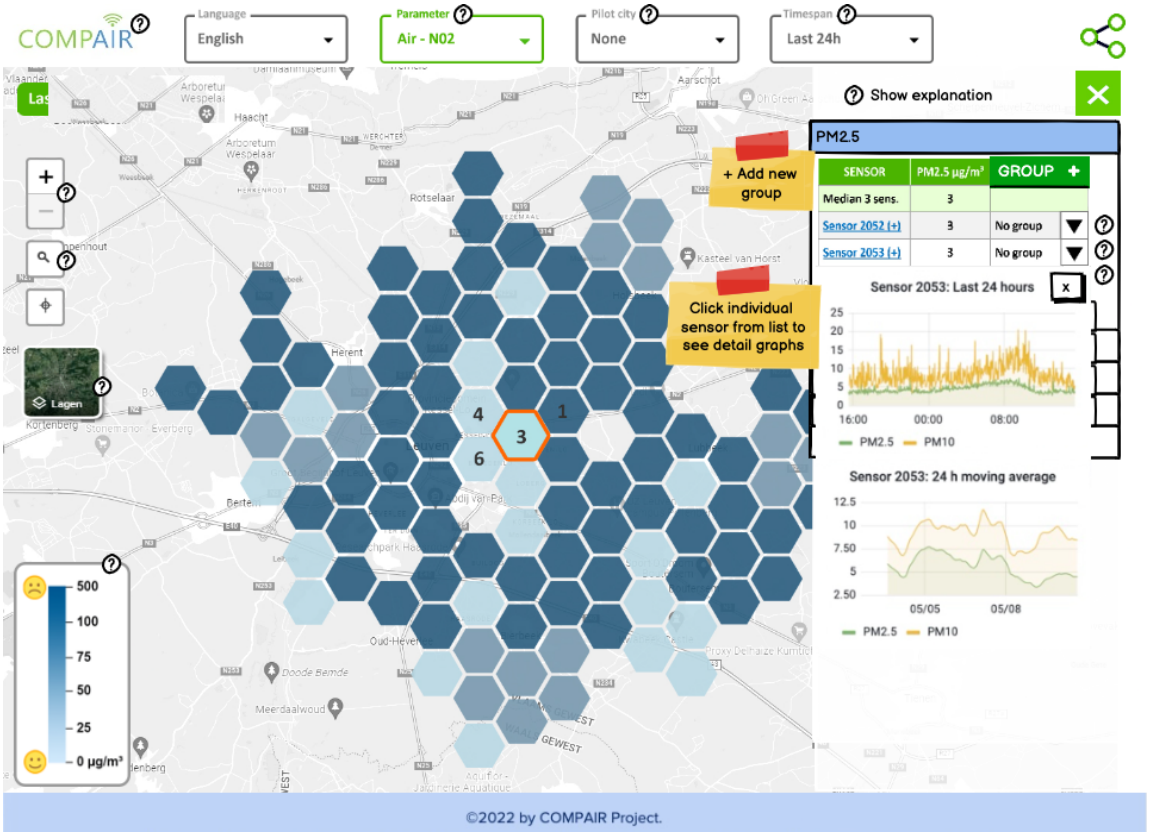

Figure 8: Information from one sensor

Adding a sensor to a group

The user can see the sensors that are available per group and can also create a new group by clicking the GROUP + button (Figure 9).

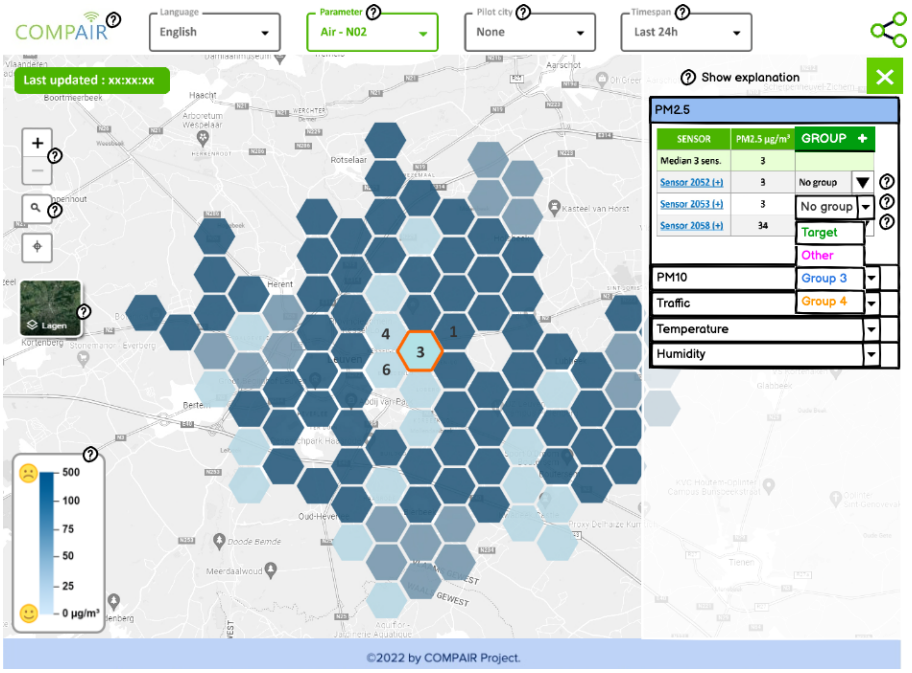

Figure 9: Adding a sensor to a group

Create a new group of sensors

The user can create a new group of sensors by clicking the (+) button as depicted in Figure 10.

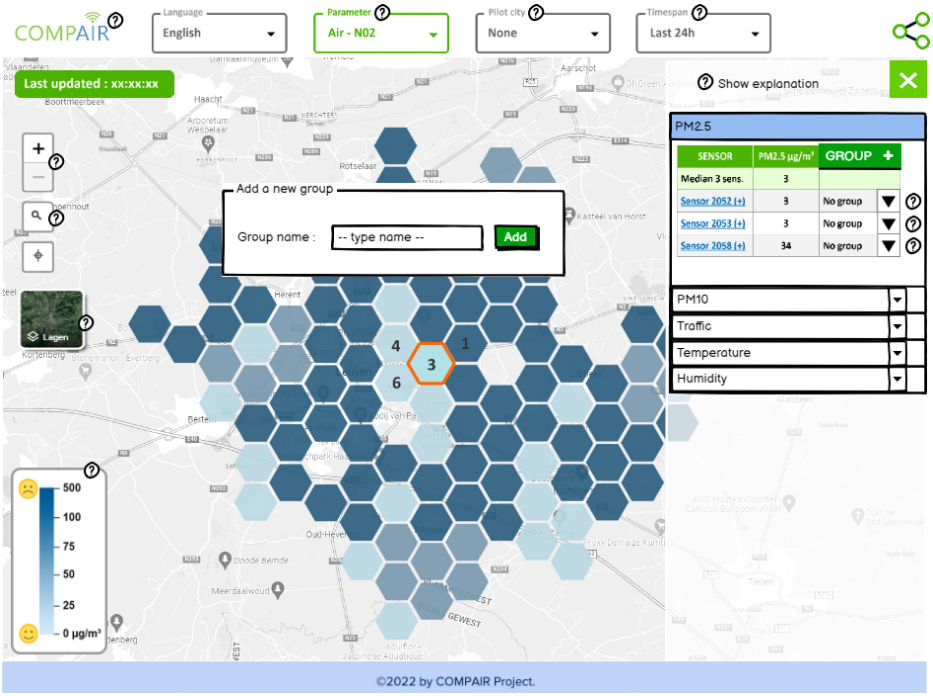

Figure 10: Create a new group of sensors

In addition to the functionalities described above, we aim to explore the impact of changes in policy by allowing users to compare the difference between the status before and after introducing new measures.
The user can see a summary of traffic and air pollution for the different time windows and groups through a set of graphs.
The Pilots and the technical team will further analyse this functionality.

3.4 Carbon Footprint Simulation Dashboard

3.4.1 Purpose and main function

A carbon footprint is the total amount of greenhouse gases (GHG), either methane or carbon dioxide (CO_2), produced by our daily activities. The estimation of the total carbon footprint of EU-27 for 2019, according to Eurostat, was 6.8 tons of CO_2 per capita[11]. By using carbon footprint as a quantitative expression of Greenhouse Gas emissions for everyday activities, the most significant sources of the emissions can be established which can lead to better policy making regarding the mitigation of climate change (Carbon Trust 2007b).

A carbon footprint calculator measures the carbon emissions as an effect of a certain activity or set of activities[12]. Many carbon footprint calculators have been created for private and public use, with the focus on calculating the carbon footprint of people, countries or organisations.

The **COMPAIR** Carbon Footprint Simulation Dashboard is created to support specific experiments around carbon footprints. Visualisations of algorithms results will allow users to understand and compare how their daily actions (driving, recycling, etc.) affect future CO_2 levels. The goal is to guide user behaviours towards more environmentally friendly choices like limiting waste and maximising recycling, replacing household appliances with less energy consuming ones, choosing a more environmentally friendly car use (carpooling). The dashboard will be unlike other existing carbon footprint dashboards as it also captures cs participants' opinions on what actions they are willing to perform towards the achievement of a policy target and the probability of achievement. In this manner **COMPAIR** will work towards more effective behaviour/policy recommendations.

The Carbon Footprint Simulation Dashboard consists of two tools. The first one is the Carbon Footprint Calculator which calculates the users carbon footprint and recommends actions on how to lower it. This tool is meant to help users understand how they affect their carbon footprint through their daily activities, as well as provide recommendations on how they can reduce their carbon footprint. The second tool is the Scenario Simulation Dashboard. This tool allows citizens to participate in policy making. It presents a set of

[11] ec.europa.eu (2022). Greenhouse gas emission statistics - carbon footprints. Retrieved on August 1, 2022 from: https://ec.europa.eu
[12] Wiedmann, T. and Minx, J. (2008). A Definition of Carbon Footprint. *Ecological Economics Research Trends*, 1, 1-11. https://www.researchgate.net/publication/247152314_A_Definition_of_Carbon_Footprint

actions they are willing to make, as well as actions they are willing to accept from the government with the purpose of reducing carbon emissions. Citizens can choose which actions they believe they are willing to adopt and that creates a scenario they can submit, which policy makers can gain insight from.

By informing citizens about their carbon footprint and emissions they are motivated to a more environmentally friendly behaviour. By changing their behaviour, it will lead to a reduction in their carbon footprint and in individual, urban and national CO_2 emissions.

3.4.2 List of epics for the CO2 Dashboard

The following table presents the epics for the Carbon Footprint Simulation Dashboard.

Table 3: List of epics for the CO2 dashboard

ID	EPICS
Co2Cal	As a citizen, I want to know the current and historic contribution of my different activities to my Carbon Footprint, so I can maximise the impact of changes to my behaviour
Co2RRe	As a citizen, I want to get a list of recommendations on how to reduce my contribution to CO2 emissions
Co2Man	As an admin, I want to manage the dashboards I am responsible for, so I can help my users be efficient
Co2Sce	As a citizen, I want to be able to create scenarios of citizen and government actions that show me how emissions can be reduced to a certain target.

3.4.3 User Interface Design

In this section we present an initial set of web pages which stands as the User Interface of the first version of the CO2. These web pages are mainly focused on the functionalities derived from the epics: Co2Cal, Co2RRe, Co2Man and Co2Sce.

Homepage

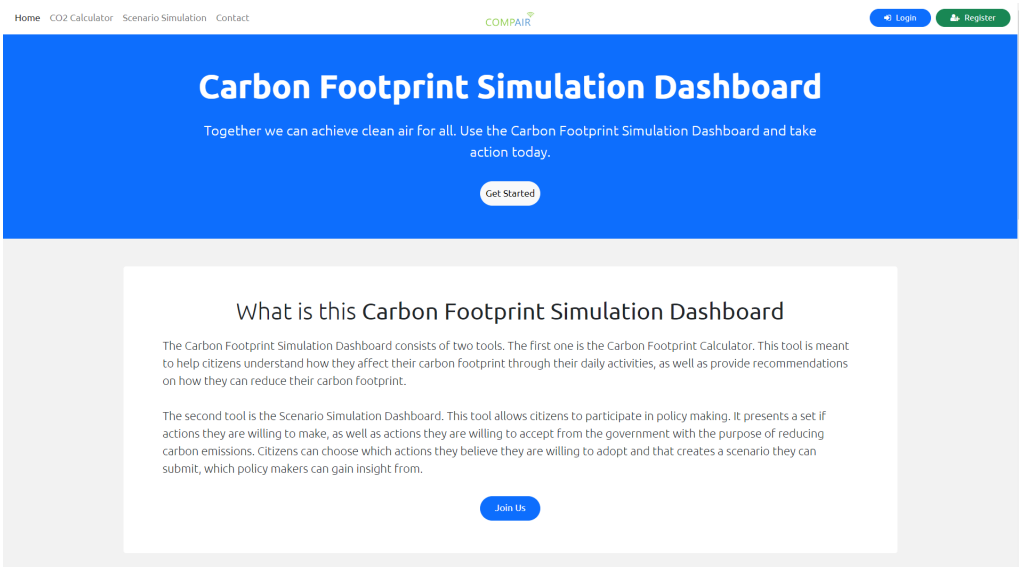

Figure 11: Homepage

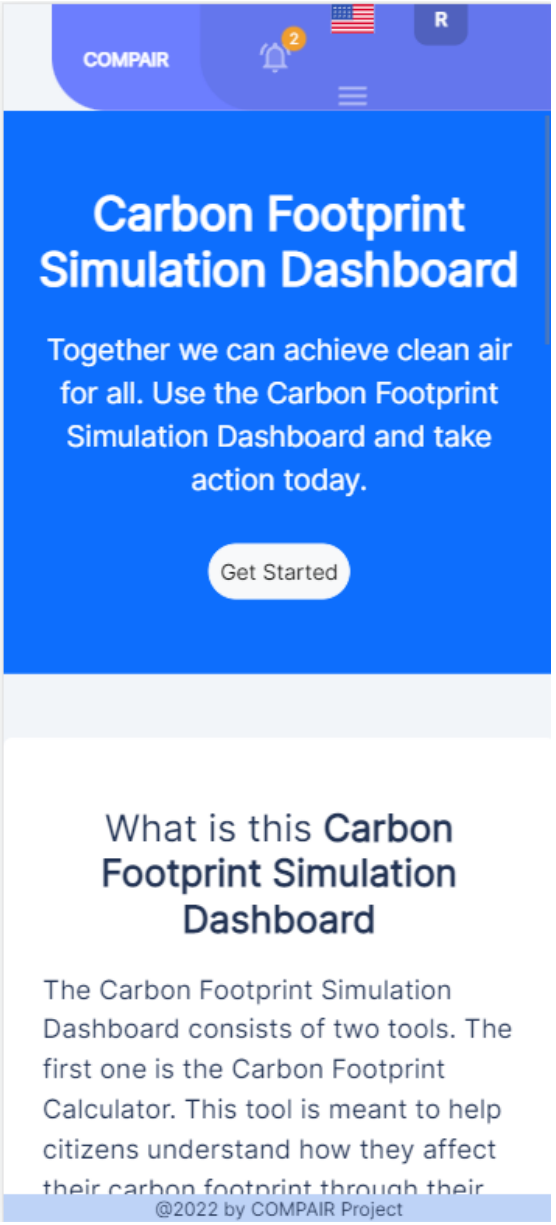

Figure 12: Homepage mobile view

On the homepage, the user will have the option to choose between the two tools, the Carbon Footprint Calculator and the Scenario Simulation. They will also be able to learn more about the **COMPAIR** Project.

If the user chooses the Carbon Footprint Calculator, they are led to a page with various tabs. Each tab has different questions the user has to answer. Some tabs have questions for a specific carbon footprint domain. Each domain focuses on a different set of activities that contribute to the user's carbon footprint, such as the use of their car, how they handle their waste, or the energy their house consumes. Other tabs have questions for the user that are not about a specific domain such as their country, the period for which they want to calculate their carbon footprint, and some demographic data. Finally, the last tab presents the results of the calculator.

Carbon Footprint Calculator - Welcome

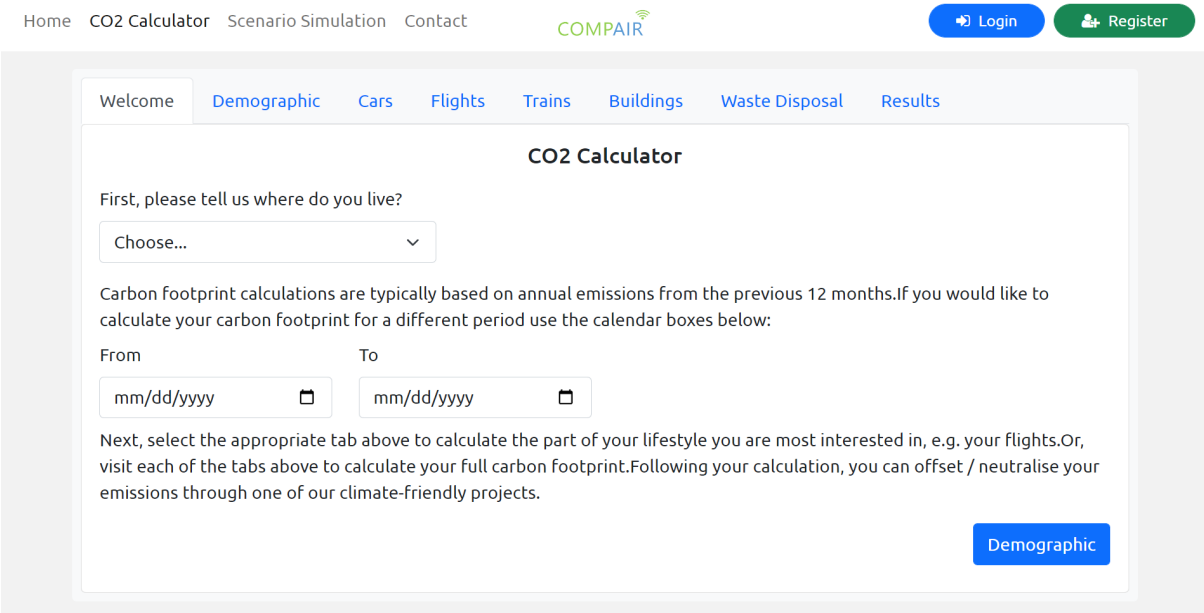

Figure 13: Carbon Footprint Calculator - Welcome

On the Welcome tab the users choose their country and set the time period for which they wish to calculate their carbon footprint. Usually, carbon footprint is calculated for a 12 month time period.

Carbon Footprint Calculator - Demographic Characteristics

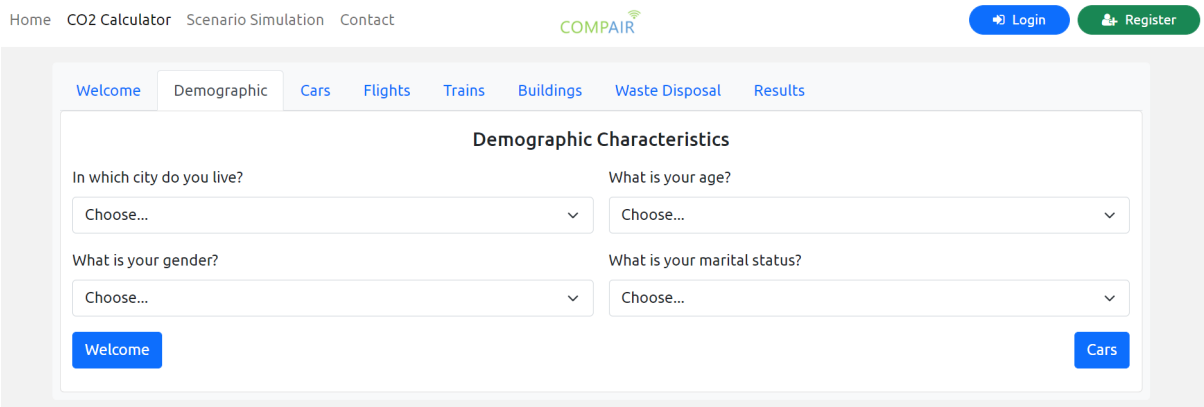

Figure 14: Carbon Footprint Calculator - Demographic Characteristics

On the Demographic Characteristics tab the users can input some information regarding themselves. This information helps with the calculation of the carbon footprint, as well as the presentation of the results.

Carbon Footprint Calculator - Cars

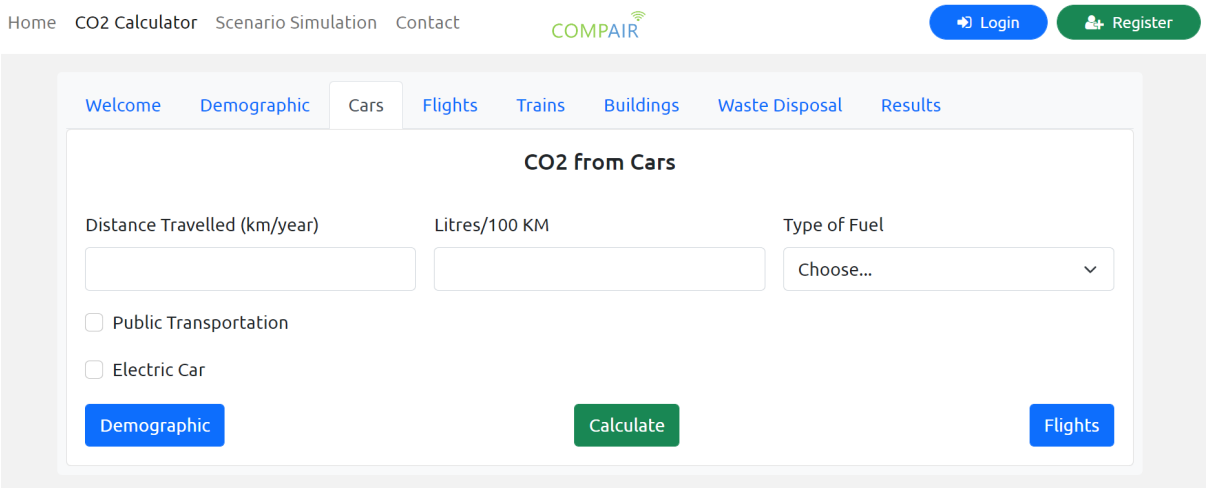

Figure 15: Carbon Footprint Calculator - Car

The Cars Tab is the first carbon domain presented in the Carbon Footprint Calculator. If the users own a car, they can fill in the information regarding its usage. The information they have to fill in is the distance they travelled with the car during the time period they have set, the fuel type, and their car consumption.
If they also use public transport, they can choose so. The way the carbon footprint is calculated for this domain changes to take that into account. Finally, in the case of using an electric car, the calculation method will change.

Carbon Footprint Calculator - Flights

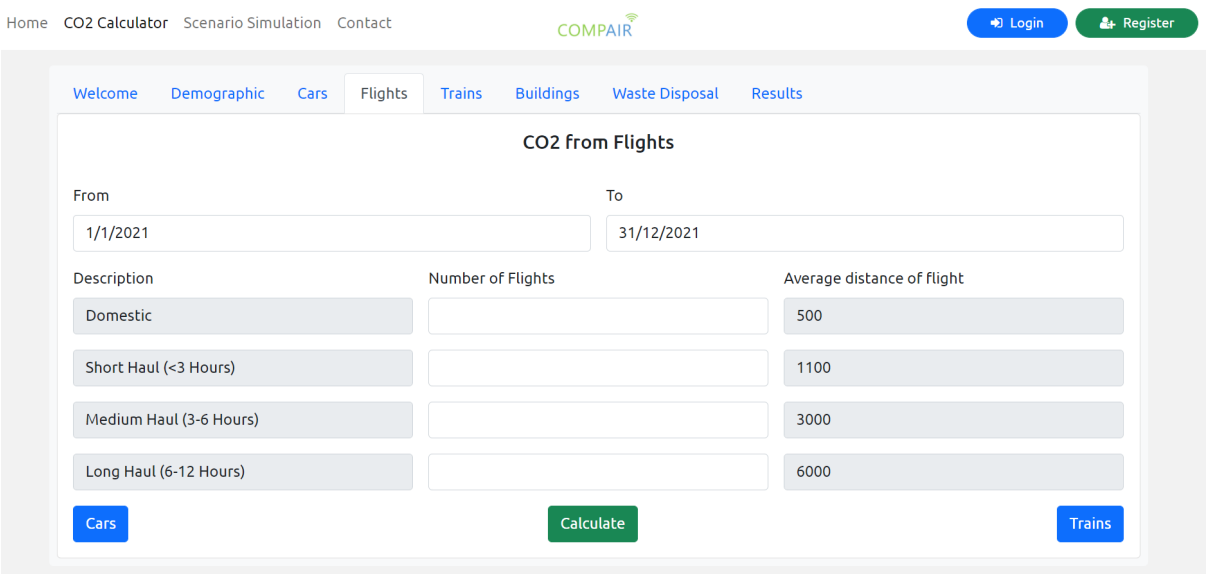

Figure 16: Carbon Footprint Calculator - Flights

On the Flights tab the users can input the number of flights they took for the selected time period. The time period on this tab is automatically filled based on the time period the user selected in the Welcome tab. The users just need to know the duration of their flights.

Carbon Footprint Calculator - Trains

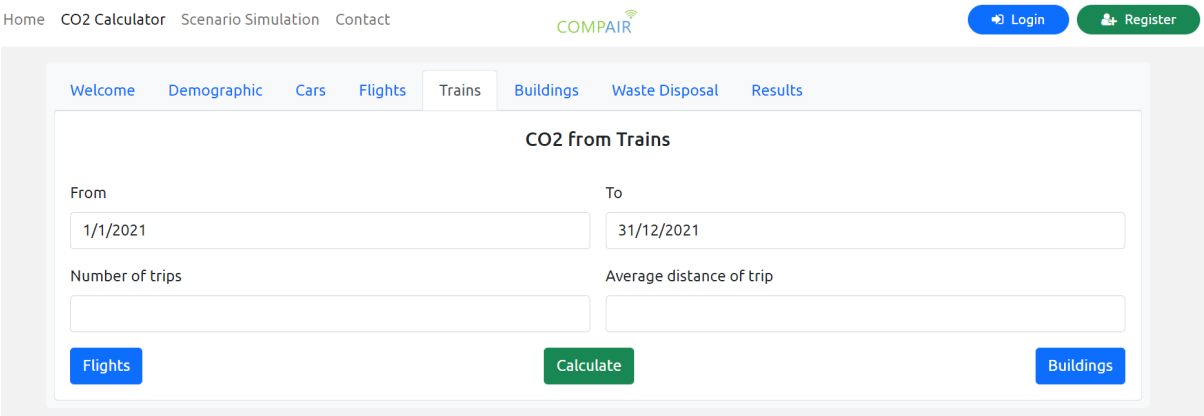

Figure 17: Carbon Footprint Calculator - Trains

The Trains tab contains questions regarding the use of trains by the user. Currently, the users have to fill in the number of trips they take and the average distance of a trip.

Carbon Footprint Calculator - Buildings

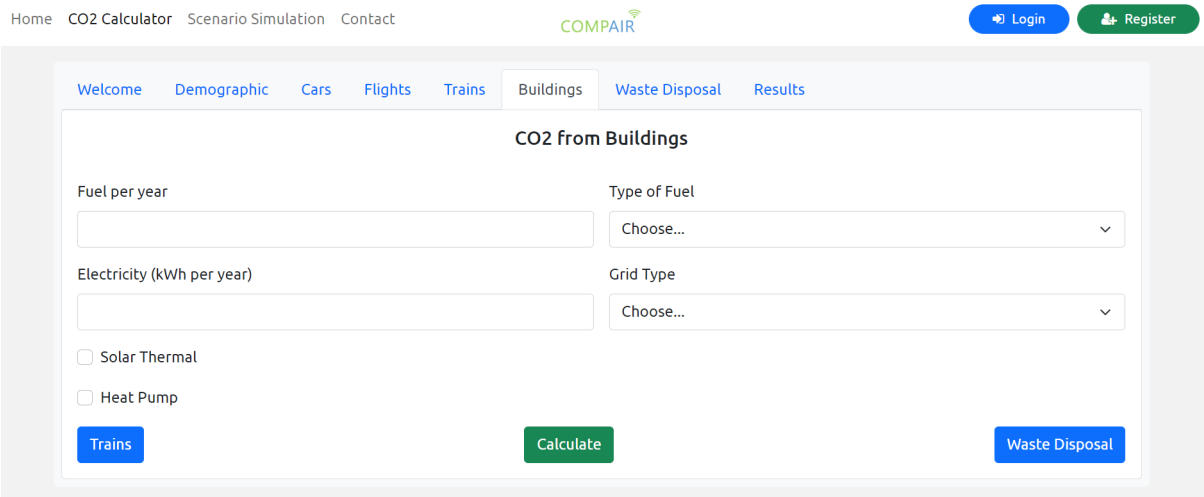

Figure 18: Carbon Footprint Calculator - Buildings

The Buildings tab calculates the carbon footprint for the users' house taking account the way they heat it and the amount of electricity they use in it. The users can select between diesel, coal, natural gas and biomass, depending on the type of fuel they use. Also for the calculation of the electricity, the grid type (the transmission system for electricity) is needed. They can choose between new grid, old grid or island, in case they are living in an island. There are also options if they use solar energy or a heat pump that alter the method of calculation of the carbon footprint for this domain.

Carbon Footprint Calculator - Waste Management

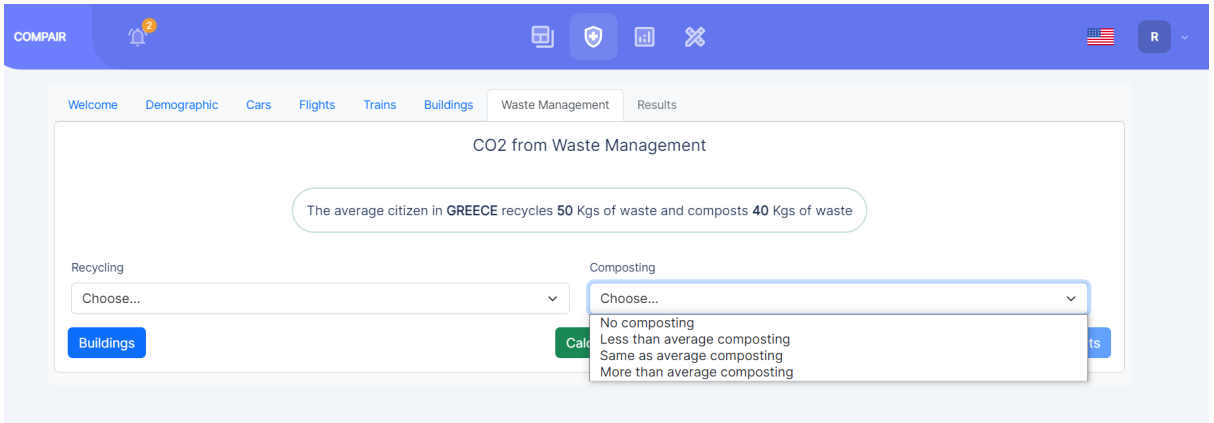

Figure 19: Carbon Footprint Calculator - Waste Management

The Waste Disposal calculates the carbon footprint for this domain by asking the user to choose the amount of recycling and composting based on the average of the user's country.

Carbon Footprint Calculator - Results

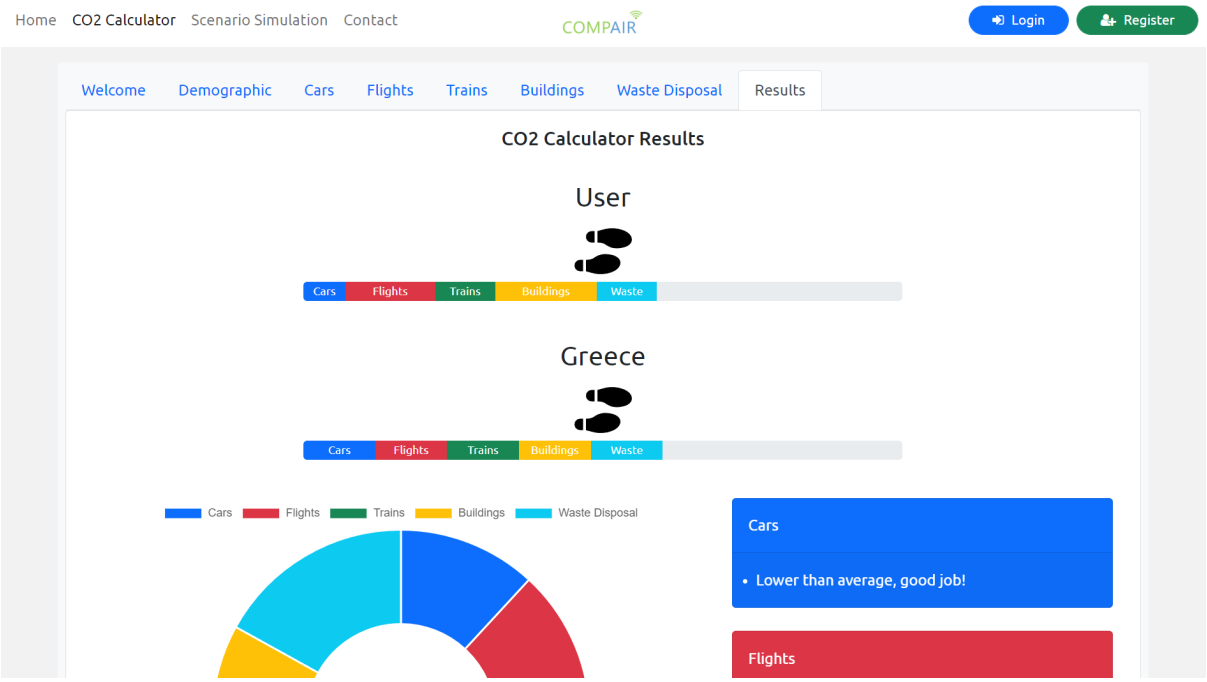

Figure 20: Carbon Footprint Calculator - Results

The Results tab presents the carbon footprint of the user. The carbon footprint is broken down into domains so the users can easily see how much each domain contributes to their carbon footprint. Then, the average carbon footprint of the user's country is presented so the user can compare it to their own. Also the European and the World average will be presented as a basis for comparison.

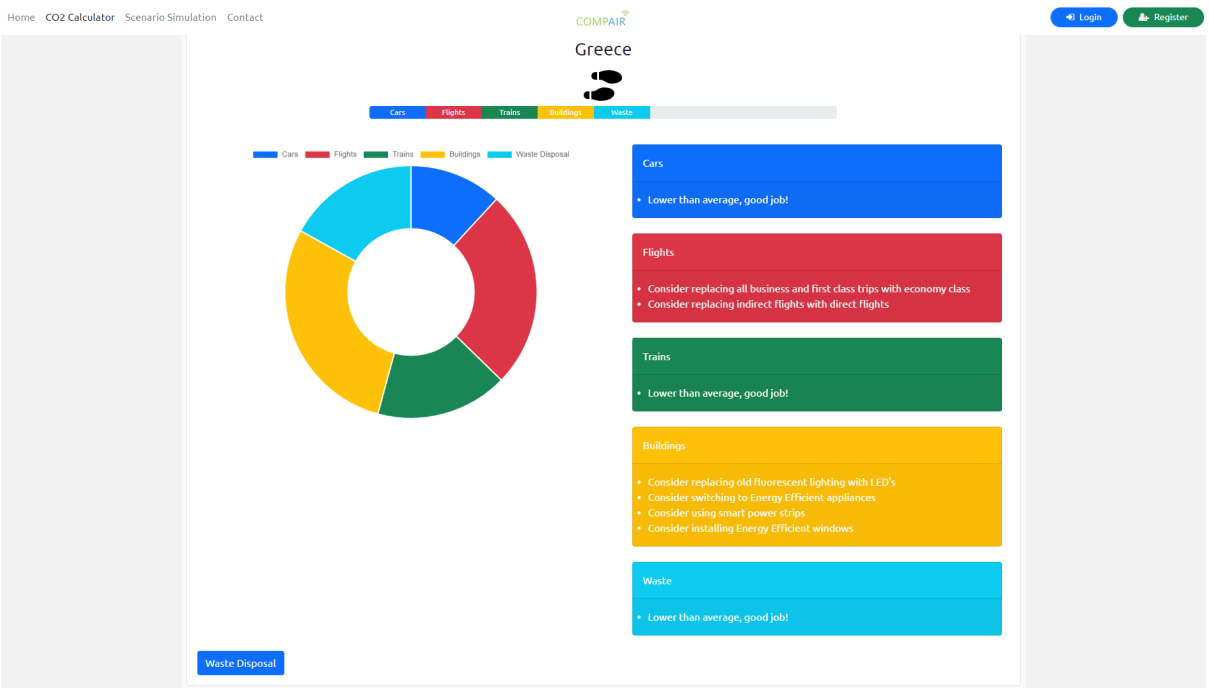

Figure 21: Carbon Footprint Calculator - Recommendations

Based on the user's input and the calculated results, the user will receive tailored recommendations.

Scenario Simulation

The second tool the user can access from the menu is the Scenario Simulation (Figure X). There is no requirement that the Carbon Footprint Calculator has to be used before it. The Scenario Simulation allows the user to submit their opinion in the form of scenarios regarding a specific quantified environmental goal. For example, a goal can be the European Commission's target of a 55% net reduction in greenhouse gas emissions by 2030. The goal is visible on the top of the page.

The graph's red line at the center of the screen represents the current average of the user's country. The objective for the user is to create a scenario that, if adopted by the citizens and government, manages to reach the set goal for their country.

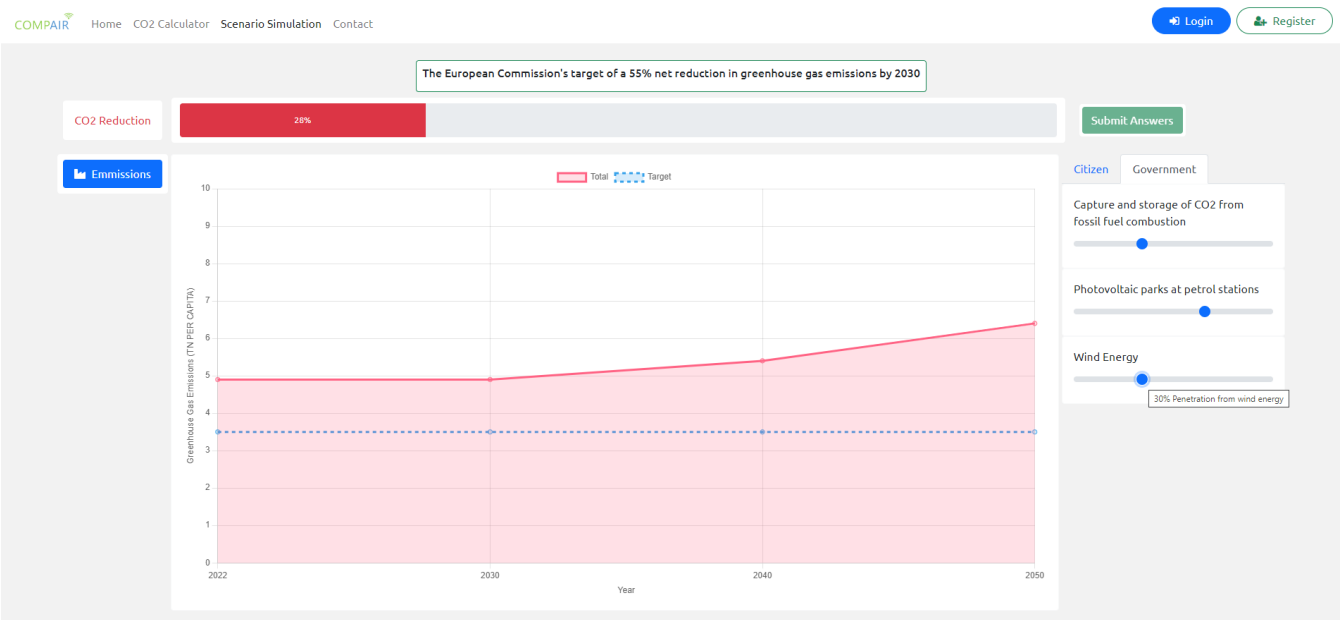

Figure 22: Scenario Simulation

Users can choose between actions they can adopt and actions they are willing to accept from the government. These actions can be found on the right part of the screen, where a tab for each of the two action types can be seen.
For example, an action a user can adopt is to replace part of their first or business class flights with economy flights, or to replace part of their home appliances with energy efficient ones. An example of government action is the capture and storage of CO2 from fossil fuel combustion, or an increase in electricity production using wind energy.

Each action has different levels that will directly affect the graph positively or negatively. Choosing an action level can be done using the slider that corresponds to each action. Each level of the action means a different level of adoption of said action. Following the examples above, the user can choose between replacing 0%, 20%, 50% or 90% of their first or business class flights with economy flights.

When a user's scenario reaches the set goal, the user can submit their scenario. The purpose of these scenarios is twofold. If the user has filled in the Carbon Footprint Calculator before using the Scenario Simulation, they are aware of their carbon footprint and have received recommendations on how to reduce it. The Scenario Simulation goes from a personal view to a larger one, and allows them to see how an action, if adopted by the citizens and government, can affect the carbon footprint of their country.

Furthermore, summaries of these collected scenarios can be later viewed by administrators and policy-makers. The data presented to them will be anonymous and not tied to a specific user. This data will present the opinions of the citizens and allow government bodies to take these opinions into account when making decisions.

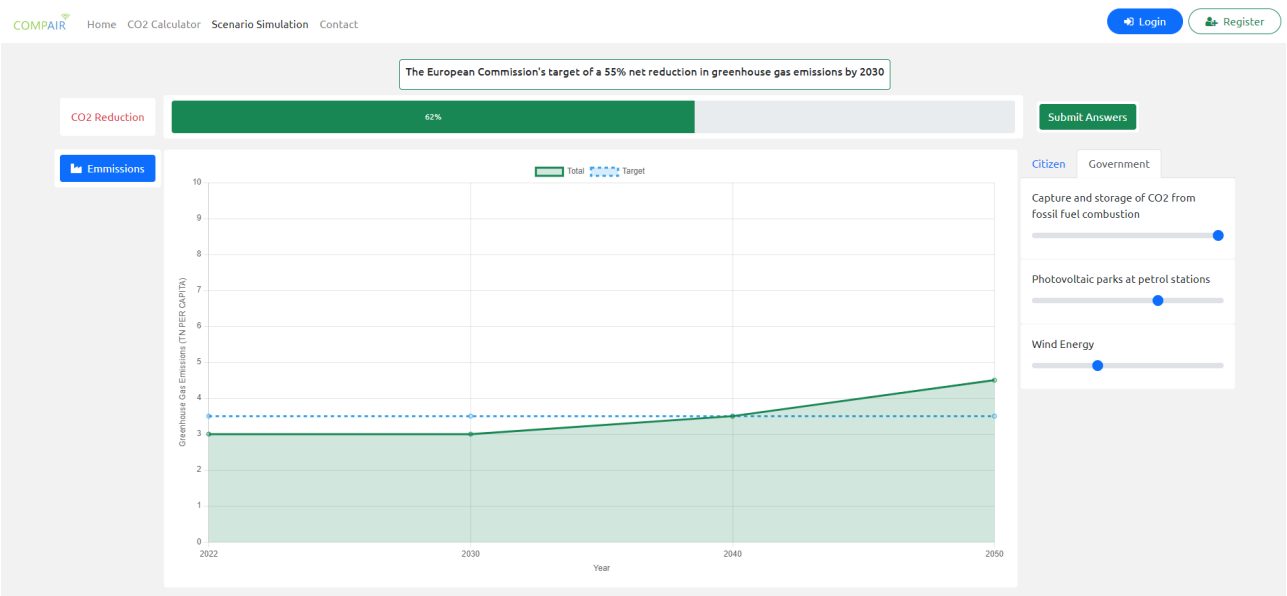

Figure 23: Scenario Simulation - Reaching the goal of CO2 reduction

4 Conclusions

This report - **COMPAIR** project deliverable D3.4 - provides an overview of the dashboards design considerations in terms of design approach and user interface integration that will be used for the actual implementation of the **COMPAIR** dashboards. Information about the four dashboards, their main purpose, the agile epics that they need to realise, as well as the latest mockups designed as a result of the interaction with the pilots of the project is presented in detail.

This document is very useful to define and communicate the initial blueprint of the **COMPAIR** dashboards. This deliverable acts as the reference point for the actual development of the dashboards and offers a shared and common background for the Consortium participants on the envisaged technologies that are necessary to build the dashboards.

Currently the technical team works towards the delivery of the alpha version which consists of the implementation of specific epics as defined by the Pilot partners. Upon delivery of the alpha version, we will define the epics to be implemented for the next version of the **COMPAIR** solution. Additional designs and mockups will be created in order to cover the new functionalities.

5 References

1. COMPAIR Deliverable D2.1: Value Network Canvas, February 2022
2. COMPAIR Deliverable D2.4: Pilot Operations Plan, September 2022