

Deliverable

D5.4 URBANAGE Ecosystem Prototype.

Intermediate

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|-------------------------------|---|---|
| Project Acronym: | URBANAGE | |
| Project title: | Enhanced URBAN planning for AGE-friendly cities through disruptive technologies | |
| Grant Agreement No. | 101004590 | |
| Website: | www.urbanage.eu | |
| Version: | 1.0 | |
| Date: | 30/04/2023 | |
| Responsible Partner: | ATC | |
| Contributing Partners: | ENG, IMEC, TEC, FVH, CIC, AIV | |
| Reviewers: | Silence Jurgen (AIV) Julio García (CIC) | |
| Dissemination Level: | Public | x |
| | Confidential – only consortium members and European Commission | |

Revision History

| Revision | Date | Author | Organization | Description |
|----------|------------|--------------------------------|--------------|--|
| 0.1 | 24.03.2023 | Giorgos Giotis, Marina Klitsi | ATC | Initial Structure, ToC |
| 0.2 | 31.03.2023 | Jan Deprez, David Vermeir | IMEC | Components related to Flanders functionalities |
| 0.3 | 06.04.2023 | Jurgen Silence | AIV | Addition of 3 manuals for Flanders R1 |
| 0.4 | 06.04.2023 | Sergio Campos; Giuseppe Ciulla | TEC, ENG | URBANAGE Architecture, components, sequence diagrams for Santander and Helsinki; URBANAGE Ecosystem User Guide |
| 0.5 | 10.04.2023 | Sergio Campos | TEC | Manuals for some TEC components |
| 0.6 | 20.04.2023 | Giorgos Giotis, Marina Klitsi | ATC | Initial version incorporating all the input provided |
| 0.7 | 20.04.2023 | Julio García | CIC | Included Age route Planner mobile application 5.1.4 Internal review |
| 0.8 | 21.04.2023 | Jurgen Silence | AIV | Internal review |
| 0.9 | 28.04.2023 | Claudia Vicari | ENG | Internal review |
| 1.0 | 28.04.2023 | Giorgos Giotis, Marina Klitsi | ATC | Final version |

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List of abbreviations

| Abbreviation | Explanation |
|--------------|---|
| API | Application Programming Interface |
| AI | Artificial Intelligence |
| APP | Application |
| BI | Business Intelligence |
| CI/CD | Continuous Integration / Continuous Development |
| CIM | City Information Model |
| DML | Data Management Layer |
| DT | Digital Twin |
| GC | Green Comfort |
| GCI | Green Comfort Index |
| GCM | Green Comfort Model |
| GDPR | General Data Protection Regulation |
| GPS | Global Positioning System |
| IoT | Internet of Things |
| IT | Information Technology |
| PoI | Point of Interest |
| PWA | Progressive Web App) |
| QA | Quality Assurance |
| R1,2,3... | Requirement |
| SQL | Structured Query Language |
| UE | URBANAGE Ecosystem |
| UI | User Interface |
| UAT | User Acceptance Testing |
| WP | Work Package |

| | |
|-----|---------------------|
| WMS | Web Mapping Service |
| 3D | 3 dimension |

1 Executive Summary

This document describes the intermediate release of the URBANAGE Ecosystem. This is a second working version of the prototype that offers a set of the expected functionalities and will act as the test-bed for the URBANAGE stakeholders to experience this set of URBANAGE provisions and to assess the concepts and knowledge conveyed by the project.

The deliverable examines the ecosystem from two different aspects; from the internal point of view, in which the functional and architectural structure is presented briefly, and from the end-user point of view, in which the look & feel and the overall high-level functionalities and interaction potentials are explained. Moreover, the document provides an overview of the current functionalities in the form of a user guide, exposing every available feature so far.

The URBANAGE Ecosystem, far from being a simple container for the individual modules, is a coherent application, where several different components reside and collaborate in harmony. The intermediate prototype is a proof of concept for the URBANAGE end users. It encapsulates most of the underlying technologies and gives a clear and easy-to-use graphical interface. The benefit of the current architecture is that any additional functionality can be wrapped into a separate component and be added to the ecosystem, provided that it abides by the basic communication standards exposed by the URBANAGE Ecosystem architecture. The scope of this practice is to enable future extensions of the ecosystem to arise functionalities, which may maximise the potential for further exploitation and adoption of the ecosystem beyond the project end.

2 Introduction

This deliverable aims to provide an overview of the second release of the URBANAGE Ecosystem Prototype. To this end, the report describes shortly the implementation aspects as well as the current functionalities which are explained in the form of a user guide. It is the second of three deliverables under the “Task 5.3: URBANAGE Ecosystem (Continuous Platform Integration and User Interface)”, including the initial (D5.3), the intermediate (D5.4) and the final (D5.5) version of the URBANAGE Ecosystem prototype.

The “WP5: Ecosystem and Integration” aims at providing the implementation aspects for the delivery of the URBANAGE components integration in a unified ecosystem. The design of the URBANAGE Ecosystem is driven from the user stories and specifications coming from the “WP6: Use Cases”.

Following the implementation of the individual modules, the WP5 delivers an integrated view of the URBANAGE Ecosystem to act as the testbed for the URBANAGE pilots in WP6. The content presented in this deliverable is subject to refinements and modifications based on the progress of the technical work packages, as well as the insights gained during the validation and evaluation phases of the project. These updates will be included in the final version of this deliverable (D5.5 URBANAGE Ecosystem Prototype. Final) expected at M33.

This document reports on the activities and effort placed in integrating the various technologies and tools provided by the WP3 and WP4 towards delivering the intermediate release of a functional URBANAGE integrated prototype. The integration effort is guided by the Agile Software Development methodology¹, aiming to progress the development work in parallel teams and regularly integrating their output based on a well-defined design. The intermediate release acting as a “Minimum Viable Product” has been built via sprint iterations. It has been implemented, tested, and evaluated iteratively, using short cycles to add functionality to the prototype. This way, the implementation processes and the definition of the integration mechanisms will proceed in parallel until the end of the project through close collaboration between all the teams.

The scope of this document is to act as an appendix to the current version of the URBANAGE integrated prototype, and as such, it is structured as follows:

- Section 3 provides an overview of the URBANAGE Ecosystem prototype, including the development aspects.
- Section 4 describes the deployment workflow.
- Section 5 presents a user guide with the main functionalities of the URBANAGE Intermediate Release.
- Section 6 provides the conclusion of the Deliverable.
- Sections 7 and 8 provide the References and Annex I (presenting the list of requirements implemented per pilot).

¹ <https://www.atlassian.com/agile>

3 Overview of the URBANAGE Ecosystem

The URBANAGE Ecosystem acts as a container for data-based visualisation tools and analytical services that interact dynamically in a shared environment and provide valuable insights for smart city-relevant stakeholders. The URBANAGE Ecosystem is the basis of the framework that integrates Big Data Analysis, modelling and simulation techniques with Artificial Intelligence (AI) algorithms and adapted visualisation methods through Urban Digital Twins. The Ecosystem integrates a dynamic, iterative approach and correlations among multiple variables from multiple and varied data sources to better tackle urban systems' complexity and interrelated nature.

The Ecosystem comprises the following tools and services:

- **Data management components** in charge of collecting, aggregating and harmonising different types of data coming from various sources in the cities,
- **Artificial Intelligence algorithms and simulation engines** able to analyse the collected data and provide predictions to support decision-making processes,
- **Big Data analytics components** able to analyse a large set of data to extract knowledge providing visual dashboards for the end users,
- **Digital Twin** able to visualise geospatial information.

The open URBANAGE ecosystem provides a range of data-based visualisation tools and analytical services making it easier to understand the complex interrelation between urban factors and the expected impacts of potential changes on the population, especially older residents. This intelligence helps you make better evidence-based planning, operational decisions and longer-term policy choices to create more liveable, accessible and inclusive age-friendly cities that work for all.

The 2nd release of the URBANAGE Ecosystem has been built via Sprint iterations following the agile process, as described below in concrete steps:

- The pilot partners agreed on specific user stories (as those defined in WP6).
- The selected stories were broken down into tasks by the technical team.
- The prioritised stories became available in URBANAGE Trello² from the pilot partners.
- The technical URBANAGE team organised bi-weekly meetings where team members came together to lay out the components for the upcoming round of work.
- Pilot partners tested the provided functionalities and provided their feedback by adding it to the Trello board.

Considering the list of stories defined by the pilot partners, the list of requirements implemented is presented in Annex I of the current document.

² [Trello Official Website](#)

3.1 URBANAGE Architecture

This section presents the updated version of the URBANAGE Ecosystem architecture. The updated high level architecture of the Ecosystem is provided as well as the interactions between its main components. Its final version will be described in more detail as part of the Deliverable D5.6 System Architecture. Final (M33).

The URBANAGE Ecosystem has been conceptually separated into two large subsystems: The Digital Twin and the Big Data Analytics Platform, with a shared security and UI Interface. We can identify different layers, integrating specific functional components:

- UI: Digital Twin Interface, URBANAGE UI
- Data Modelling and Integration
- Big Data Analytics, AI Algorithms and Simulation tools
- Middleware
- Data Management
- Connectors

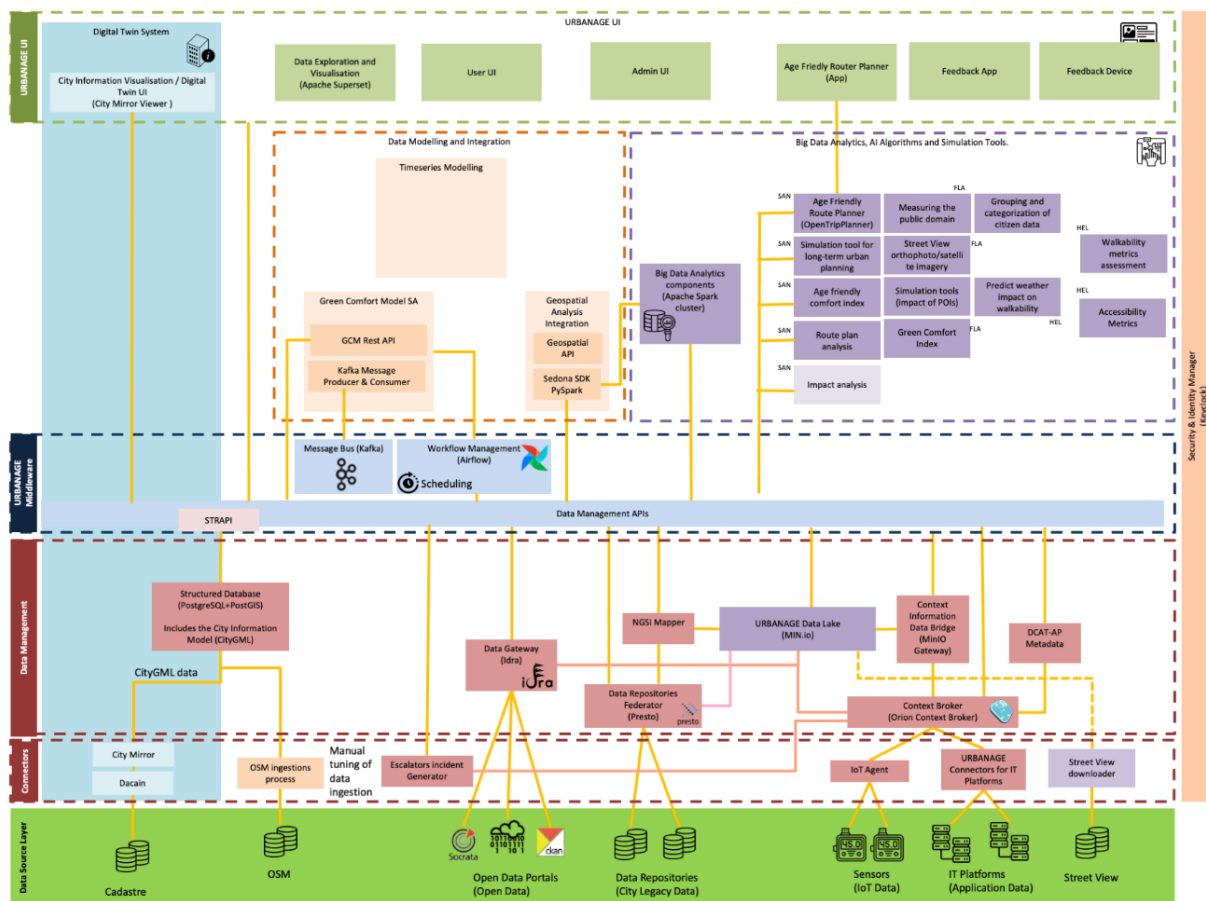


Figure 1: URBANAGE Ecosystem Platform Architecture

URBANAGE UI

The URBANAGE user interface layer is based on some main components based on the user's role and pilot. These components are:

- The User UI providing a container UI with shared elements like the header, menu, footer, etc. It enables basic user functionalities like login, user registration and user settings administration.
- The Admin UI allows the system administrator to monitor and manage various system resources like users, services etc.
- The Data Exploration and Visualisation UI enables the user to view and explore advanced big data visualisations.
- The AFRP App allows the user to search the friendliest routes, in terms of number of amenities along the route.
- The Feedback App enables the user to view and provide feedback related to geospatial points.
- The Feedback Device enables the user to define issues in a specific location.
- And finally, the Digital Twin UI enables the 2D and 3D visualisation of the pilot cities' data.

Data Modelling and Integration

Data Modelling and integration layer offers the capabilities to transform, model and integrate data managed by the URBANAGE Platform, preparing them for the platform's end-user functionalities.

It includes the following main components: Geospatial Analysis and Integration (i.e. geospatial querying), Timeseries Modelling (to integrate data that have solid temporal characteristics), and Solution Accelerators (a set of reusable system components with well-defined inputs and outputs to "accelerate" the delivery and value creation; an example of solution accelerator is the "Green Comfort Model SA" which aim is to calculate comfort-levels of certain areas in the city).

Big Data Analytics, AI Algorithms and Simulation tools

This layer offers the functionalities to build Descriptive (i.e. what happened in the past), Predictive (i.e. what is likely to occur in the future), and Prescriptive (i.e. what actions are to be taken) analysis, as well as intelligent algorithms, providing means for supporting the decision-making processes for urban planners and policy-makers, and to guide ageing people on daily decisions and routines.

Middleware

The Middleware layer acts as the interface between the Data Management and the high-level capabilities of the URBANAGE Platform, allowing the latter to access the data managed by the first, as well as for inter-component communication and orchestration. To this purpose, it's built of three main components: Data Management APIs (the collection of APIs exposed by the components of the Data Management Layer), Message Bus (it offers a messaging system enabling both synchronous and asynchronous communication between the components) and Workflow Management (it allows to define, execute, and monitor workflows which involve different components to accomplish complex tasks).

Data Management

The Data Management Layer provides the different functionalities for managing the data needed to feed the high-level capabilities of the URBANAGE platform (i.e. access, collect, aggregate and harmonise static and real-time data coming from heterogeneous sources). Its main components are the Context Broker (the central element of the Data Management Layer providing functionalities to manage context information), the Data Repositories Federator (allows the execution of SQL queries across heterogeneous data repositories, internal and external, to the URBANAGE Platform), the Data Gateway (offers the functionalities to search datasets managed by the URBANAGE Platform and provided by potential external systems/platform, such as Open Data Management Systems), Structured Database (allows to manage structured data supporting the implementation of end-use functionalities of the URBANAGE Platform), URBANAGE Data Lake (devoted to the storing of the data feeding the big data analysis).

Connectors

Connectors represent the boundary between the URBANAGE platform and external data sources (e.g. static data such as repositories, databases and files, as well as dynamic data, such as data generated by IoT devices and further IT systems). Illustrative, but not exhaustive, examples of connectors are IoT Agents (FIWARE Generic Enablers that simplify the connection of IoT devices); DACAIN (that allows importing shape files “.shp”, e.g. from cadastres); and URBANAGE Connectors for IT Platforms (tailored components to enable the interconnection with legacy IT systems).

3.2 Overview of the URBANAGE Components

3.2.1 URBANAGE Components

The following table presents the URBANAGE logical components developed and integrated into the context of the URBANAGE project. The table provides the component’s name, a short description indicating its role in the system and the related functionalities in which the component is involved.

Table 1: URBANAGE Logical Components

| Component | Short description |
|--|--|
| Green Comfort Model Solution Accelerator | An extensible, dynamic model used to calculate Green Comfort indices constructed using the URBANAGE Solution Accelerator architecture for transferability to other pilots. This includes a UI used by citizens and experts, called the “Green Comfort Scenario Builder”, to create and simulate what-if scenarios. |
| Geospatial API | Allows clients to execute spatial queries and operations on amenities, cadastre data, feedback points, ... |

| Component | Short description |
|--|---|
| Simulation & Interaction API | Services that allow for model and simulation orchestration |
| Big Data Analytics | Provides visualizations on descriptive, predictive and prescriptive analytics applied on streaming data (accessibility issues, route itineraries). |
| Participatory Data Collection | Tool to collect feedback with spatial coordinates |
| Feedback Map | App for collecting and processing feedback related to geospatial points. |
| Feedback Map API | API for the data collected with Feedback Map and Participatory Data Collection device. |
| Travel-time matrix | Tool for urban planners to assess older people's accessibility to everyday services. |
| Identity Access Management (KeyCloak) | Provides single sign on/out, to avoid users needing to authenticate for each separate component. |
| NGSI Model Mapper | Translate structured input data to NGSI-LD-compliant entities. |
| Context Broker | Manages the life cycle of context information (in the form of NGSI-LD entities) and the dispatching of real-time information (based on publish-subscribe mechanisms). |
| Age Friendly Route Planner DML APIs | Allows the Age-Friendly Route Planner to store the data it produces in the Data Management Layer. |
| Escalators' Incident Generator | Provides functionalities to generate fictitious data related to potential incidents that could occur on public escalators. |
| Context Information Data Bridge | Acts as a gateway between the Context Broker and the URBANAGE Data Lake to store the changes occurring to the managed NGSI-LD entities. |
| Age-friendly route planner | Provides the friendliest routes, in terms of number of amenities along the route, elements that improve the comfortability, usage of urban infrastructures or the consideration of flat streets instead of sloppy sections. |
| Simulation tool for long-term urban planning | A visual aid for decision-making by computing and visualizing the impact of different possible actuations on a predefined set of key indicators defined by experts. |
| Age Friendly Comfort Index | Aggregates a set of sub-indices that reflect the impact of the urban equipment and services on the age-friendliness of the city. |
| Digital Twin UI | Allows the visualization of the digital twin and interaction with it, manages different elements of the city to be visualized by layers, |

| Component | Short description |
|------------------------------|--|
| | such as buildings, green areas, roads, points of interest, etc. and visualize its attributes and analyse the spatial distribution based on the attributes. Allows users to explore Green Comfort in a virtual representation of the city. |
| City Information Model (CIM) | Allows the storage of previously generated urban model in CityGML standard. 3D City DB is a 3D geo database to store, represent. |
| Route Plan Analysis | Perform the analysis of popular routes based on the selected routes by citizens. |

3.2.2 Deployment Tools

An overview of the tools used for the development and deployment of the URBANAGE components is presented in the table below.

Table 2: Development/Deployment Tools

| Category | Tool |
|--|--|
| Component packaging | Docker |
| Runtime for multi container component deployment | Docker Compose |
| Continuous integration / Continuous deployment | Gitlab CI/CD |
| Log monitoring | ELK stack (Elasticsearch, Kibana, Beats, Logstash) |
| Resource monitoring | cAdvisor |

3.3 Components Interaction

The following diagrams present the URBANAGE components' main interactions between them and with the external systems in order to realise the user requirements and stories as defined in the D6.1: Use Case implementation and validation plan.

3.3.1 Santander Sequence Diagrams

Santander Use Case 1: Age-friendly-route planner

This sequence diagram shows the complete flow in which a user wants to go from point A to point B in a city. First, the app is loaded with the items or POIs it finds in the city. This step could be omitted since it is the actual loading of the app, but since it depends on the user's preferences, it has been inserted in the diagram. Subsequently, the request for the itineraries is made. This call ends up providing from 1 to N itineraries to the users, and the app in turn, saves the request in the context broker for further processing. Once users have the N itineraries, they can select the one that benefits them the most. The application will also save this selection for further processing.

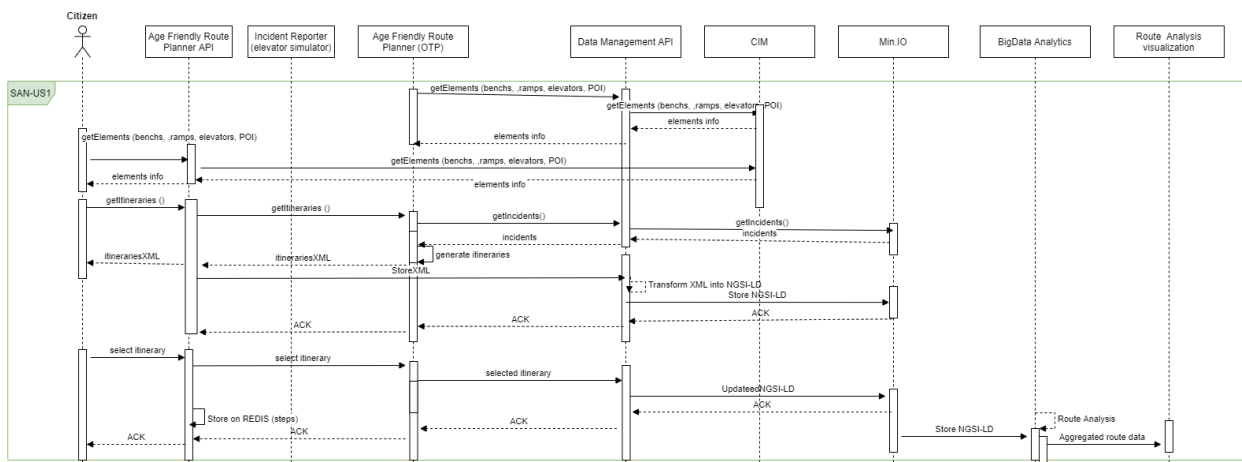


Figure 2: Santander Use Case 1: Age Friendly Route Planner

Santander Use Case1: Warning of incidents and Simulation of incidents

This sequence diagram shows the flow in which new routes will be returned for those affected by an incident. In short, when someone inserts an incident in the application or simulates one, it will analyse all the operational itineraries to see which ones would be affected. These affected itineraries are returned to the user for subsequent decision-making.

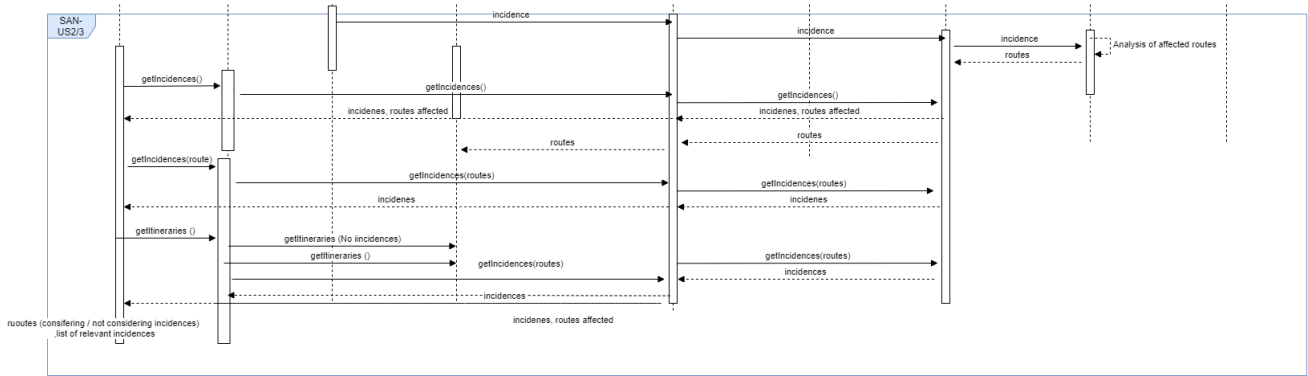


Figure 3: Santander Use Case 1: Warning of incidents and Simulation of incidents

Santander Use Case 1. Evaluate the Impact on Citizen

This sequence diagram complements the previous one, supporting the public servant in minimising the impacts on citizens due to incidents or maintenance operations by means of recommendations of the best-suited timing for such activities. To provide this recommendation, the system recaps the routes potentially affected by an incident based on the history of popular and most frequent routes.

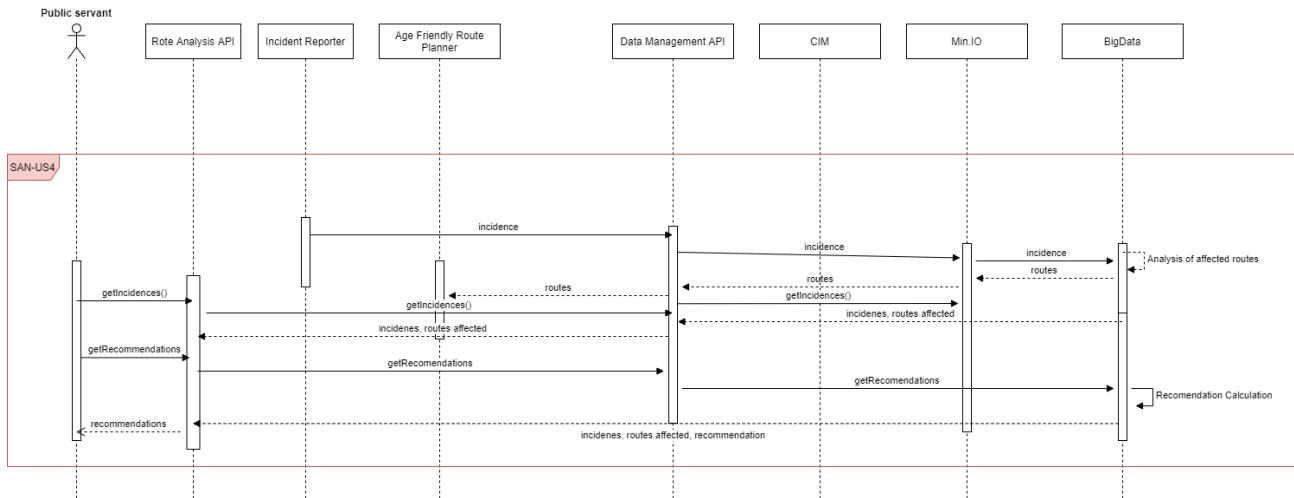


Figure 4: Santander Use Case 1: Evaluate the Impact on Citizen

Santander Use Case 2. Simulation tool for long-term urban planning

For the second use case of Santander, two different sequence diagrams have been included.

1. Calculus of the Age friendliness Index and simulation of the accessibility improvements

This first sequence diagram focuses on the evaluation of the accessibility improvement, based on the age friendliness neighbourhood index and the application of a multi-criteria analysis, from which the user can identify the priority areas. The Digital Twin is the main actor, accessing relevant data from CIM and Geoserver.

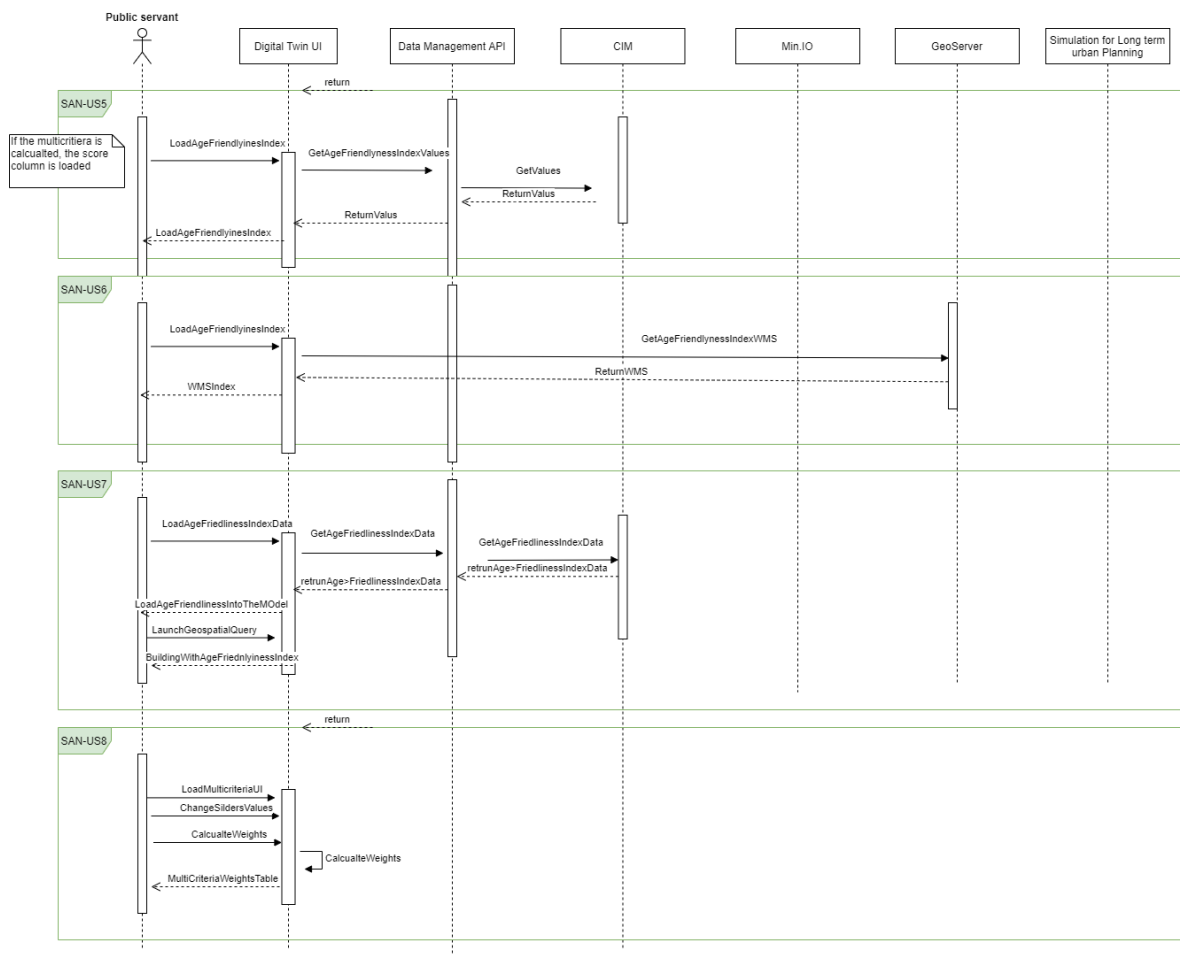


Figure 5: Santander Use Case 2: Calculus of the Age friendliness Index and simulation of the accessibility improvements

2. Simulation of future scenarios and visualization of potential strategies.

This second sequence diagram focuses on evaluating alternatives for urban planning by comparing them by visualising potential strategies to be simulated in detail. It provides such policies for companies, entrepreneurs and citizens for better transparency.

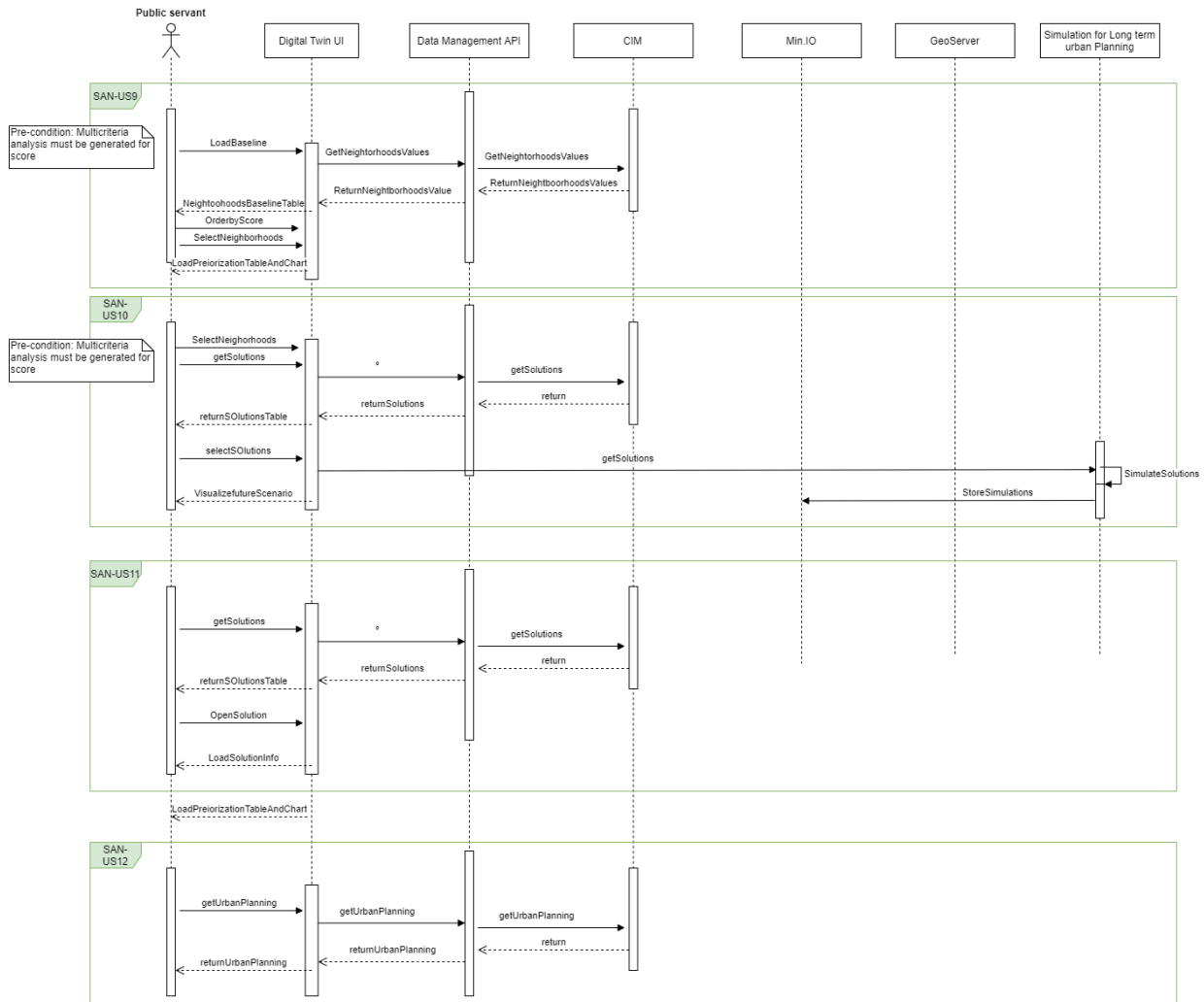


Figure 6: Santander Use Case 2: Simulation of future scenarios and visualization of potential strategies.

3.3.2 Helsinki Sequence Diagrams

Helsinki Use Case 1: Feedback on accessibility issues

This sequence diagram describes the interaction of components as a user, citizen or public servant generates feedback on accessibility issues with a browser-based feedback tool or with the IoT device (US1-2). Similarly, the diagram describes the process of retrieving, visualising and filtering particular accessibility issues in the platform (US3-4).

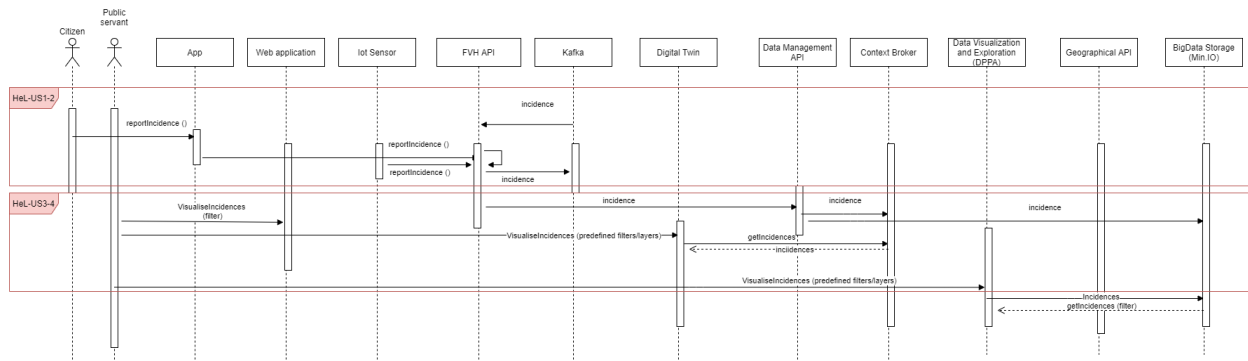


Figure 7: Helsinki Use Case 1: Feedback on accessibility issues

Helsinki Use Case 2: Points of Interest

This sequence diagram describes the interaction of components as a user, citizen or public servant, generate POIs with a browser-based feedback tool or with the IoT device (US1-2). Similarly, the diagram describes the process to retrieve, visualise and filter particular POIs in the platform (US3-4).

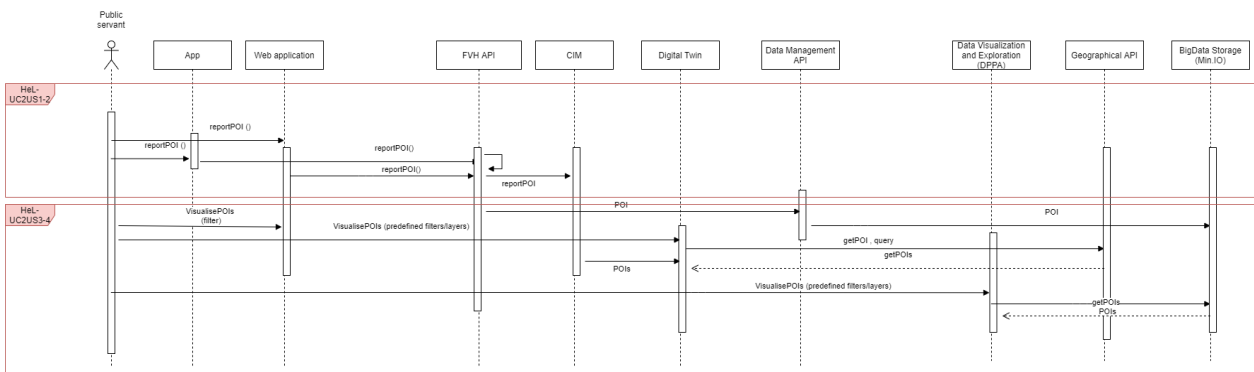


Figure 8: Helsinki Use Case 2: Points of Interest

Helsinki Use Case 3: Travel-Time Matrix

This diagram describes the process of calculating, storing and retrieving the Travel time matrix in order for the user to view a distance heatmap between two different locations.

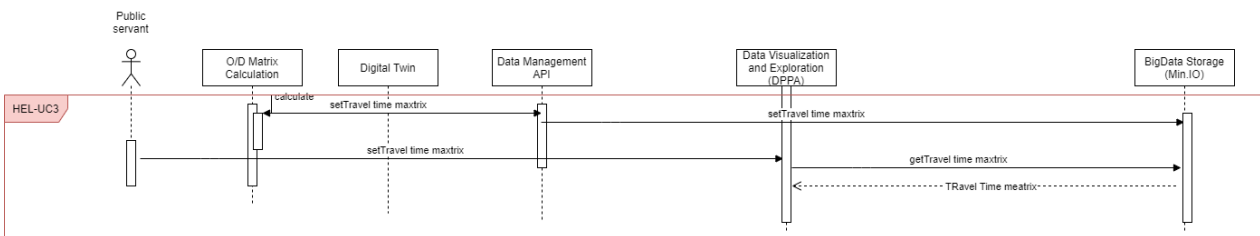


Figure 9: Helsinki Use Case 3 Travel Time Matrix

3.3.3 Flanders Sequence Diagrams

Flanders Use Case 1: View Map

This sequence diagram shows 3 Flanders user stories in the first Flanders Use Case. The first (FI_01, Deployable Green Comfort model, version 1) and second (FI_03, Onboarding GC indicator datasets into URBANAGE ecosystem) are combined into one flow. To visualise the Green Comfort baseline, a curated collection of datasets is preloaded into the ecosystem's PostGIS storage. The Green Comfort Model is triggered manually to calculate a baseline Green Comfort Index (GCI) for the unaltered datasets. It is stored in H3-format in a file in MinIO, transformed by the GeoserverSink service into GeoJSON and stored in the PostGIS storage.

The second flow shows the visualisation of Green Comfort in the Digital Twin UI (FI_04, Visualization GC in URBANAGE Ecosystem). This is achieved by configuring the ecosystem's PostGIS storage as a datastore for GeoServer. The Digital Twin UI can load the GCI as Web Mapping Service (WMS) tiles generated by GeoServer on demand for the area the user views on the map.

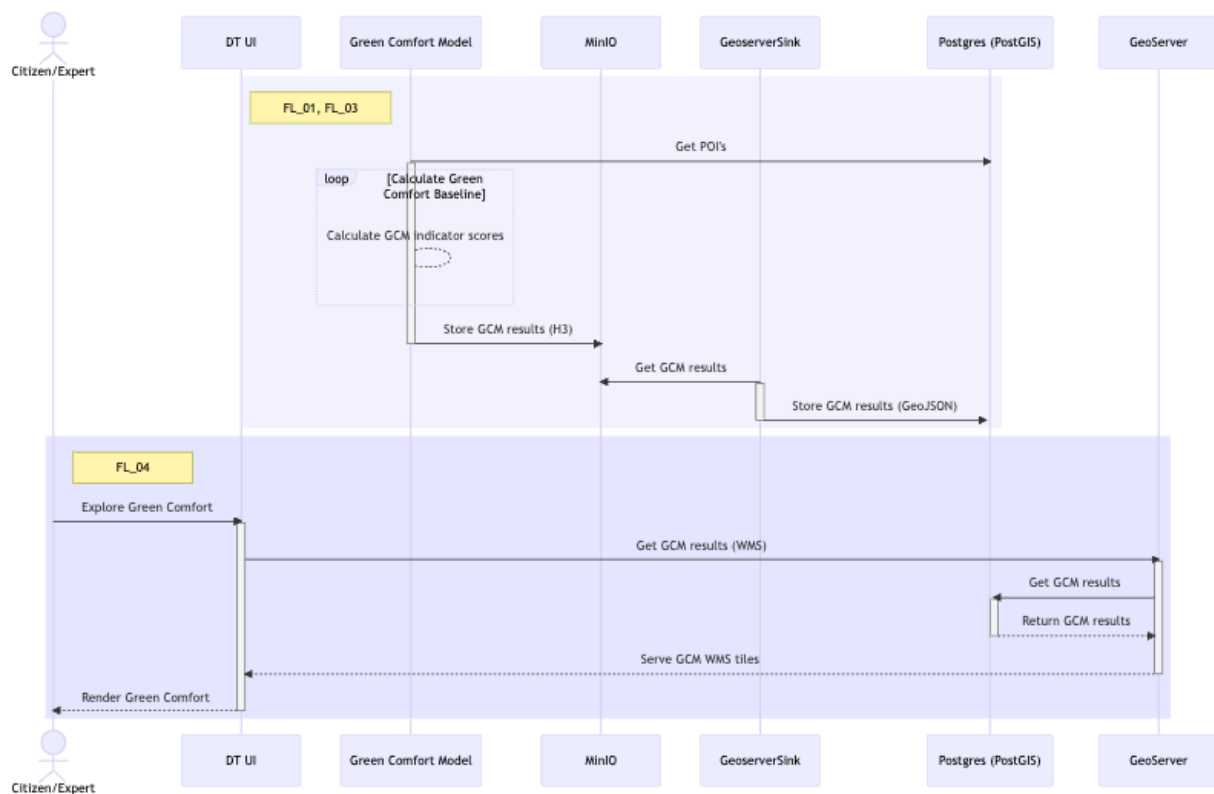


Figure 10: Flanders Use Case 1: View Map

Flanders Use Case 2: Evaluate/update the green comfort index score

In the sequence diagram, we show the flow of user stories in the second Flanders use case, namely, giving and analysing feedback on Green Comfort. The first flow (FL_05 Register user feedback on GC via a form in Urbanage visualisation) shows how a citizen can use the feedback app to register a comment about a certain topic or tag, for a location. To give the user more context, the app is configured with feedback categories related to Green Comfort indicators and we also show the Green Comfort scores (same as in the DT UI) directly in the app. When the user submits the feedback, it is saved in the Feedback app's database, which is a Postgres (PostGIS).

The second flow (FL_07 Analysis for user feedback) is implemented in a first iteration in this intermediate prototype by using the feedback app's administration backend (allowing an expert user to browse feedback and configure the app) and the separate feedback app's map that allows all user types to see feedback from other users on a map and add comments to that feedback.

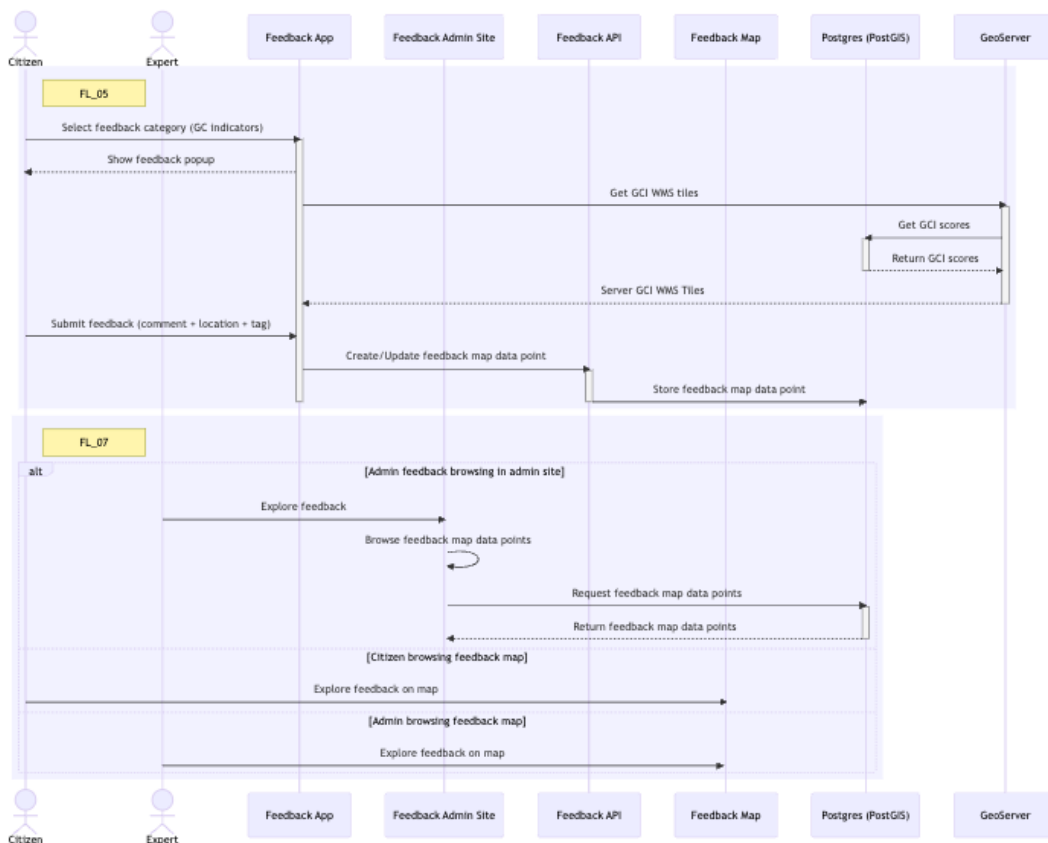


Figure 11: Flanders Use Case 2: Evaluate/update the green comfort index score

This sequence diagram shows the flow (FL_06 Capture user feedback centrally) and interaction of the components involved in storing the feedback in ecosystem storage components. When feedback is submitted and saved in the feedback app's storage (Postgres) the feedback API also calls the Data Management API's Send_Data endpoint, which published the feedback on the Orion Context Broker component (short-term storage) and stores the feedback in the MinIO storage (long term, historic storage). The Data Management API also handles the conversion of the feedback data to the NGSI-LD Open311ServiceRequest model.

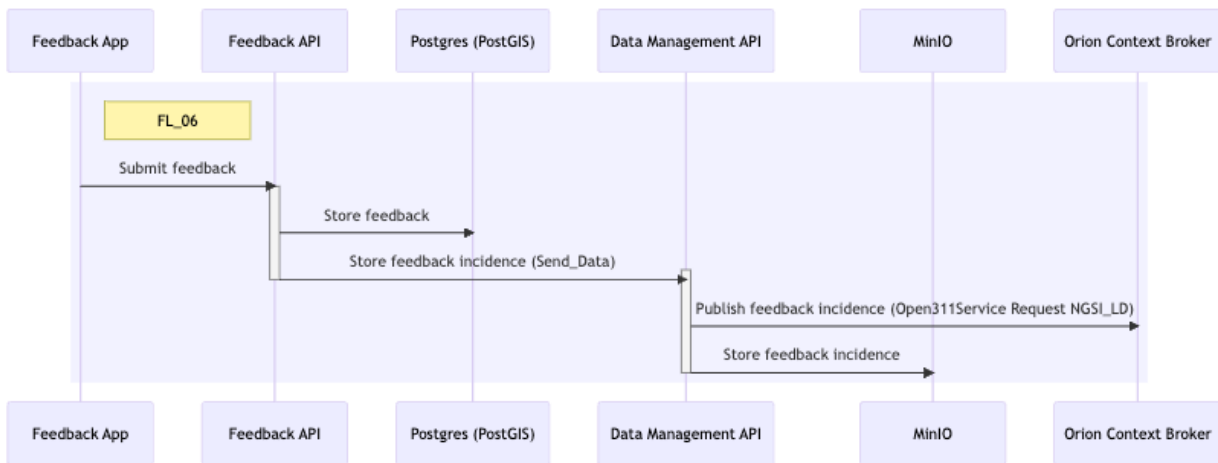


Figure 12 Flanders Use Case 2: Evaluate/update the green comfort index score

Flanders Use Case 4: Simulations of city adjustments by gamification

In this sequence diagram we show the flow (FL_10 Gamification UI for small GC simulations) all the way to the GCM calculating a GCI and storing it. The citizen or expert can create a what-if scenario using the GCM Scenario Builder UI. It uses the Interaction API to store changes to GC Indicator datasets used in the calculation and creates a “snapshot” of all the changes when starting a simulation. The simulation is triggered by the UI (the user clicks the Simulate button), and the Simulation API triggers the GC Model through its Solution Accelerator interface. The UI is updated on the progress of the simulation, and on completion, the results are stored in MinIO and a reference to the results is stored in the Asset Catalog component. Visualisation is handled separately and is described in the following sequence diagram.

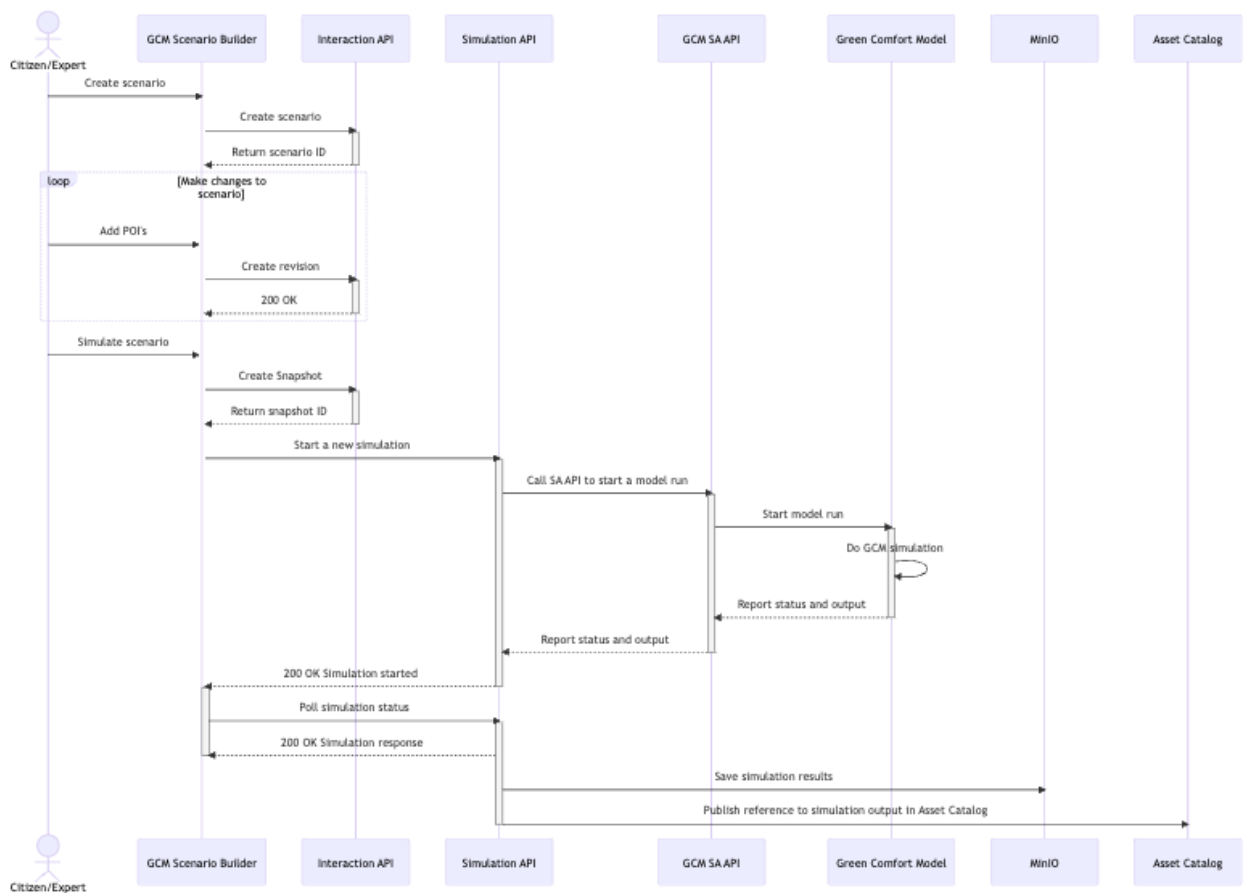


Figure 13: Flanders Use Case 4: Simulations of city adjustments by gamification

In this sequence diagram, we show the visualisation flow of the GCM results. The Geoserver sink subscribes to AssetCreated messages in Kafka and, on receiving one, fetches the asset (the simulation results), transforms them to GeoJSON and stores them in Postgres. The Digital Twin UI can visualise these results anytime by requesting the simulation layer from Geoserver, filtered by the simulation ID.

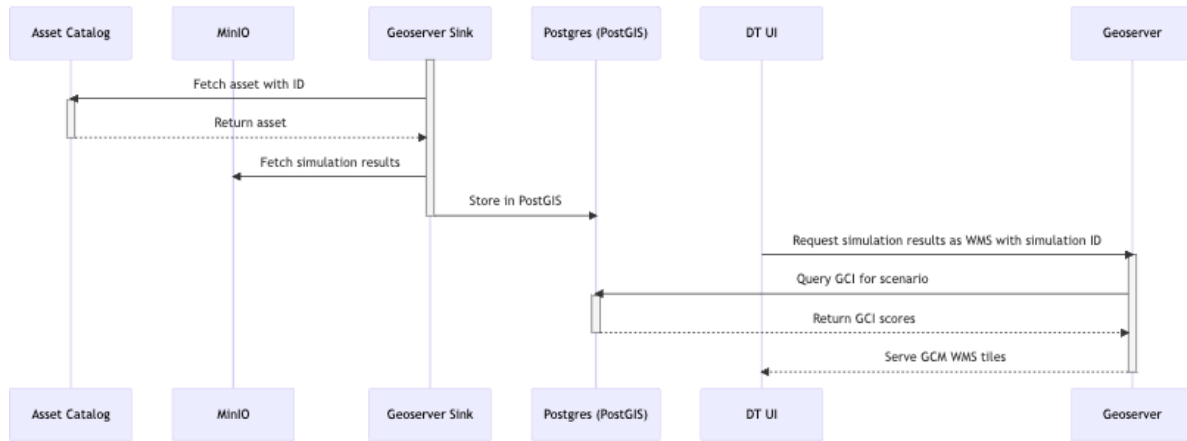


Figure 14: Flanders Use Case 4: Simulations of city adjustments by gamification

4 Deployment Workflow

Two different deployment environments are configured to support the development lifecycle of the URBANAGE components. Dedicated configuration code and infrastructure are provisioned accordingly in both environments. Specifically, the staging and the production environments hold the same underlying components, while the processes followed in each are different.

The staging environment serves the need for testing the implemented functionality. It allows addressing any technical and integration issues before they occur in production, contributing in this way to the overall URBANAGE ecosystem resilience. Moreover, it allows performing User Acceptance Testing (UAT), where engineers and pilot responsible can make sure that the implemented functionalities meet the user expectations.

In the production environment users can access the final integrated version of the functional components after all of the updates and testing and manages real piloting data.

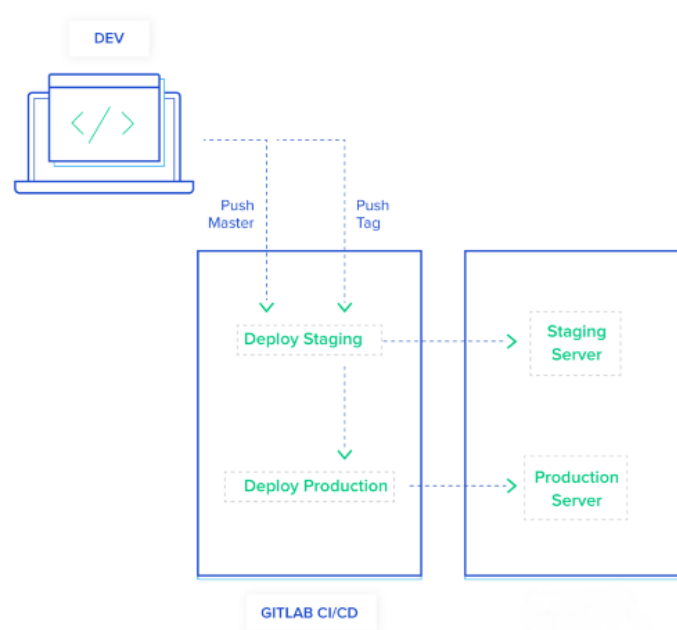


Figure 15: Deployment workflows for staging and production environments

The Validation and Quality Assurance (QA) workflow that is followed consists of the following steps/processes:

- Technical validation on the local development environment
- The component gets deployed on the URBANAGE staging environment
 - This is an automatically triggered process
- Technical/Functional validation by the component owner takes place
- The corresponding task in Trello (project management tool) is updated, and the pilot responsible gets notified

- Functional validation/UAT is performed by the pilot responsible
- The corresponding task in Trello is updated, and the integration team gets notified
- The component gets deployed on the URBANAGE production environment
 - This is a manually triggered process.

4.1 CI/CD pipelines

The code repository of the URBANAGE ecosystem is hosted on a self-managed instance of Gitlab³, an open-source collaboration platform. It can be accessed at <https://srcrep.atc.gr/urbanageeu>. It maintains the Wiki pages, including connection details and the deployed components' public endpoints. Moreover, it allows to set up continuous integration (CI) and continuous deployment (CD) pipelines. By automating as many steps in the deployment process as possible, CI/CD provides rapid feedback builds to shorten the time it takes to release the URBANAGE platform to the end users.

All components are deployed as containers on a Docker runtime. The configured CI/CD pipelines execute the docker compose scripts provided within the component's source code. The minimum stages executed are build and deploy, as shown in Figure 3. The build stage executes the provided Dockerfile and packages the component along with its dependencies as a Docker image. The Docker image is then shared on the URBANAGE private container registry (<https://registry.ecosystem-urbanage.eu/>). On a successful build event the deploy-on-dev stage is triggered. The deploy stage pulls the Docker image and deploys it on the corresponding environment, either staging or production. The CI/CD pipelines are automatically triggered whenever a push or a merge request event occurs on the protected branch.

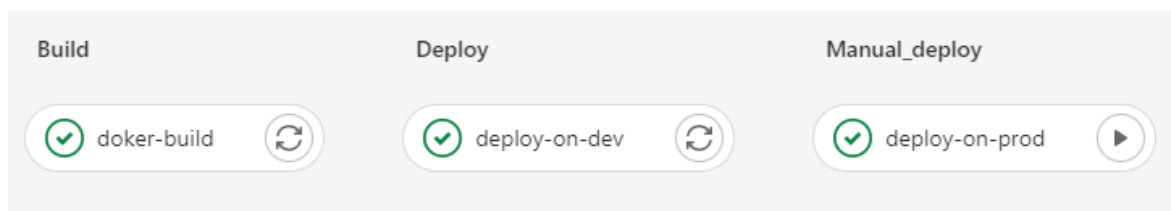


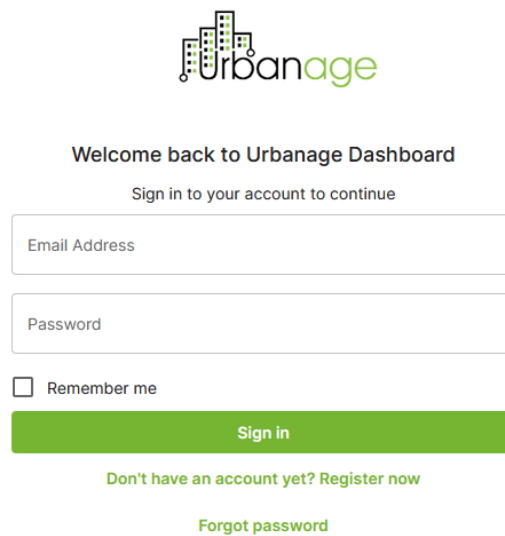
Figure 16: Gitlab CI/CD stages

³ <https://about.gitlab.com/>

5 URBANAGE Ecosystem User Guide

The following section presents a User Guide for the Intermediate release of the URBANAGE Ecosystem.

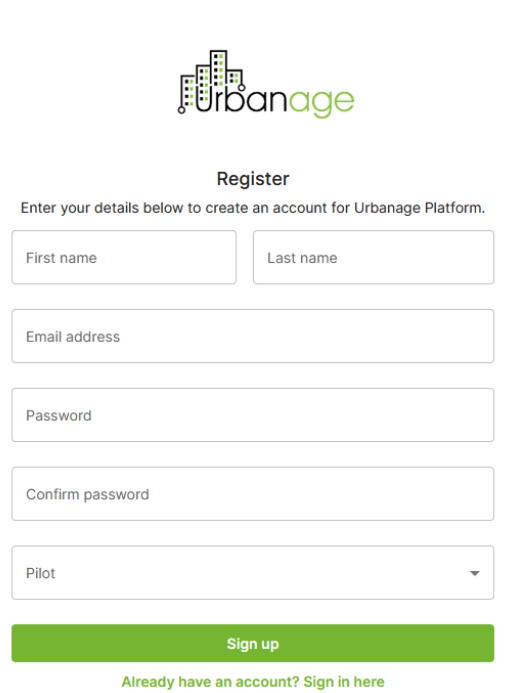
The URBANAGE platform is accessed by the following link: <https://ui.ecosystem-urbanage.eu/>. This link directs the users to the platform's user interface to log in or apply for an account. To use the URBANAGE platform, users need to have a registered account. If users do not have an account, they can create one by clicking the “Register now” button on the login page.



The screenshot shows the login page of the URBANAGE ecosystem. At the top, there is the Urbanage logo. Below it, the text reads "Welcome back to Urbanage Dashboard" and "Sign in to your account to continue". There are two input fields: "Email Address" and "Password". Below these fields is a checkbox labeled "Remember me". A prominent green button labeled "Sign in" is centered below the checkbox. At the bottom of the form area, there are two links: "Don't have an account yet? Register now" and "Forgot password".

Figure 17: Login Page

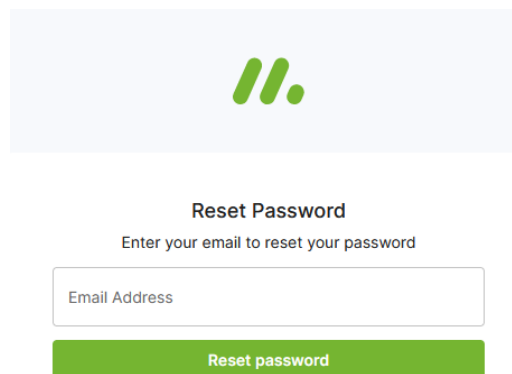
Afterwards, users will be directed to the registration page to complete a registration form with their details, such as name, email address, chosen password, and pilot information.



The registration page features the Urbanage logo at the top. Below it, the heading "Register" is followed by the instruction "Enter your details below to create an account for Urbanage Platform." The form consists of several input fields: "First name" and "Last name" (side-by-side), "Email address", "Password", and "Confirm password" (all stacked vertically), and a "Pilot" dropdown menu. A prominent green "Sign up" button is located at the bottom of the form. Below the button, there is a link that reads "Already have an account? Sign in here".

Figure 18: Registration Page

If the users' registration is successful, they are redirected back to the login page to enter their credentials and click the "Sign up" button. Users can click the "Forgot password" button on the login page if they forgot their password. This will direct them to a new page where they will be prompted to enter the email address used during registration.



The reset password page features a large green double-slash icon at the top. Below it, the heading "Reset Password" is followed by the instruction "Enter your email to reset your password". The form consists of a single "Email Address" input field. A prominent green "Reset password" button is located at the bottom of the form.

Figure 19: Reset password page

Once the email is entered, users receive a new password they can use to log in to the URBANAGE platform. After entering the correct login information, the user will be taken to the platform's home page.

Each pilot site has a unique homepage. Therefore, users will see the Flanders home page when they are registered to the Flanders pilot after logging in. Similarly, users who are registered to the Helsinki pilot will visit the Helsinki homepage, and so on, for the Santander pilot.

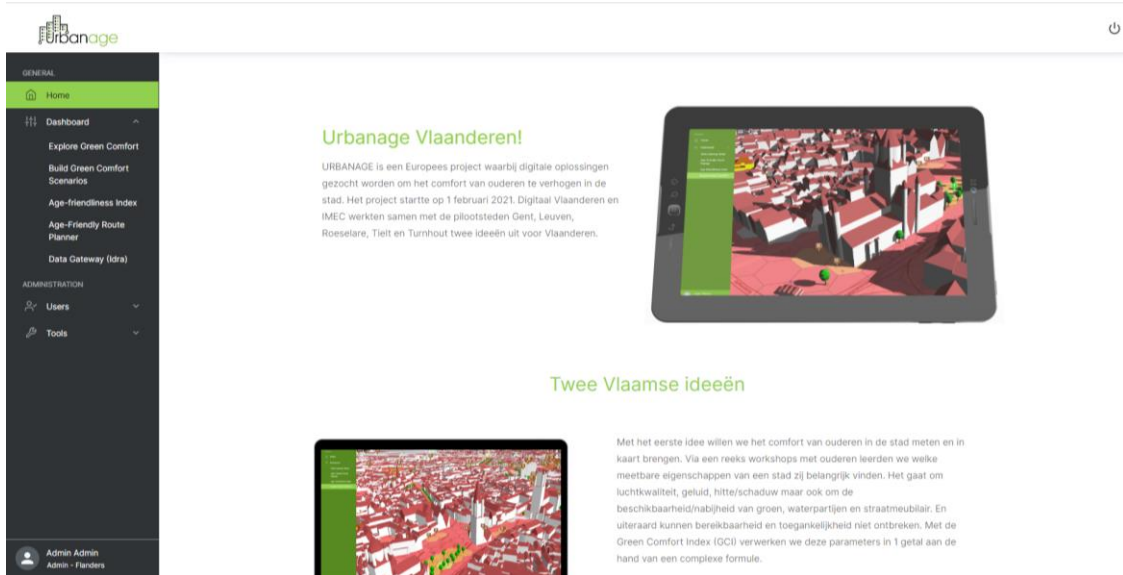


Figure 20: Home page - Flanders pilot

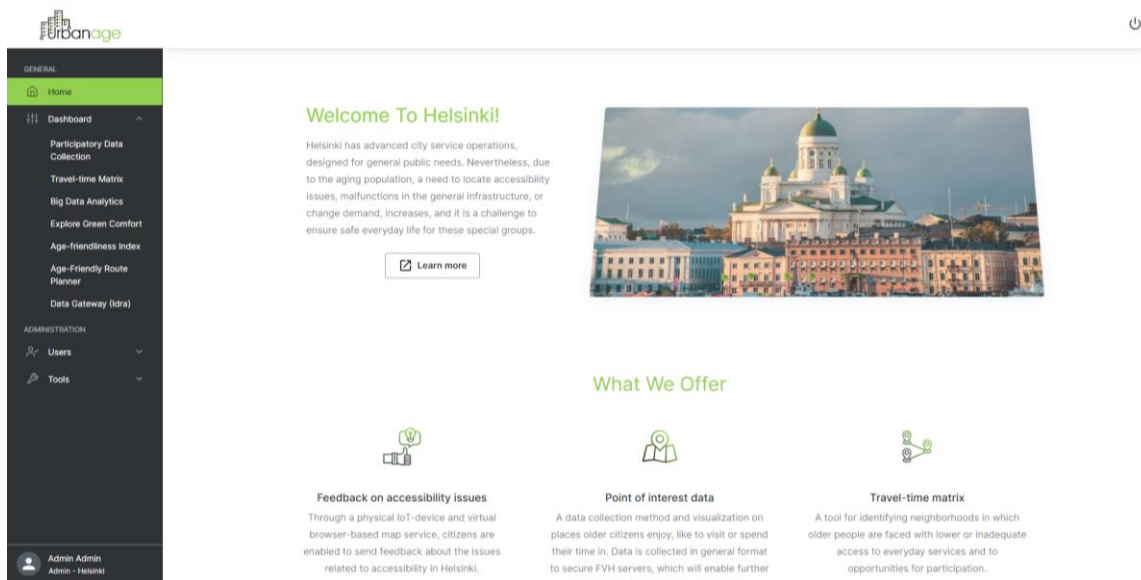


Figure 21: Home page - Helsinki pilot

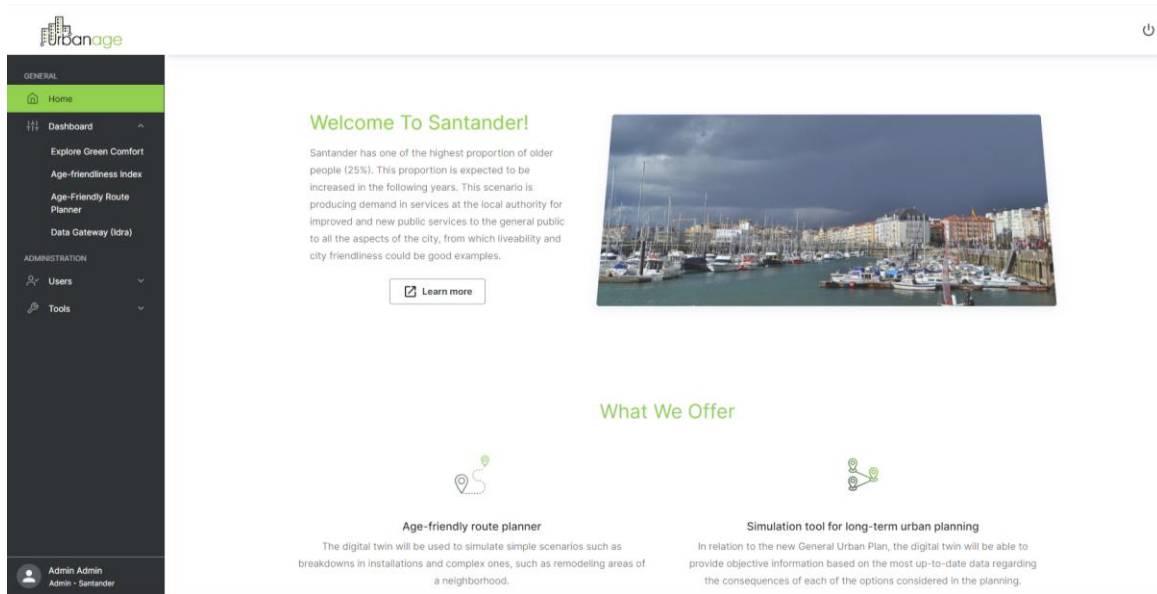


Figure 22: Home page - Santander pilot

In addition to the homepage, the dashboard components in the main navigation menu are also unique for each pilot. When users log in to the URBANAGE platform for a specific pilot city, they get access to the dashboard components relevant to that city/region, and the specific home page.

The users can edit their personal details, change their password, or delete their account to comply with GDPR regulations. These functionalities are available on the profile page, which can be accessed by clicking on the button in the screen's top right corner.

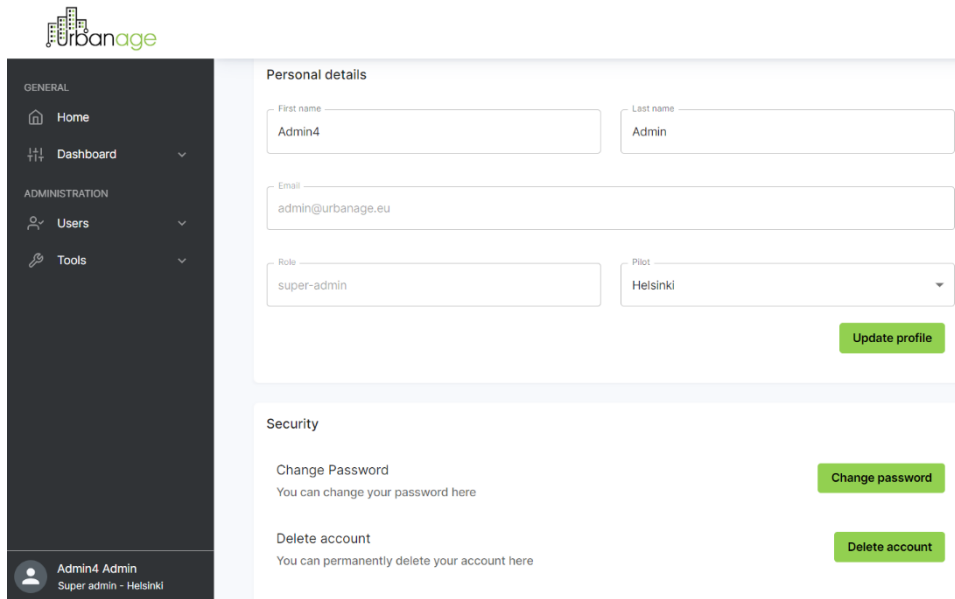


Figure 23: My profile page

In addition to the regular user functionalities, administrator users can access the user management page and other administrative tools. On the user management page, admin users can add, edit, or delete one or more users, as well as search for users by entering their name, email, or ID in the search box.

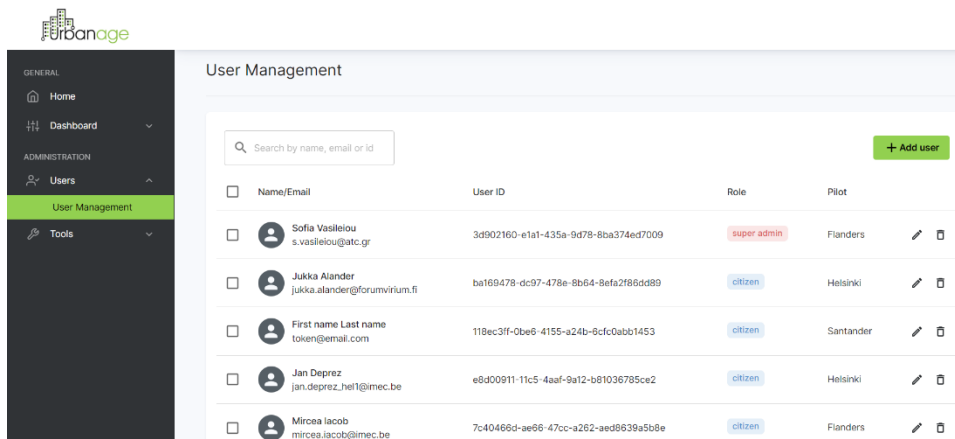


Figure 24: User management

5.1 Dashboard Components

As stated above, the dashboard components in the main navigation menu are also unique for each pilot. When users log in to the URBANAGE platform for a specific pilot city, they get access to the dashboard components relevant to that particular city/region. The following table presents the components that are available per Pilot.

Table 3: Dashboard Components per Pilot



| | Explore Green Comfort | Age friendliness Index | Age Friendly Route Planner | Data Gateway | Build Green Comfort Scenarios | Participatory Data Collection | Travel Time Matrix | Big Data Analytics |
|------------------|-----------------------|------------------------|----------------------------|--------------|-------------------------------|-------------------------------|--------------------|--------------------|
| Santander | x | x | x | x | | | | |
| Flanders | x | x | x | x | x | | | |
| Helsinki | x | x | x | x | | x | x | x |

5.1.1 Explore Green Comfort

Visualization of Buildings and other urban elements relevant for age friendliness index calculation

The functionality allows visualising on a virtual globe the georeferenced urban elements relevant for the calculation of the Age Friendliness Index, including buildings, urban furniture (such as benches or escalators), green elements (such as trees) or urban services (such as toilets or parking).

The steps to carry out the functionality are:

- Click on the “Hamburger Button” 
- Click on the “Colour all” icon , each urban layer is coloured with a different colour
- Enable/Disable each layer in the left side menu to visualise or hide the elements in each layer of the digital twin.
- Navigate through the virtual 3D model using the mouse

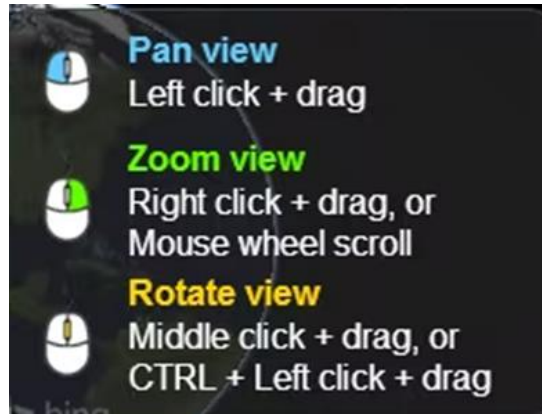


Figure 25: View management




Figure 26: Visualization of Buildings and other urban elements relevant for age friendliness index calculation

Show Urban element information

The functionality allows visualising the information included in the digital twin of each of the different urban elements on a virtual globe.

The steps to carry out the functionality are:

- Click on the “Hamburger Button” 
- Select an urban element on the 3D view. The information about the urban element is displayed in a table.

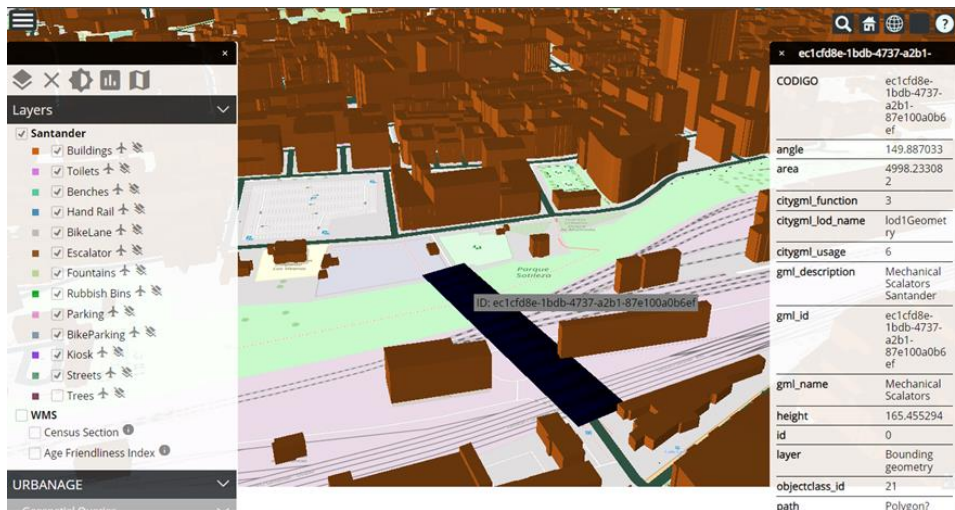


Figure 27: Visualization of the information about a mechanical escalator in Santander

Geospatial Queries

The functionality allows visualising the geospatial distribution of the information about the urban elements included in the digital twin on a virtual globe. Specific queries for buildings have been implemented (such as building use, construction year or population) and the distribution of the buildings over the census sections of the city.

The steps to carry out the functionality are:

- Click on the “Hamburger Button”
- Under the URBANAGE -> Geospatial Queries, select the query to perform, and the urban elements are coloured, and the corresponding legend is displayed.
- Click on the legend to filter the query for one specific or more than one range.

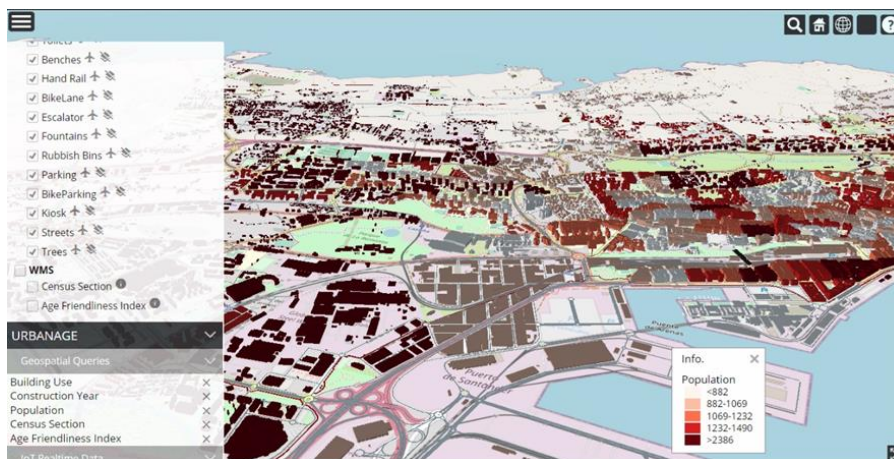



Figure 28: Geospatial query, buildings colored

External data Integration (WMS)

This functionality allows visualising the geospatial information available in external Web Map Services (WMS) on a virtual globe. This information is served from a GeoServer.

The steps to carry out the functionality are:

- Click on the “Hamburger Button” 
- Under the Santander -> WMS. Select the WMS that the user wants to enable/disable; by default, they are disabled (the other elements of the city may be disabled for better visualizing the WMS).
- Once the WMS is loaded, click on it to display the information of the polygon clicked.

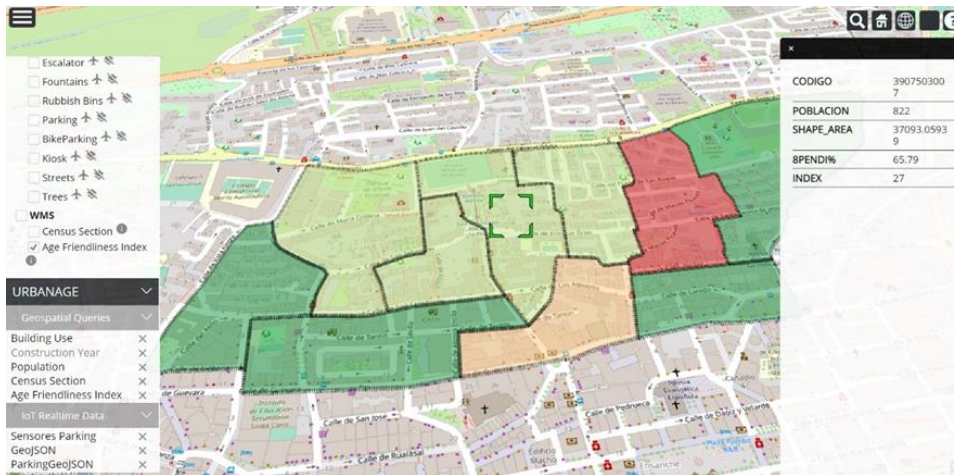



Figure 29: WMS Age Friendliness Index

External data Integration (GeoJSON)

The functionality allows visualising the geospatial information available in URBANAGE Ecosystem that is served in GeoJSON format on a virtual globe. Currently, two datasets are available “GeoJSON” and “ParkingGeoJSON”.

The steps to carry out the functionality are:

- Click on the “Hamburger Button” 
- Under the URBANAGE -> External Data. Click on “Parking Status”.
- Navigate in the map to see the GeoJSON markers, they can be clicked to see the individual information.

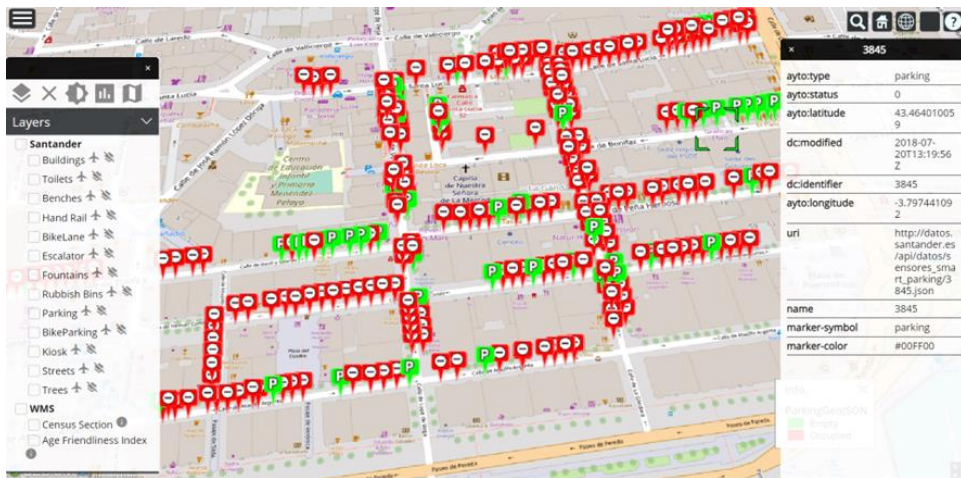


Figure 30: GeoJSON query

Real-time Shadows

The functionality allows us visualising the representation of the urban elements and to simulate the shadows on a virtual globe.

The steps to carry out the functionality are:

- Click on the “Hamburger Button”
- Click on the “Sun Button”
- Navigate on the map to watch the shadows.





Figure 31: Realtime Shadows

Multicriteria Analysis

The functionality allows the user to define the different weights of the indicators thanks to the sliders and multicriteria calculation.

The steps to carry out the functionality are:

- Click on the “Hamburger Button” 
- Click on the “Chart Button” 
- A new menu will appear; go to the first step, “Multicriteria”.
- Change the sliders’ values and click “Calculate Weights”.
- A table will appear calculating the weights based on the value of the sliders.

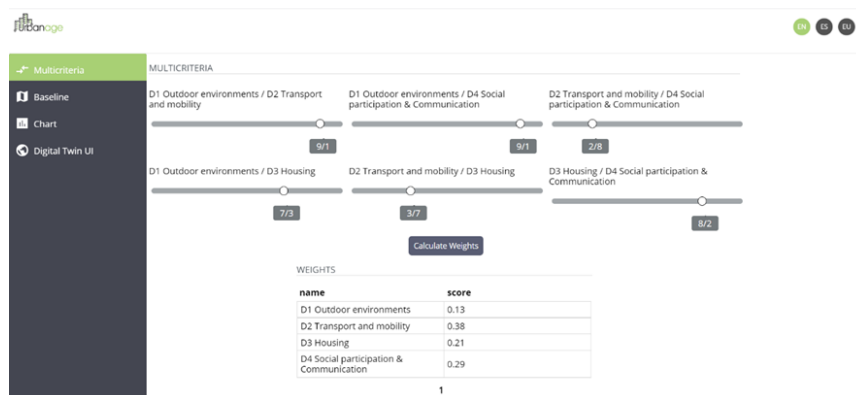



Figure 32: Multicriteria Analysis

Age friendliness index Visualization (Geospatial distribution)

The functionality allows visualising the calculated geospatial information, Age friendliness index, on a virtual globe.

The steps to carry out the functionality are:

- Click on the “Hamburger Button” 
- Under Santander -> WMS. Select the WMS that the user wants to enable/disable; by default, they are disabled (the other elements of the city may be disabled for better visualizing the WMS).
- Once the WMS is loaded, on click, it displays the information of the element clicked.

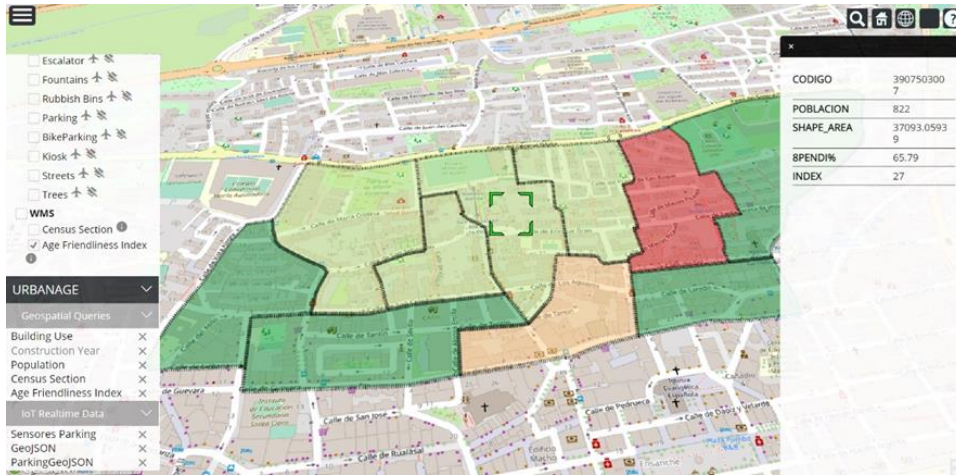


Figure 33 WMS Age Friendliness Index

The second way is to visualize the Age friendliness index in the buildings of the zone. For this, the steps to carry out the functionality are:

- Click on the “Hamburger Button” ☰
- Under the URBANAGE -> URBANAGE Data, click on “Age Friendliness Index”
- Navigate to the buildings with the Age Friendliness index calculated (in different colours)



Figure 34 WMS Age Friendliness Index

Identification of priority areas

The functionality allows the user to analyse the data of different neighbourhoods, filtering and ordering by expert criteria or as defined by the user (multicriteria must be done first).

The steps to carry out the functionality are:

- Click on the “Hamburger Button”
- Click on the “Chart Button”
- (Multicriteria step must be done for calculating the “score” parameter)
- Click on “Baseline” menu step.
- A table with the data of the neighbourhoods will appear, the table can be filtered with the “Search”

field on top right and can be ordered by any of the fields clicking the arrows

The functionality allows the user to analyze the data of different neighborhoods, filtering, and ordering by expert criteria or on defined by the user (multicriteria must be done first).

The steps to carry out the functionality are:

- Click on the “Hamburger Button”
- Click on the “Chart Button”
- (Multicriteria step must be done for calculating the “score” parameter)
- Click on “Baseline” menu step.
- A table with the data of the neighborhoods will appear, the table can be filtered with the “Search”

field on top right and can be ordered by any of the fields by clicking the arrows.

| Neighborhood | AgeFriendlinessIndex | Domain1 | Domain2 | Domain3 | Domain4 | score |
|--------------------|----------------------|---------|---------|---------|---------|-------|
| Centro | 60 | 20.22 | 12.12 | 25 | 71 | 33.07 |
| Cuatro Caminos | 44 | 45 | 37 | 74 | 28 | 43.57 |
| Barrio Pesquero | 50 | 45 | 11 | 25 | 54 | 30.94 |
| Cabildo de Arriba | 44 | 18 | 49 | 47 | 63 | 49.1 |
| Castilla-Hermida | 88 | 90 | 10 | 34 | 45 | 35.69 |
| Ciriego | 60 | 41 | 88 | 20 | 13 | 46.74 |
| El Sardinero | 55 | 66 | 77 | 44 | 33 | 56.65 |
| Jardines de Pereda | 66 | 22 | 33 | 44 | 55 | 40.59 |
| La Albericia | 35 | 55 | 44 | 68 | 41 | 50.04 |
| Nueva Montaña | 25 | 94 | 13 | 47 | 56 | 43.27 |

Figure 35. Identification of priority area

Identification of priority areas (chart)

This functionality allows the user to analyse the data of different neighbourhoods in a graphical way.

The steps to carry out the functionality are:

- Click on the “Hamburger Button”
- Click on the “Chart Button”
- (Multicriteria step must be done for calculating the “score” parameter)
- Click on “Baseline” menu step.
- A table with the data of the neighbourhoods will appear. Select the neighbourhoods that need to be analysed in a graphical way. You can press the plus button to add and the dustbin for deleting.
- Once the neighbourhoods are selected, click on the “Chart” step in the left menu.
- A graphic with the neighbourhoods and the values will appear.

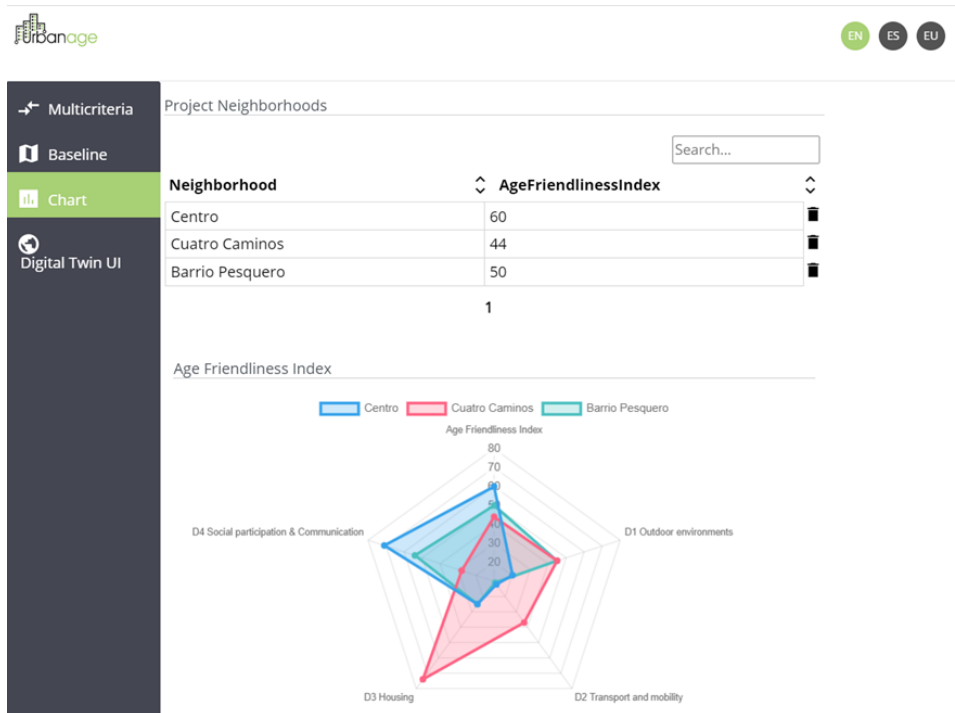


Figure 36 Identification of priority areas in chart

5.1.2 Age Friendliness Index

Simulate for accessibility improvement

The Age Friendliness Index Simulation is a simulation and visualisation tool that can be used to verify the current state of Santander based on the Age Friendliness Index and modify indicators to understand the impact of each one of them in the different neighbourhoods. This tool loads data directly from the database. This data consists, as per now, of indicator values and weights, topic values and weights, domain values and weight, neighbourhood polygons and neighbourhood information such as population or neighbourhood code. Whenever the simulation is accessed, it will show all this information, and it will colour code the Age Friendliness Index value for each neighbourhood. The Age friendliness index is visualised in a colour gradient that goes from red (0.0) to orange (0.5) to green (1.0) for each neighbourhood on a map.

The steps to carry out the functionality are:

- Check that the map and indicators load and resemble the figure below.

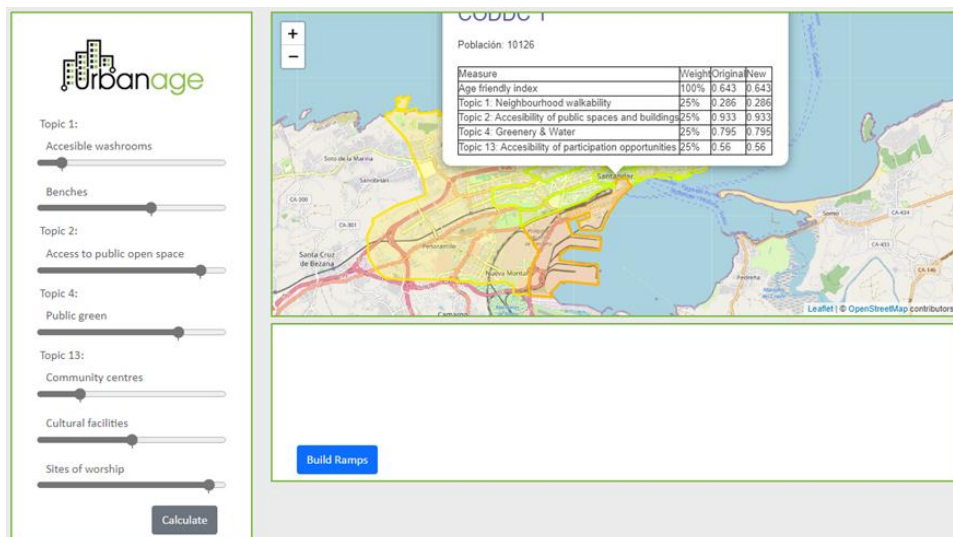


Figure 37: Age friendliness index simulation view with default values for a neighbourhood

Visualisation of indicator values and final index values for each neighbourhood

For every neighbourhood, a table of content pops up. This table shows the overall Age Friendliness Index and the disaggregated topic values and weights that contribute to it.

The steps to carry out the functionality are:

- Access the relevant UI in the platform
- Wait for the map and indicators to load:

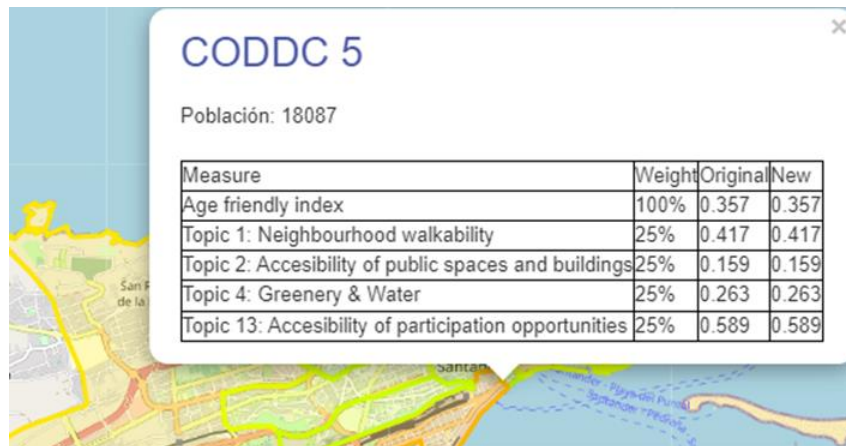


Figure 38: Age friendliness index simulation view with default values for a neighbourhood

- The top-right panel shows a table pointing at a neighbourhood. The table lists topic and age friendliness indexes per neighbourhood. Some additional information, like population or the district code, can be seen here in the popup.
 - The Age friendliness index is the weighted sum of the topic values and topic weights.

Visualization of a different neighbourhood values: The functionality allows visualising all domain, topic and indicator values for each neighbourhood and choosing a different neighbourhood without losing the current scenario. This is helpful for civil servants and urban planners because they can visualise the current state of the city neighbourhood by neighbourhood. Users will also be able to simulate new scenarios where they can improve specific indicators and see how much those indicators influence the Age Friendliness Index of each neighbourhood.

The steps to carry out the functionality are:

- Wait for the map and indicators to load.
- Click on a neighbourhood polygon to check its domain, topic and index values.
- Check that you can choose every single neighbourhood.

Manually simulating different scenarios, changing indicator values

Users might want to simulate manually what a new scenario would be if an indicator gets improved or how that indicator affects the topic it is from. Additionally, they might also want to check how badly it will affect if an indicator worsens. All these simulations can be done by moving the sliders shown at the left. Also, this can be individually assessed per neighbourhood so the urban actions can be localised in just one single neighbourhood.

The steps to carry out the functionality are:

- Wait for the map and indicators to load.

- The left panel shows a list of sliders representing the selected neighbourhood’s indicators. These are divided into topics.
 - Each topic is the weighted sum of the indicator values and indicator weights.
- Check that when the indicator sliders are moved, the top-right table updates both topics and the Age friendly index correctly. It should also update the colour. For a quick example check the figure below to see a configuration set to 0.

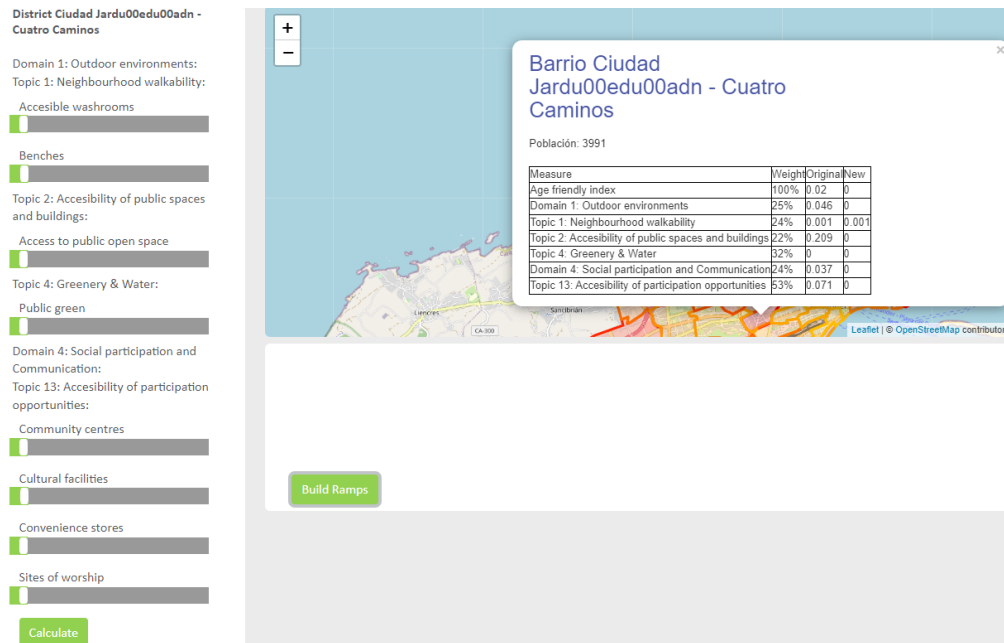


Figure 39: Two screenshots of a modified indicator simulation where all values are set to 0 and the popup neighbourhood table correctly shows all values set to

Visualization of a different neighbourhood values in new simulation scenarios. Local persistency.

This functionality allows visualising all domain, topic and indicator values for each neighbourhood and choosing a different neighborhood without losing the current scenario. Although simulation values are not stored in the database yet, the modifications won’t be retrievable if the page is refreshed.

The steps to carry out the functionality are:

- Wait for the map and indicators to load.
- Click on a neighbourhood polygon to check its domain, topic and index values.
- Check that you can choose every single neighbourhood and are correctly stored if clicked on a different neighbourhood.

Adding ramps

This functionality allows adding ramps just by clicking on the map. This will be useful in the future so civil servants can locate new ramps and simulate how that ramp creates a new scenario where the indicators might get modified. This way, they can assess how much that ramp improves the Age Friendliness Index and if it's worth it or if another location should be chosen. This ramp placement is achieved by calling Nominatim's reverse geocoding API and targeting the closest street to get its information. This might not be able to select every single street cause Nominatim doesn't have 100% accuracy. Some streets are not indexable, and some other are eclipsed behind bigger streets.

The steps to carry out the functionality are:

- Wait for the map and indicators to load.
- Click on the blue button that says: Build Ramps.
- The neighbourhood polygons should disappear.



Figure 40: A screenshot of the Age friendliness index simulation with a ramp built because Build Ramp was enabled, and a click was performed on a map.

- Check that by clicking on the map:
 - New ramps appear on the closest street.

5.1.3 Age Friendly Route Planner Web UI

The Age-Friendly Route Planner allows users to build routes of two different natures: public transportation and walking routes. These alternatives can also be planned for people in wheelchairs, and citizens without this specific need. Additionally, users of the route planner will be able to set some preferences regarding the importance of slopes, duration, amenities and comfortability in the calculation of the route. The steps to evaluate the functionality are:

The page presents the map of Santander and a form, including the different parameters considered for route planning.

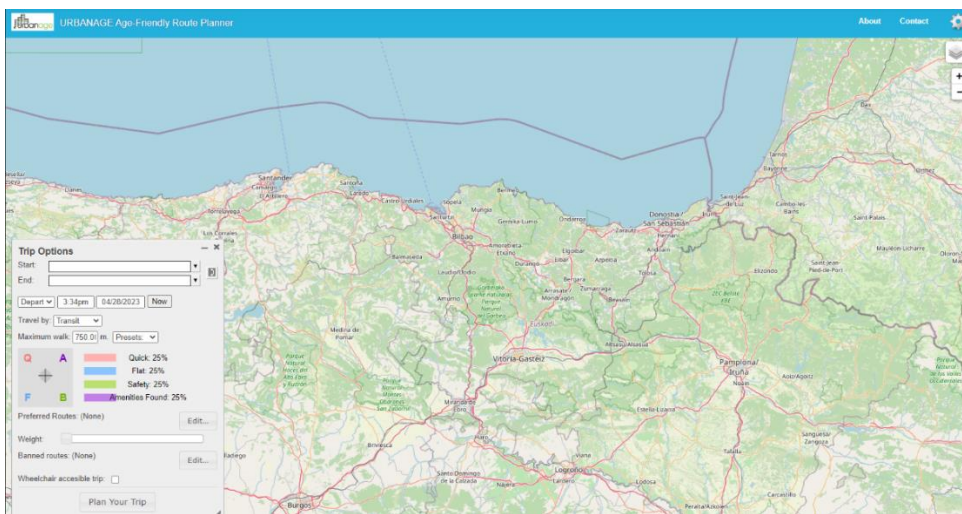


Figure 41: AGE-Friendly route Planner

The Age-Friendly Route Planner will allow users to calculate the route of public transport services, accessible on foot from the origin and final destination. The first interesting functionality implemented for the Age-Friendly route planner is Square Optimization, a core feature for the first of the walking routes provided by the planner. The steps to carry out the functionality are:

- Start selection: click on a position on the map. It is marked in it, with a green flag.
- Selection End: click on a position on the map. It is marked in it, with a red flag.
- Clicking on the trip options panel prevents you from exchanging Start and End.
- In the travel options panel, adjust the preference criteria and press the button plan your trip



Figure 42: Preference criteria selection

The following possible routes are presented

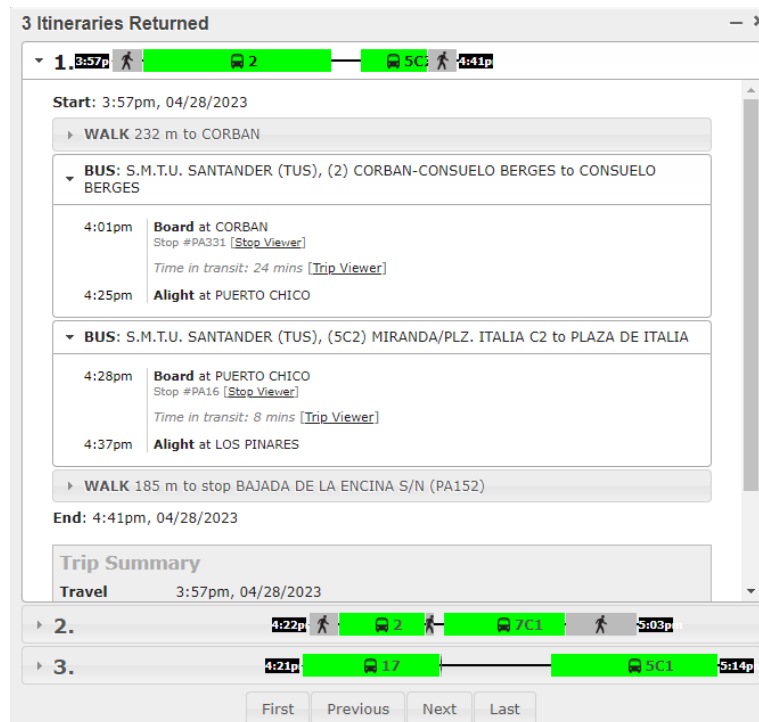


Figure 43: Route options

- Once each one of them is selected, the different sections, means of transport used and time of passage depending on the planned schedule are presented.
- The buttons First / Previous / Next/ Last allow us to move between them

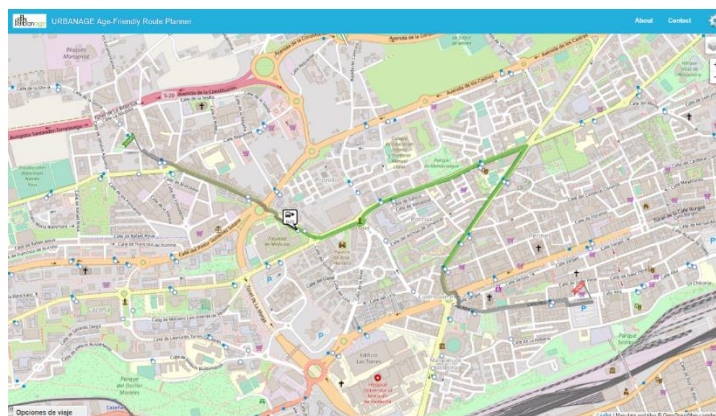


Figure 44: AGE-Friendly route Planner

Upon edit the preferred routes a pop up is displayed where the user can select a route and add it in the table of preference by clicking the button (>). The user can delete the selected routes by clicking the button (<).

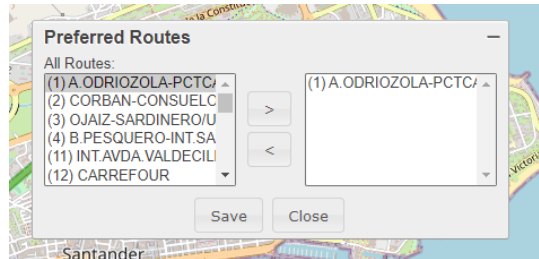


Figure 45: Favorite lines selection

Upon edit the banned routes a pop up is displayed where the user can select a route and add it in the table of preference by clicking the button (>). The user can delete the banned routes by clicking the button (<).

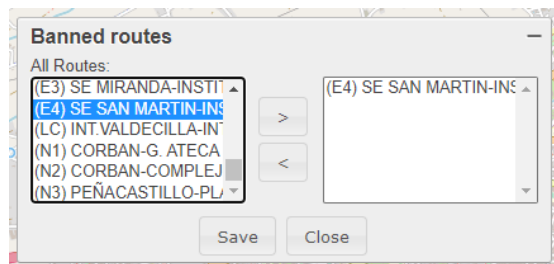


Figure 46: Prohibited lines selection

5.1.4 Age Friendly Route Planner - Mobile UI

The mobile application is for senior citizens.

This application is a **PWA** (Progressive Web App). It is actually web-based, but with a look&feel and behaviour similar to a mobile APP, and with the advantage of no stores, automatic upgrade, without user interactions. This makes it a better solution for senior citizens with less digital skills.

This application consumes the same backend services as the web version previously mentioned.

The functionality allows the citizen to open the application, set preferences and store them locally on their mobile. **No need to log in or send personal data to the backend. Preferences are stored locally.**

Access to the application

Access the following URL (in the developer environment for now): <https://urbanagetest.netlify.app> through a mobile browser or a shortcut if previously installed on the mobile desktop.

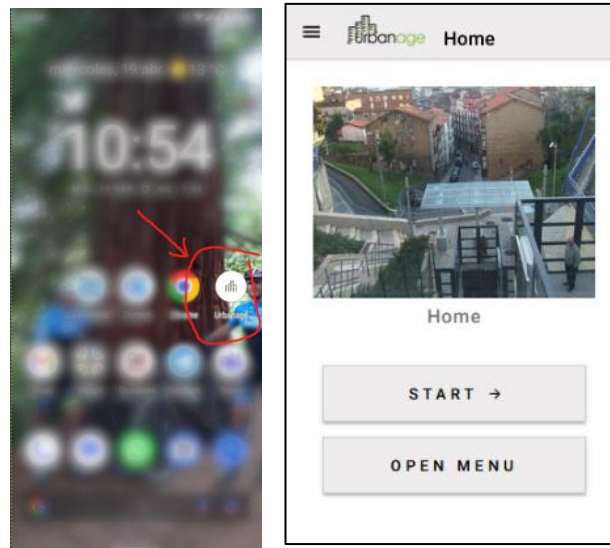


Figure 47: AGE-Friendly route Planner Mobile APP- mobile shortcut and home page

Set preferences

Users can configure the default preferences by clicking the Menu/‘Open menu’ button on the Homepage.

- Font size: the user can change the preferred font size (small/medium/large)
- Voice Player: the user can turn on/turn off the voice player.
- Language: the user can change the preferred language (English/Spanish)
- Personal preferences according to conditions or interests: if the user has a specific preference for benches/drinkable water sources/public toilets/elevators, he can select it. Also, he can add a specific position to it if he has (start/end of the route)

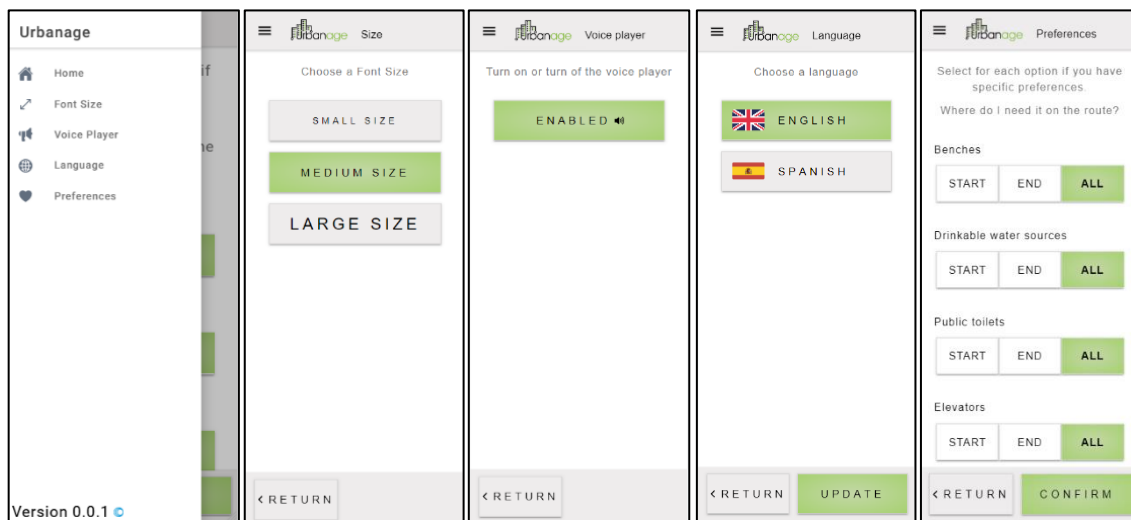


Figure 48: AGE-Friendly route Planner Mobile APP- settings and preferences

Start route searching (a new one or a favourite previously stored)

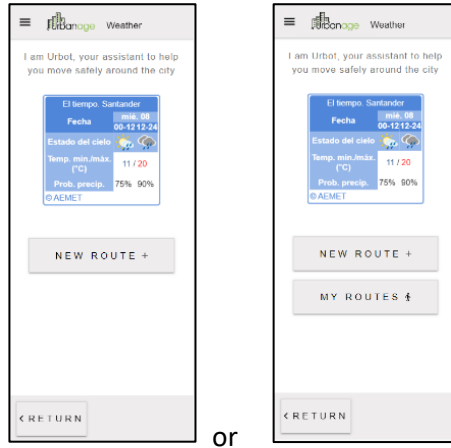


Figure 49: AGE-Friendly route Planner Mobile APP- main screen – new route or favorites

Route searching (guided, step by step)

| 1-Origin and destination | 2-How to go | 3-Preferences |
|---|---|---|
| <ul style="list-style-type: none"> Using the keyboard or voice Using your location (GPS) Using a catalog of places (works for both routes) | <ul style="list-style-type: none"> Walking Using public transport (Transit) | <ul style="list-style-type: none"> Benches Drinkable water sources Public toilets Elevators <p>And in which part of the route they prefer them.</p> |

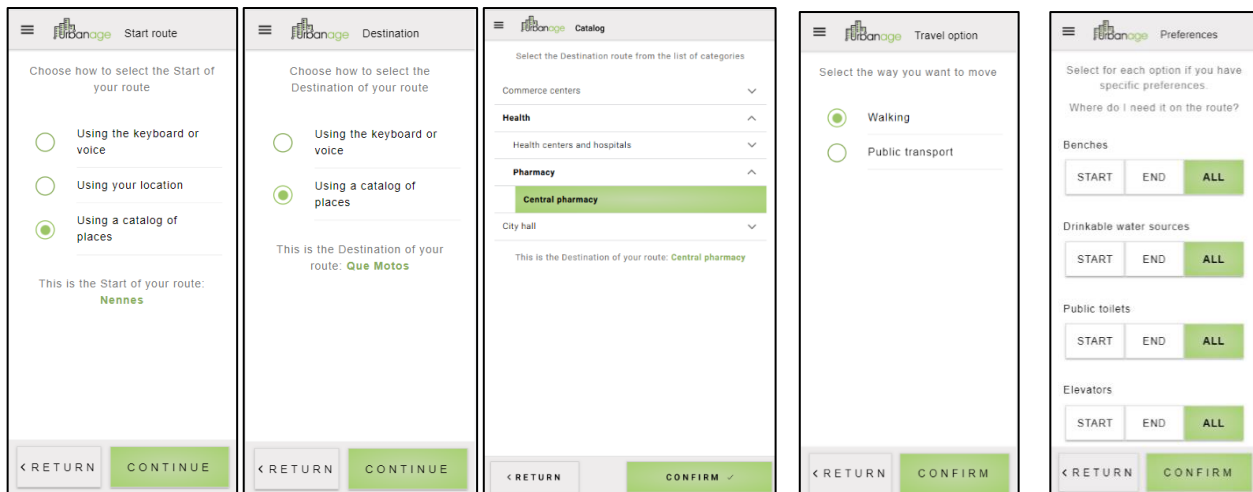


Figure 50: AGE-Friendly route Planner Mobile APP- guided screens to search routes

Routes retrieved, selection, following and storing as favourite to use again

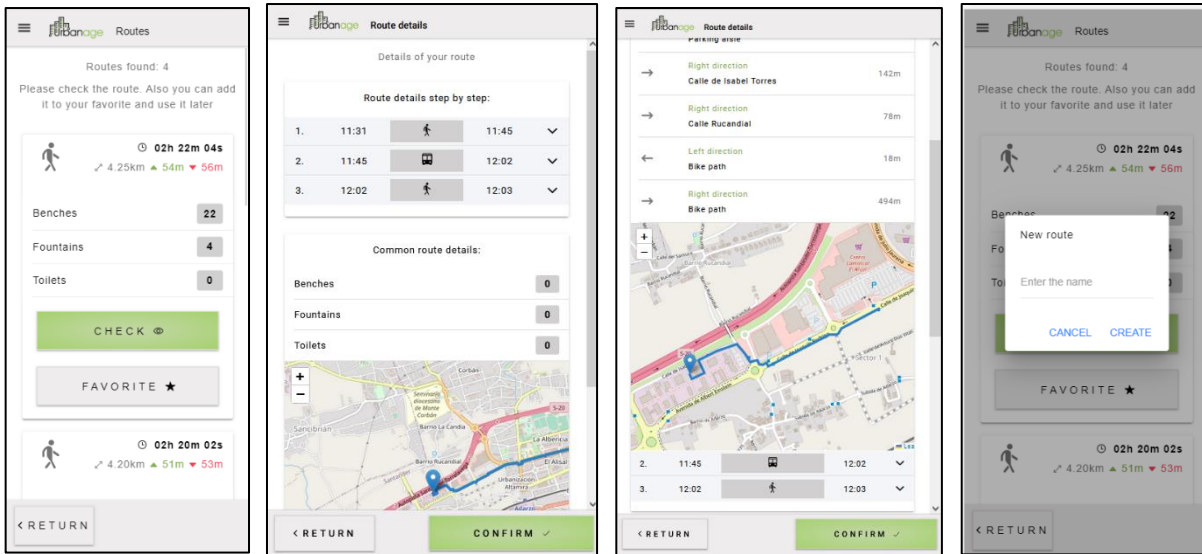


Figure 51: AGE-Friendly route Planner Mobile APP- routes found, follow and set as favourite

5.1.5 Big Data Analytics view

The user can access the Big Data Analytics view and check the distribution of accessibility issues on the map of Helsinki. A time range filter allows the user to define the start and end date and submit a search query. Various filters are available that help the user to refine the type of aggregation to apply on the data. The “Type of region” filter allows viewing statistics on a 2D density heatmap plot across the whole city, as shown in Figure 52.

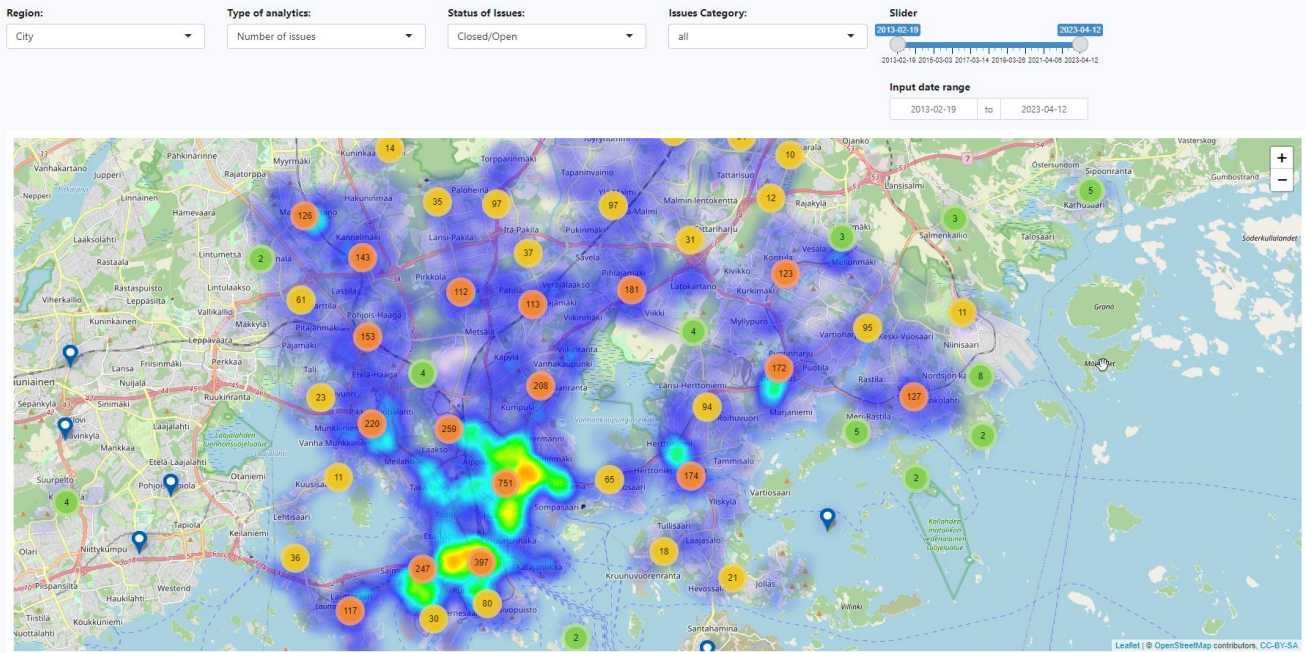


Figure 52: Density heatmap across the city

Another option is to observe the distribution of accessibility issues on a grid-based heatmap where the grids refer to the city neighbourhoods, as depicted in Figure 53.

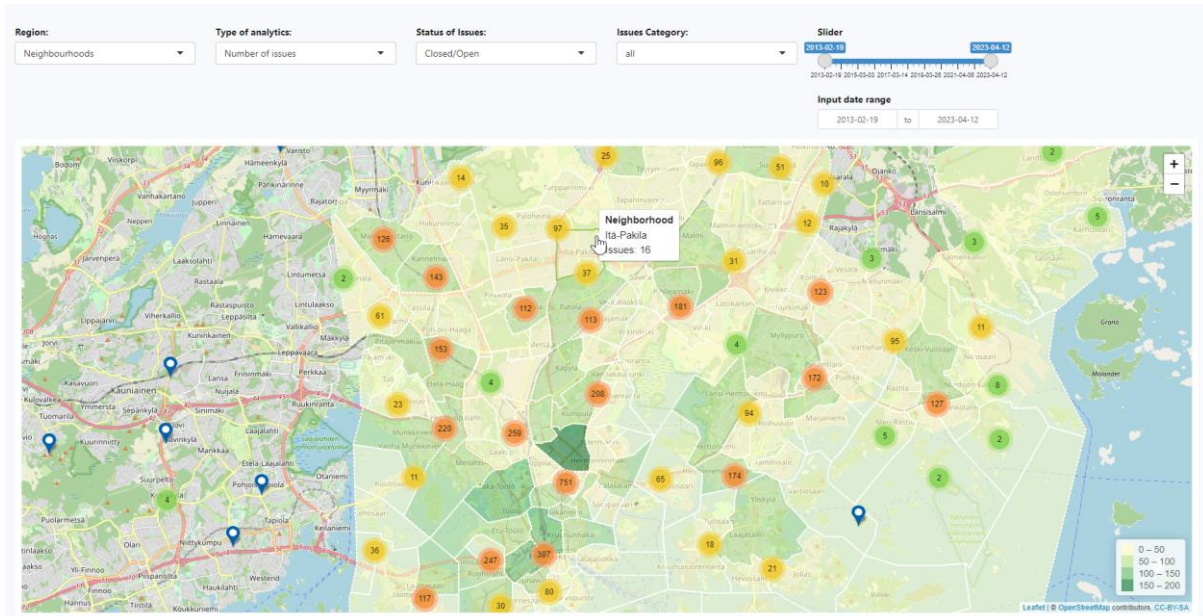


Figure 53: Grid (neighbourhood) based heatmap

The filter “Type of analytics” allows the depiction of distributions on the selected heatmap based either on the number of issues or the issues resolution duration. The filter “Status of issues” allows selecting the status of issues to be observed on the heatmap, either open or closed (resolved). Finally, the filter “Issue category” allows to depict accessibility issues that belong to a specific category. The heatmaps are interactive allowing the user to click on a neighbourhood and view neighbourhood specific statistics such as the number of issues, the issue resolution duration as well as the percentage of open issues, as shown in Figure 54.

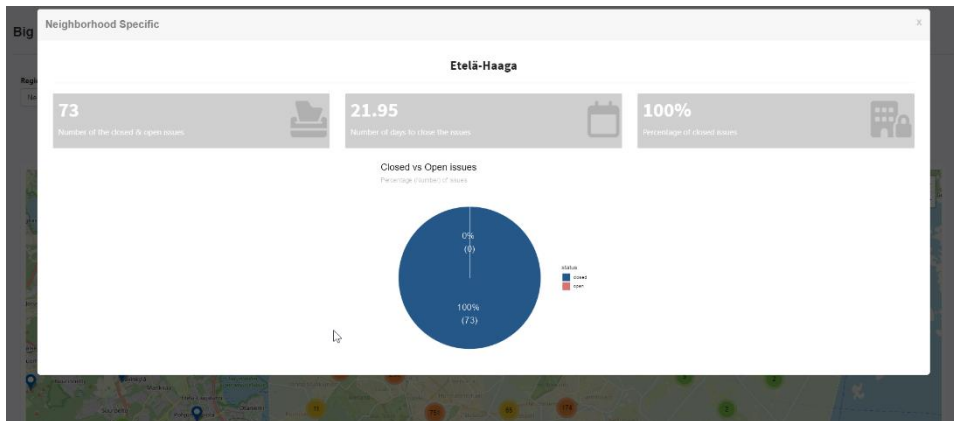


Figure 54: neighbourhood specific statistics

By zooming in the heatmap, the user can observe the description text of an issue annotated with the named entities recognised.

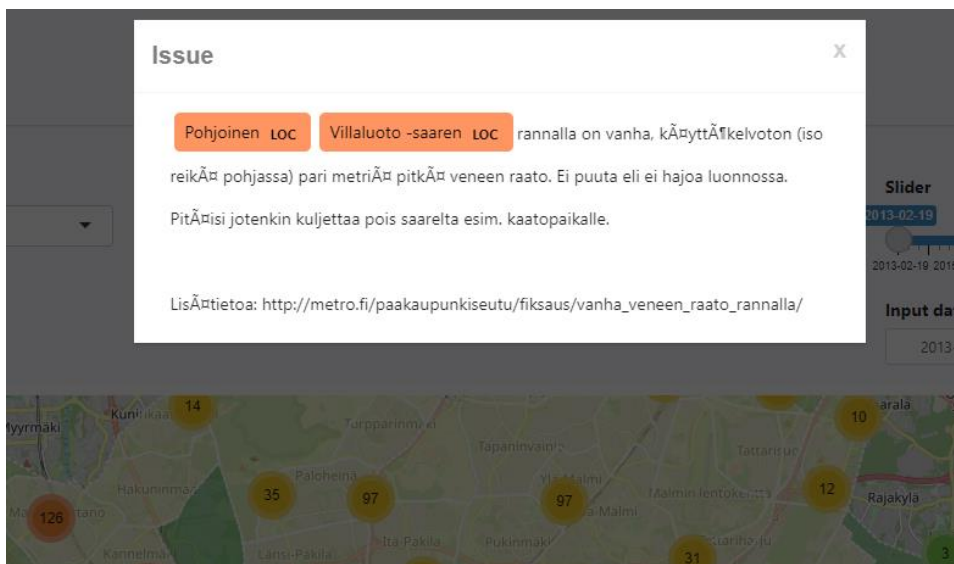


Figure 55: Issue description text annotated with named entities

Global statistics about resolution duration and status are also presented with bar plots and pie plots as shown in Figure 56.

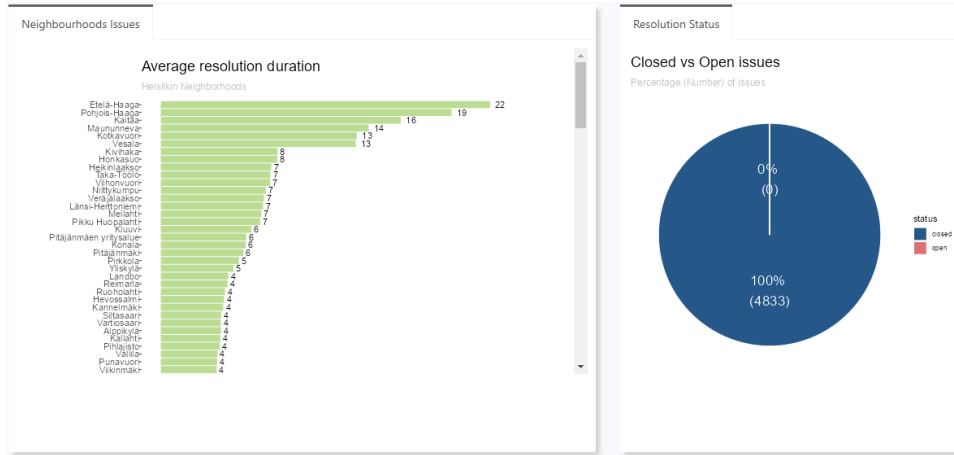


Figure 56: Global statistics

Users can observe how the analytics results of accessibility issues are distributed over time, and they can compare the distributions per issue category (see Figure 58) and detect trends. The results of time series analysis can be presented over different time intervals using the time interval filter.

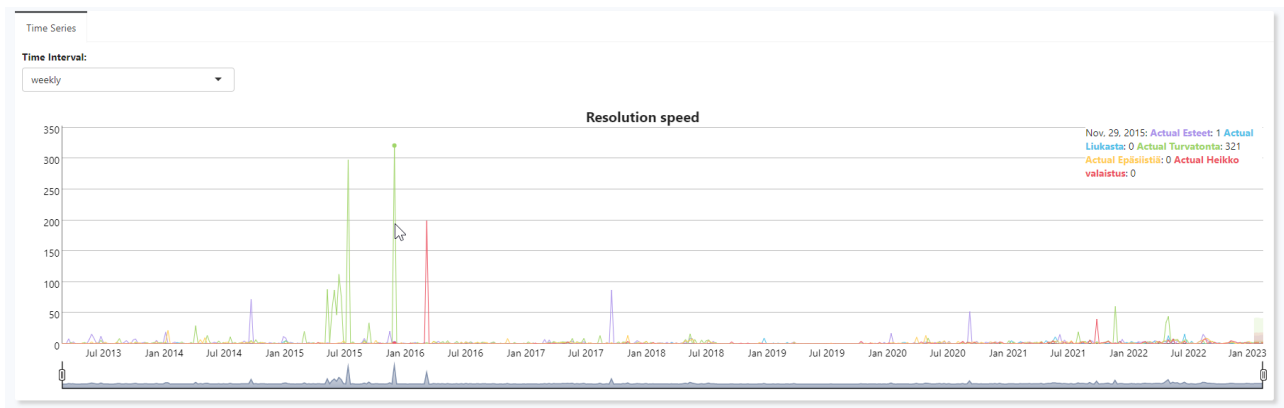


Figure 57: Distribution of issues over time

Moreover, the user can check how the distributions is expected to evolve in the future by observing the results of time series forecasting per type of analytics.



Figure 58: Time series forecasting on issues per category

5.1.6 Data Gateway (Idra)

Through the Data Gateway, the user can explore available datasets. By accessing the “Data Gateway” option in the URBANAGE dashboard, the search UI of the Data Gateway is shown.



Figure 59: Data Gateway - Search UI

The user can also access more detailed search options.

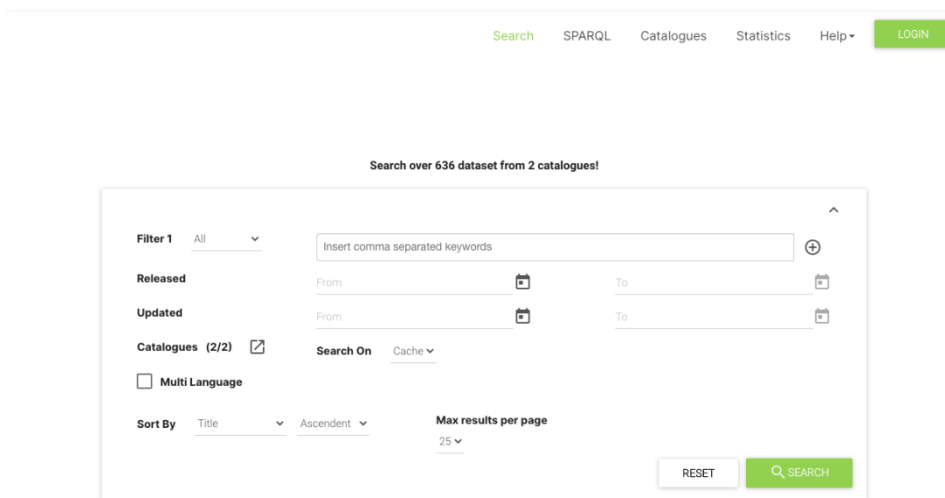


Figure 60: Data Gateway – Advanced Search UI

Once the user inserts the keywords of the datasets, the corresponding results are displayed.

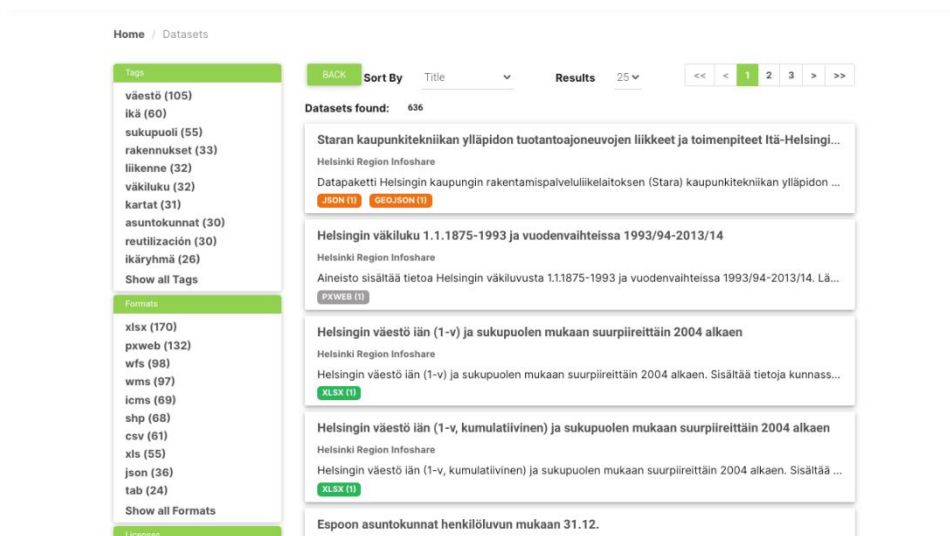


Figure 61: Data Gateway - Search Results

However, the results the user obtains are too many, and need to refine the relevant search; so, the user can select filters provided in the left column.

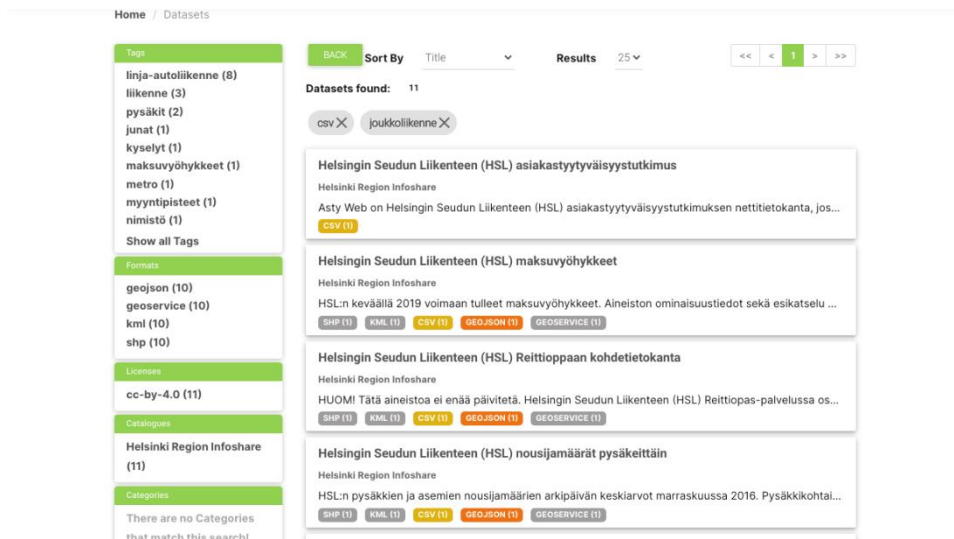


Figure 62: Data Gateway – Filtered Search Results

Now the user has a clear view of the datasets he/she is looking for and he/she can select the one interested and access its details.

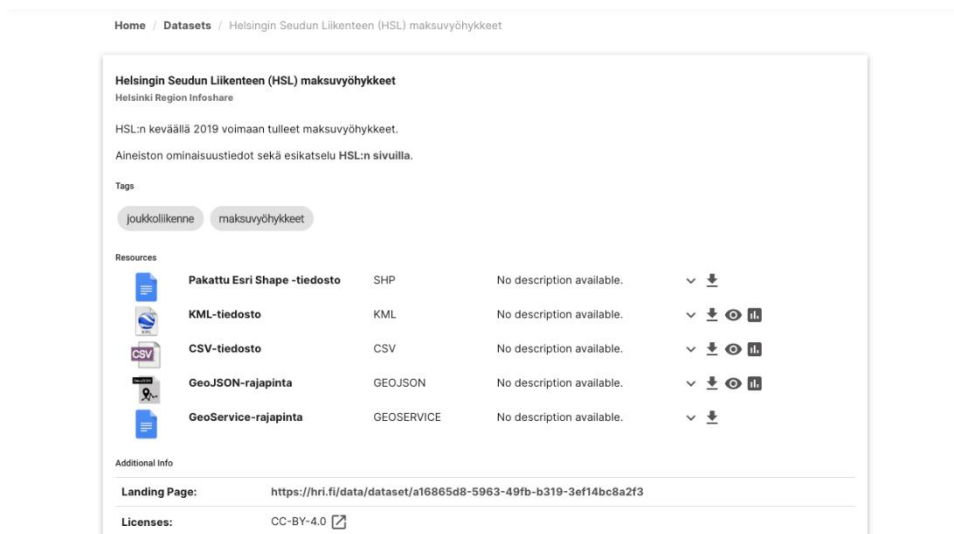


Figure 63: Data Gateway – Details of a Dataset

Moreover, the user can also access a graphical preview of the dataset.

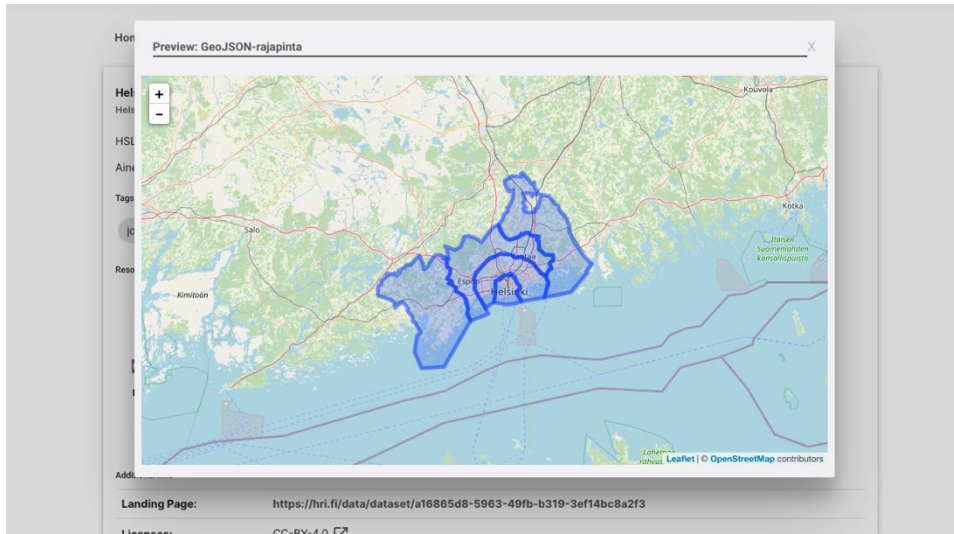


Figure 64: Data Gateway – Preview of a Dataset

5.1.7 Build Green Comfort Scenarios

As a logged in user, I can simulate the implant of new city amenities and evaluate their impact on Green Comfort.

Users can start by navigating to “Build Green Comfort Scenarios” in the URBANAGE dashboard.

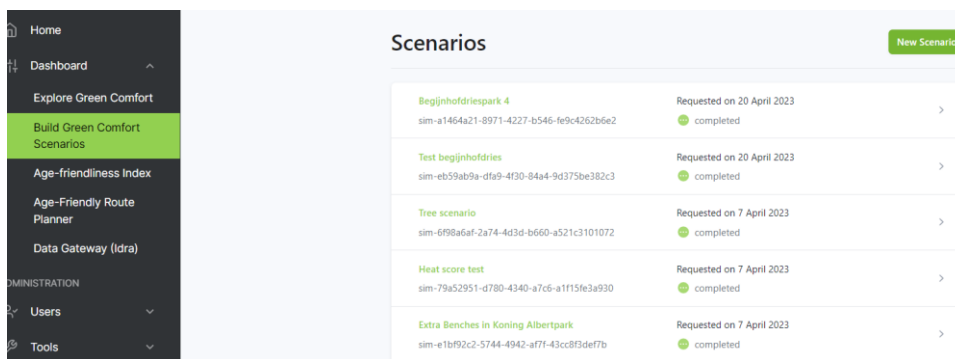


Figure 65: Build Green Comfort Scenarios - Scenarios

Users can see a list of scenarios created earlier, with the most recent ones on top. The status of the simulation run that goes with each scenario can also be verified.

If users want to create a new scenario, they can click the “New Scenario” button.

The screen changes, and the users can see a map of the city with several layers active, and some options are available to help them set up a new scenario.

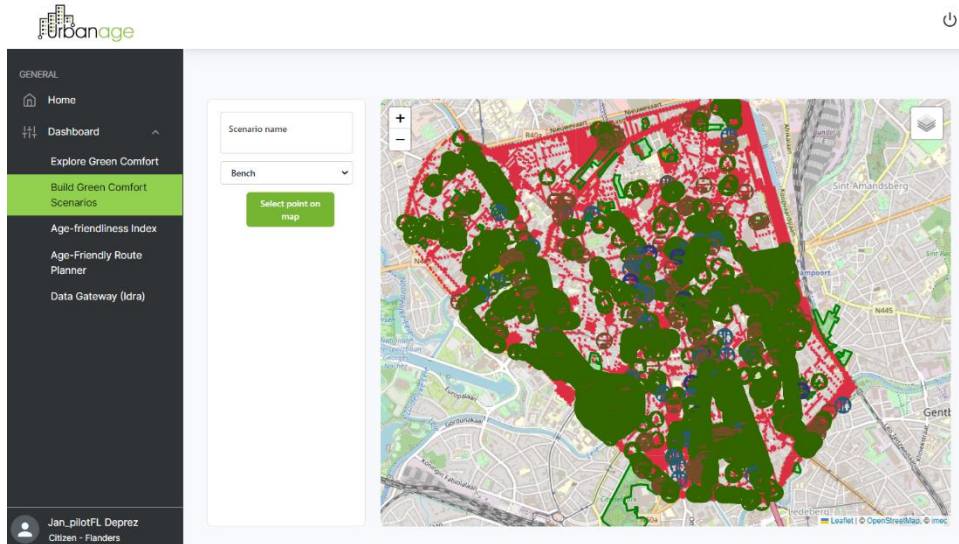


Figure 66: Build Green Comfort Scenarios - New scenario overview

Users should start by giving this new scenario a unique name.

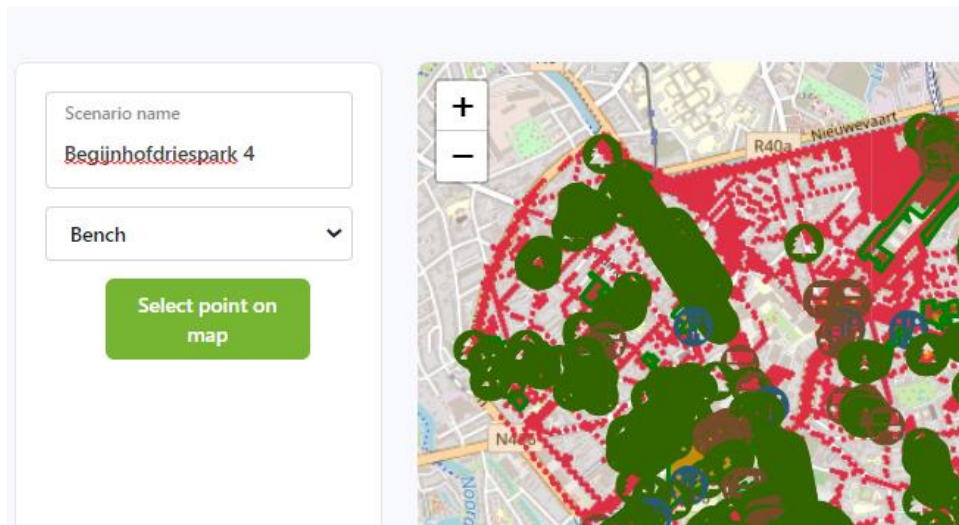


Figure 67: Build Green Comfort Scenarios - New scenario name

Users can use the map on the right-hand side to explore the city, and find the area they are interested in. Users can zoom in and out using the mouse wheel, and they can drag the map to pan around the city.

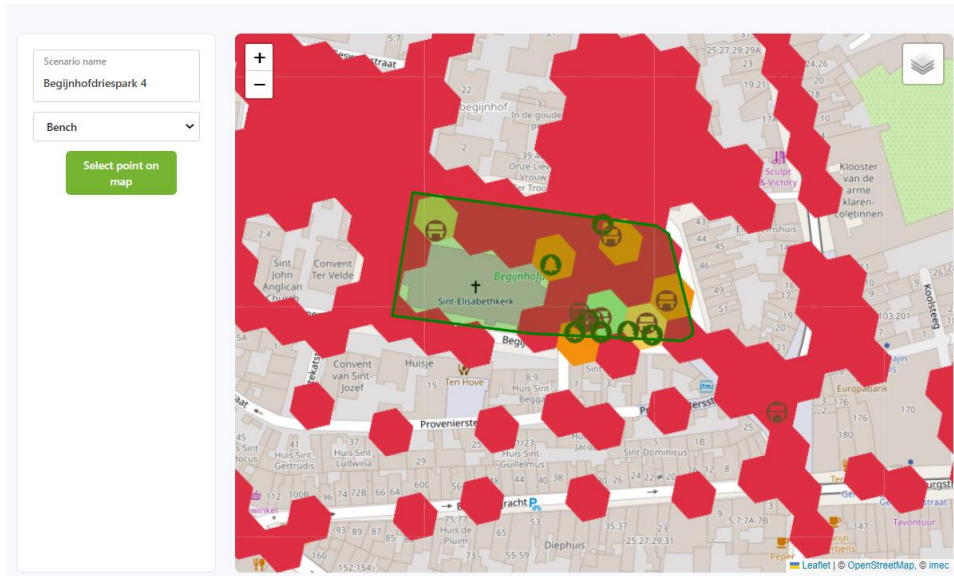


Figure 68: Build Green Comfort Scenarios - New scenario pan and zoom

If users have found their area of interest, they can select and deselect layers by hovering over the layer button in the top-right corner. For instance, the Green Comfort Index layer (GCI) can be deselected, and they can select the Heat stress layer instead.

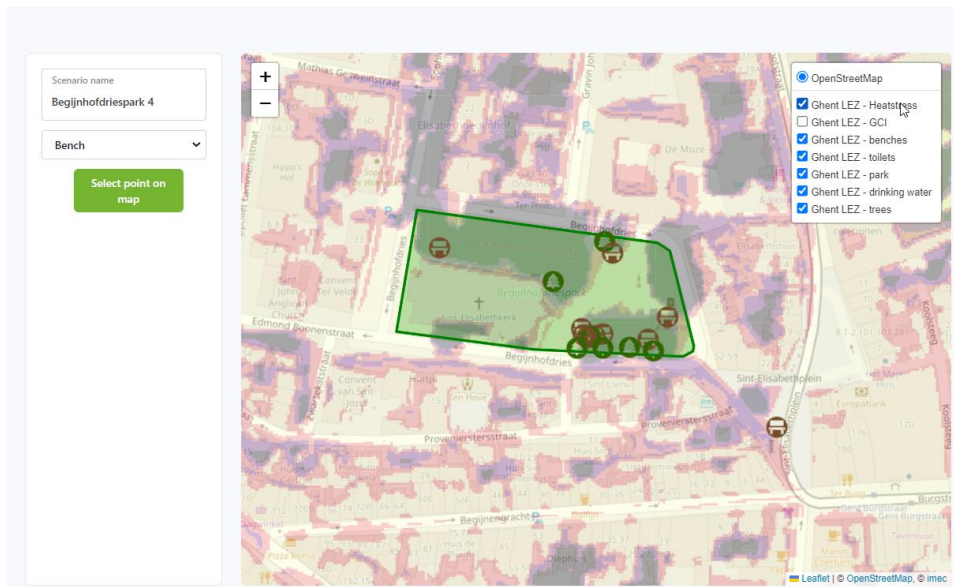


Figure 69: Build Green Comfort Scenarios - New scenario layer selection

Users can now start adding amenities to the map. They have a list of options available in a dropdown menu, in my case, I start by picking “Tree”.

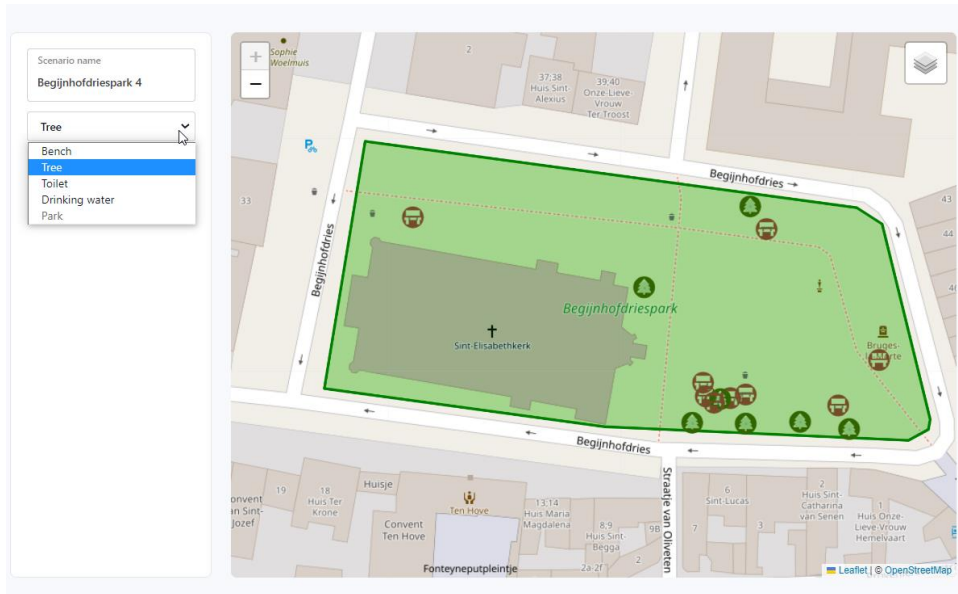


Figure 70: Build Green Comfort Scenarios - New scenario amenity selection

To add a tree to the map, users can click the “Select point on map” and click where they want the new tree. Users can do this several times. For each point they add to the map, a new item appears in the list on the left-hand side. If users make a mistake, they can click the trashcan icon to remove any of the points.

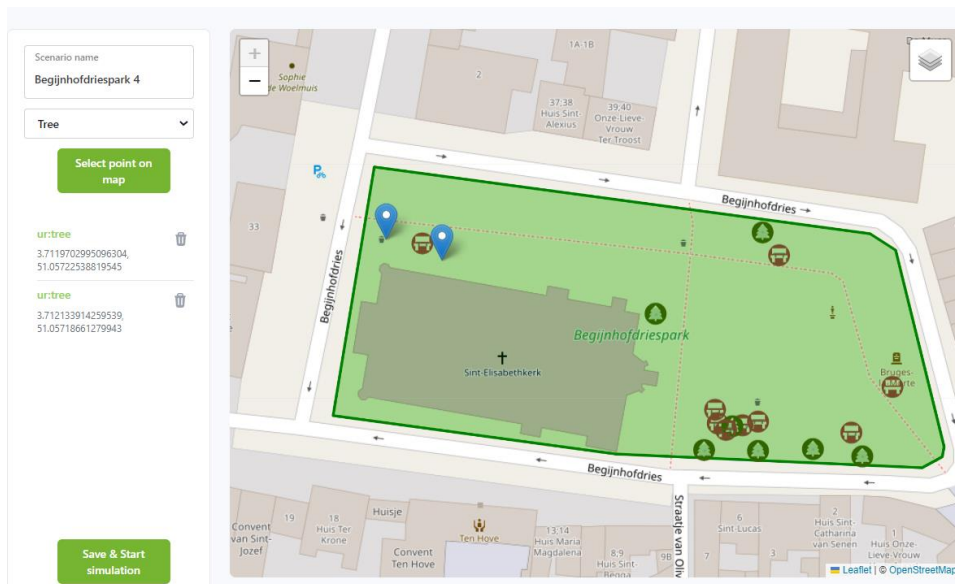


Figure 71: Build Green Comfort Scenarios - New scenario adding trees

Users can also change the amenity type and add for example a drinking water fountain.

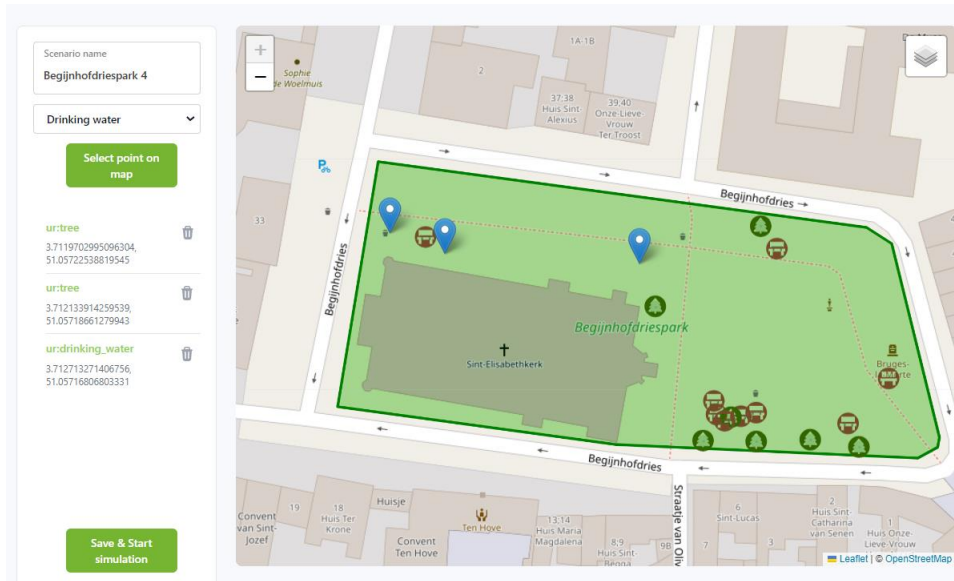


Figure 72: Build Green Comfort Scenarios - New scenario adding drinking water

If users are happy with their scenario, they can click “Save & Start simulation”. The scenario will close and a simulation run will be requested. This simulation run will calculate the impact of the users’ changes to Green Comfort. After closing the scenario, users are back at the list of scenarios, with their new scenario on top.

The status of the new scenario is “created” for now, and will change to “completed” once the simulation is finished.

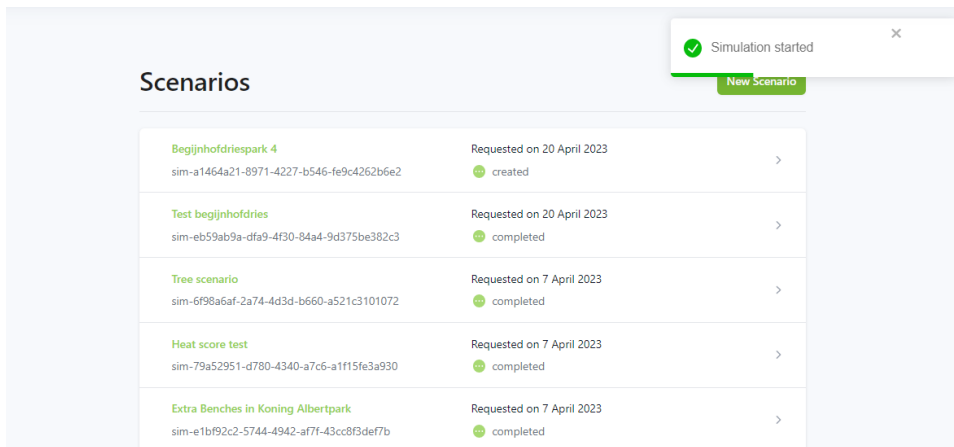


Figure 73: Build Green Comfort Scenarios – Scenario status

5.1.8 Participatory Data Collection

The participatory data collection tool enables users to generate and submit location-based information about urban environment.

The tool can be found under “Participatory Data Collection” tab in the URBANAGE dashboard.

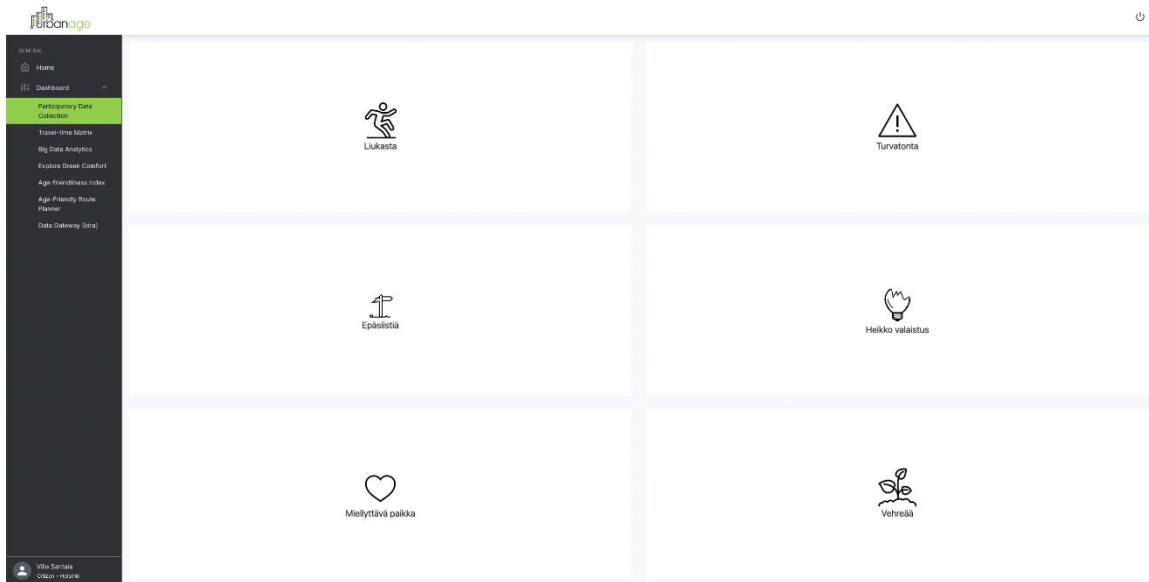


Figure 74: Participatory Data Collection (Home)

Once users select a category to submit information on, they click the button. This command opens a pop-up window with a map view where a pin is dropped to their actual location (users need to give permission for the browser to access their device location).

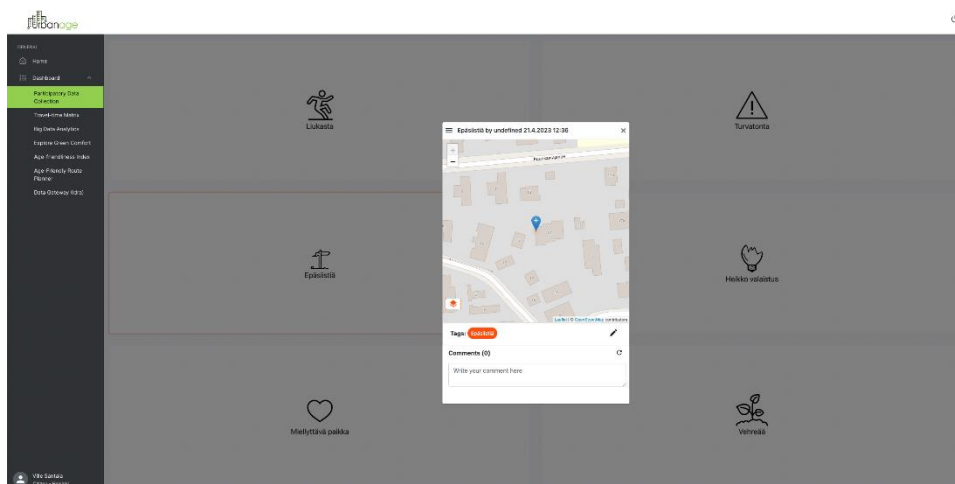
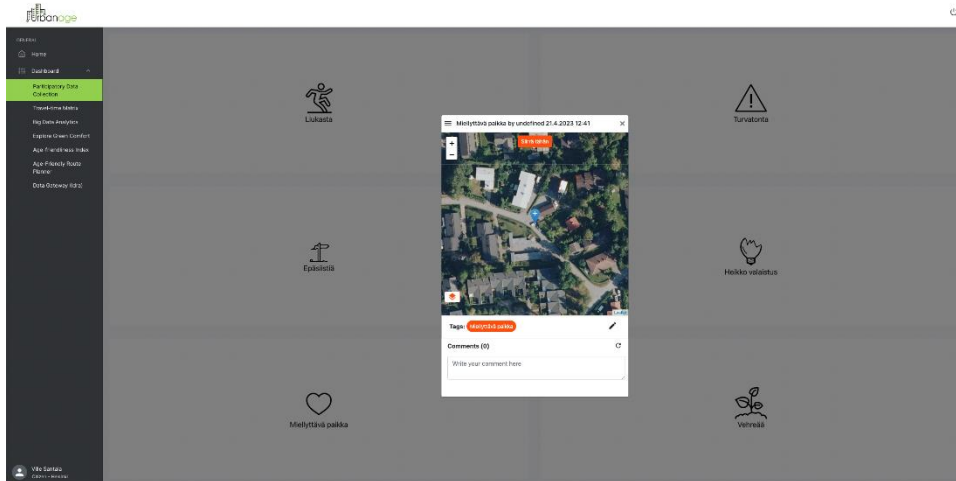


Figure 75: Map View

The drag-and-drop functionality enables users to adjust the location, and there is an option to change the map view to aerial imagery to help with positioning the feedback. Additionally, in the pop-up view, users can add comments, other information and attachments.



Exiting the pop-up window will save the generated information.

5.1.9 Travel Time Matrix

The travel time matrix is a data set and tool for urban planners. The user interface provides the expert user with the addresses of the data endpoints, which can be used in conjunction with a desktop GIS system, such as QGIS, ESRI ArcGIS, or MapInfo, and a wide range of data science frameworks.

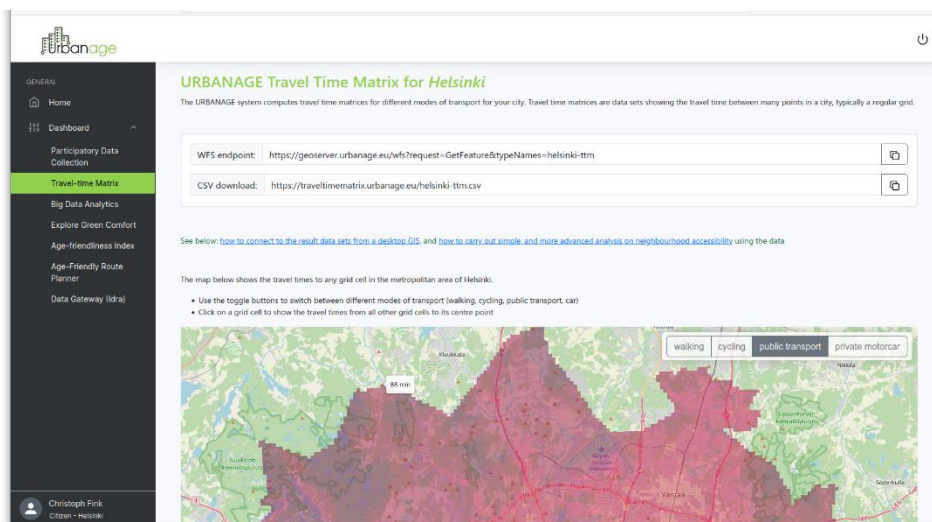


Figure 76: Travel Time Matrix

At the current stage, R2, the user interface also includes an interactive map of the resulting travel time data (see below). However, detailed instructions on how to use the provided data sets for advanced analysis in a desktop GIS or data science framework are still in placeholder-stage, and will be completed for R3.

The interactive map interface provides an easy-to-use preview of the data, showing the accessibility by different transport modes to any part of the pilot city and its metropolitan area. Darker shades signify longer travel times to the selected destination location, which is marked with a map marker:

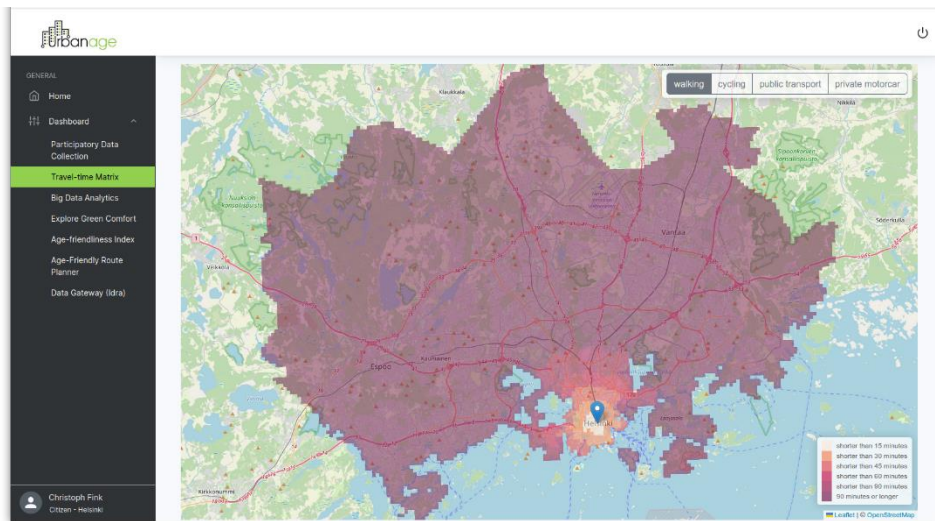


Figure 77: Interactive Map Interface

Users can switch between transport modes (which, until R3, will be extended to include specific mobility preferences of older people). Hovering over the map displays the approximate travel time with the selected mode of transport from that location:

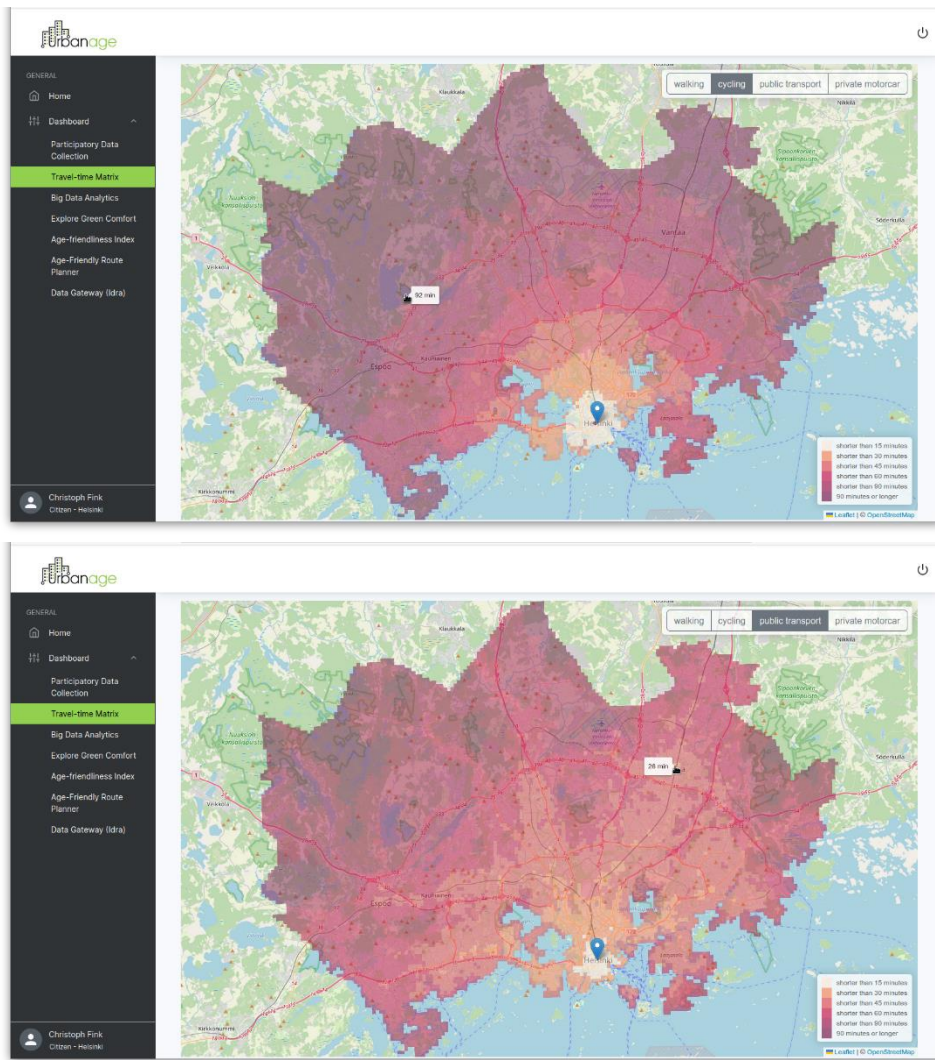
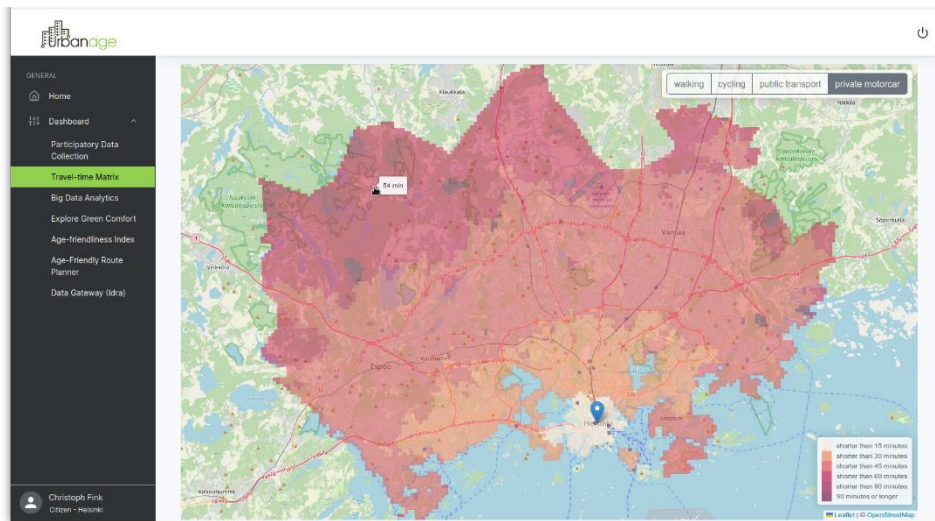
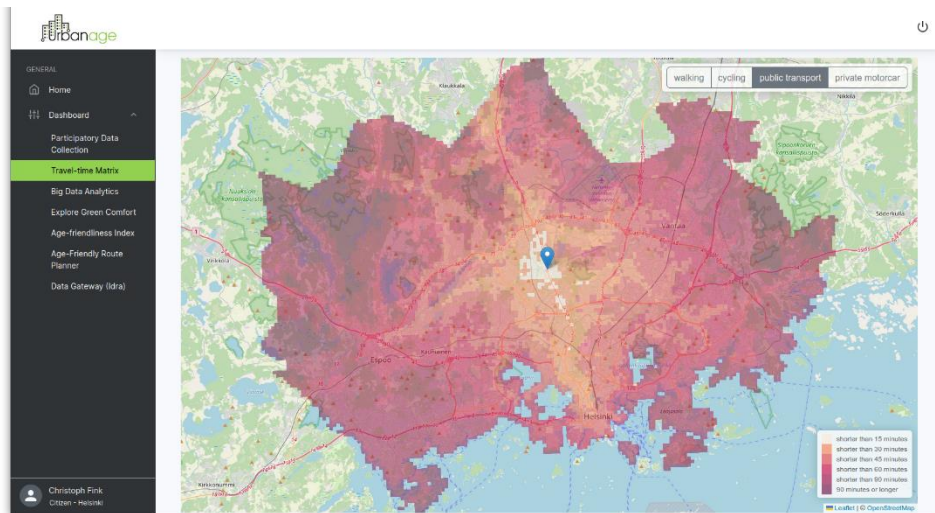


Figure 78: approximate travel time with the selected mode of transport from that location



Users can choose a different destination location by clicking in the map:



6 Conclusion

This document is the report describing the prototype deliverable D5.4 about the intermediate version of the URBANAGE Ecosystem. This is the intermediate release that offers a set of the expected functionalities and will act as the test-bed for the URBANAGE stakeholders to experience this set of URBANAGE provisions and assess the concepts and knowledge conveyed by the project.

The implementation and integration are not limited to the current level. Most URBANAGE modules, as well as the platform itself, are designed to be flexible and easily customisable. The system's overall architecture facilitates modifications and makes the platform improvement easy at any point. This will be the aim of the following period: to continue the enhancement of this platform's capabilities and make it more stable, more sophisticated and more efficient for the target end users, by plugging additional functionalities and calibrating existing ones.

This prototype version will be enriched with more functionalities to support the three pilots, so the planned evaluation iteration will be performed in the next period. The results of this evaluation cycle, along with the already scheduled work in this and the other technical WPs, will lead to another prototype release of the URBANAGE Ecosystem platform by M33 (October 2023).

7 References

- [1] D6.1: Use case implementation and validation Plan, URBANAGE project, January 2022
- [2] D6.2: Use case technical validation report. Initial, URBANAGE project, January 2023
- [3] D3.4: AI Algorithms and Simulation Tools. Final, URBANAGE project, January 2023
- [4] D3.6 Big Data Analytics Components. Final, URBANAGE project, January 2023
- [5] D4.4 Solutions Accelerator API, URBANAGE project, January 2023

8 Annex 1

The following Table presents the List of Requirements implemented per Pilot

Table 4: List of Requirements

| Requirement ID | Description |
|----------------------|--|
| Helsinki Use Case 1 | |
| Hel_01 | Ingest feedback related data + open data in URBANAGE Platform (data lake) |
| Hel_02 | Create online map for data visualisation (create user adjustable functionalities) |
| Hel_03 | Visualise data as points |
| Hel_04 | Visualise data as heatmaps |
| Hel_05 | Apply NER on accessibility issues |
| Hel_07 | Pull all feedback data to URBANAGE Platform |
| Hel_08 | Analyse text-based feedback data |
| Hel_11 | Ensure data flow from the Helsinki participatory IoT device to URBANAGE Platform |
| Hel_12 | Ensure data flow from the browser-based feedback tool to URBANAGE Platform |
| Hel_13 | Integrate the browser-based feedback tool to URBANAGE Platform |
| Helsinki Use Case 2 | |
| Hel_13 | Define PoIs for visualisations and 3D modelling |
| Hel_14 | Pull PoI data to URBANAGE Platform |
| Hel_15 | Visualise PoIs in Digital Twin UI |
| Helsinki Use Case 3 | |
| Hel_01 | Input data preparation pipeline |
| Hel_02 | Computation of routes between all origins and all destinations (n:n) using a routing algorithm for public transport, walking, cycling, and private car |
| Flanders | |
| FI_01 | Deployable Green Comfort model, version 1 |
| FI_03 | Onboarding GC indicator datasets into URBANAGE ecosystem |
| FI_04 | Visualization GC in URBANAGE ecosystem |
| FI_10 | Gamification UI for small GC simulations |
| FI_13 | Orchestration of GC simulations |
| Santander Use Case 1 | |
| SANT_01 | To find routes between points in the city that mimimizes mobility difficulties |

| Requirement ID | Description |
|----------------------|---|
| SANT_02 | To allow customization of the functionality for different groups and characteristics of the citizens |
| SANT_03 | To incorporate the precise data that allows for the correct performance for all of the user types |
| SANT_04 | To provide additional information about the reasons a particular route is recommended to the user |
| SANT_05 | To change the personal settings of the user in the tool |
| SANT_06 | To provide to the user information on what is changing in the city in the form of incident or alert |
| SANT_08 | To integrate an input communication channel that takes advantage of incidents warning municipality system |
| Santander Use Case 2 | |
| SANT_14 | To perform multi criteria analysis for a global qualification of each area of the city |
| SANT_15 | To calculate and visualize the age friendliness index at different scales |
| SANT_18 | To select and modify the parameters for the multi criteria analysis |