D2.3 Interface for End Users of the Ecosystem

March 2022

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[1]   PU = Public
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Review

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V0.4	08/03/2022	Andreea Miroslav	Expanded the descriptions of the interfaces for the "Dashboard" section
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Summary

ReDREAM Project

The energy market is rapidly transforming, and so is the role of the Consumer. Yesterday's passive consumers can become central actors in future energy markets. This change will be possible If they are enabled to become active. This transformation is always referred to as becoming "prosumers", a combination of producer and Consumer. As people –and SMEs, public administrations, and so on- become new "prosumers", energy markets can benefit from their new capability to generate energy, precisely map and communicate their consumption, including the possibility to modulate it and ultimately store it to serve the community.

The ReDREAM project aims at establishing the conditions to enable the effective participation of consumers and prosumers in the energy market. These conditions are a combination of physical and digital interventions, that helped to develop a strategy for the creation of a value generation chain based on a "service-dominant logic" (SDL) in which services are exchanged and energy is one of them. This means a big move from the common perception of energy as "just a commodity". The project will foster the demand response tools and energy/non-energy services that enable consumers to participate in the "flexible" energy market, where prices, loads, production and use patterns change constantly and need to be monitored and mapped, in order to gain efficiency in its management. This will lead to the establishment of a new concept: a connected user-centered energy ecosystem.
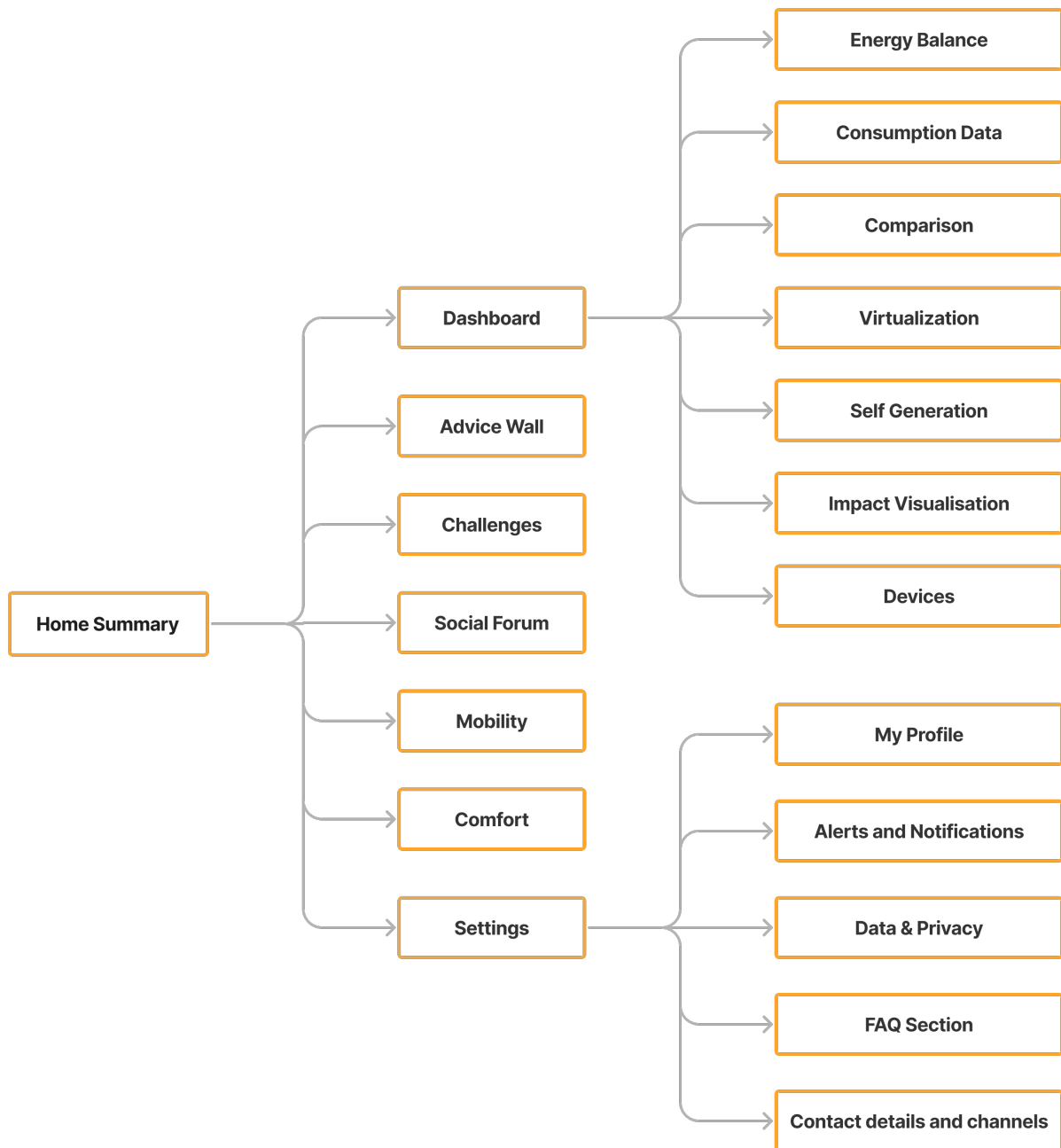
Summary of Deliverable

This Deliverable aims to describe the development of the interfaces for the ReDREAM Ecosystem. The interfaces are located in the Open Co-creation layer along with 3rd parties connection, IoT and cloud connection with assets.
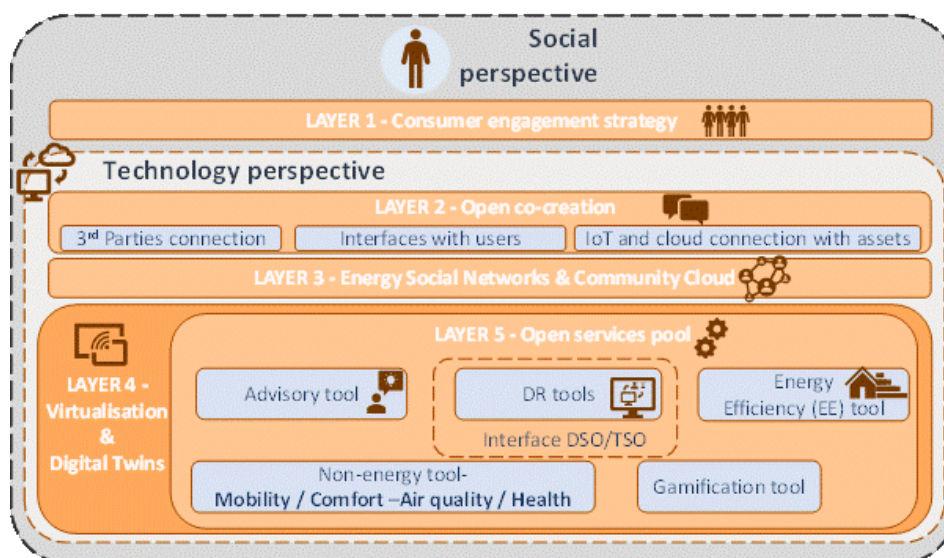
This task plays a key role in the Ecosystem: it connects the dots between all of the services developed in WP3 and makes them all usable by the final users. It is the *"face"* of the ReDREAM system, and therefore it has strong responsibilities in communicating the project aims and the central role played by consumers in it.

Developing the interface of the Consumer has been established as the first objective of this task since consumers are the most important agent in this project. Community UI and aggregator UI will be explained in D2.2.

Nowadays, the majority of available Interfaces to energy are *"technical dashboards".* Many Energy Companies, DSOs provide their users with *"energy apps"* that give them sets of numbers that people often look at with little attention, just paying it mostly to the economic part. Exactly like bills that are barely understandable to a base user, apps are filled with a lot of information, but very little effort is paid to user involvement. The reasons for this situation lay in the fracture between technical aspects and human aspects, as well as in the longstanding low cost or low impact of electricity on the overall budget of families. Energy is perceived as a *"commodity",* and as just another expense. Both conditions are subject to change due to the increase in energy costs and the rise of dynamic markets linked to renewable energy production.

Following the website structure map, the currently available pages that are described in depth in this Deliverable are:

- **Home Summary:** home page where the user can have an overview of the current situation of the house
- **Dashboard**
  - **Energy Balance:** page where users can have an overview of their energy consumption and production
  - **Consumption Data:** page where users can have an overview of their energy consumption segmented by day, week, month or year
  - **Comparison:** page where users can compare their impact and their consumption data with historical data or with an average user
  - **Virtualisation:** page where users can virtualise certain actions related to energy such as installing pv panels
  - **Self-Generation:** page where users can have an overview of their energy production segmented by day, week, month or year
  - **Impact Visualisation:** page where users can have an overview of their planet, economic and social impact segmented by day, week, month or year
  - **Devices:** page where users can have an overview of their devices
- **Advice Wall:** page that displays the outputs of the Advisory Tool
- **Challenges:** page that allows users to interact with the Challenges developed in the Gamification Tool
- **Social Forum:** Energy Social Network that allows users to interact with each other
- **Mobility:** page that displays the outputs of the Mobility Service
- **Comfort:** page that displays the outputs of the Comfort Service
- **Settings**
  - **My Profile:** page that allows users to adjust personal and home settings
  - **Alerts and Notifications:** page that allows users to choose which types of alerts and notifications they want to receive
  - **Data & Privacy:** page that allows users to adjust their privacy settings
  - **FAQ Section:** page that displays the Frequently Asked Questions
  - **Contact Details and Channels:** page that displays the preferred communication channels for customer care

This interface, therefore, was developed in strong interaction with the user engagement strategy, and this document must be read as directly related to D1.1, which outlines the outcomes of such strategy and of the related on-field analysis conducted face to face with people.

Table of Acronyms

Acronyms	Description
BE	Back End (Software)
DSO	Distribution System Operator
FE	Front End (Software)
GA	Grant Agreement
SPA	Single-page Application
TSO	Transmission System Operator
WP(s)	Work Package(s)

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1 Introduction

This Deliverable is framed in task 1.1, which develops the foundations and skeleton of the energy ReDREAM user-centric ecosystem. The Ecosystem is formed by the following five structural layers, shown in Figure 1:

1. Consumer engagement strategy: a holistic strategy to effectively engage the Consumer. This layer will be completed in T1.5.
2. Open co-creation: this layer is the entrance gate for consumers (app and webpage), installers (web), providers of energy technology (web), energy communities (web), scientific research (using open standard API) and energy resources (IoT). This layer will be completed in T2.2, T2.4 and T2.5.
3. Energy "social network": an open place for consumers to share experiences and provide reliable and direct feedback. This layer will be completed in T2.3.
4. Virtualisation: it will generate new scenarios in the backend to help the advisory tool make decisions through a consumer digital twin emulating the Consumer's behaviour with improvements. This layer will be completed in T2.6.
5. Open service pool with the catalogue of tools and services for the consumer grid. This layer contains the energy and non-energy services, gamification and advisory tool. This layer will be completed in WP3.
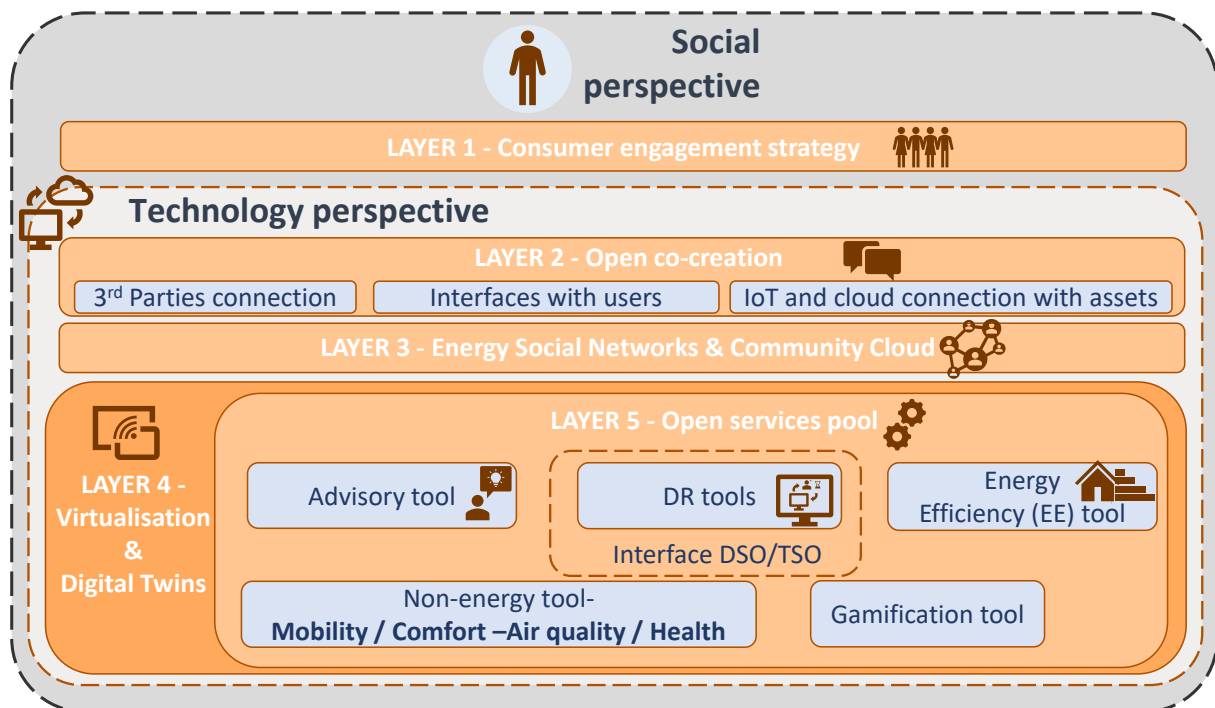

Figure 1: ReDREAM ecosystem

The different services are targeted at all-around energy, its innovative process for delivery, distribution and use. Task 2.3 in this process is the one that builds up the comprehensive interface that is the *"point of touch"* for users on this powerful, rich set of technologies on the new grid.

The final interface for the aggregator and energy community interfaces will be shown in D2.2 although a first version of the interface for energy communities or managers was shown in D2.1.

Thus, this Deliverable is focused on the explanation of this interface for the consumers with the following objectives:

- Show the historical, current and forecasted performance of the building obtained in WP3
- Show savings (carbon emissions and euros)
- The interfaces are not a mere display of data to be passively consulted ,they are designed to engage the user in the process of the energy transition and help them approach energy in a more conscious way through a simple but effective design.

The whole platform was developed following the design principles explained in D1.1 and all of the functionalities were defined using the outputs of that deliverable along with a constant collaboration with the authors of the document.

As already introduced, the ReDREAM project aims to effectively move the Consumer's participation (as a residential, industrial or commercial consumer) to the centre of the energy market through an open and co-creative ecosystem where all stakeholders will actively interact. In that sense, for ReDREAM involving the user is not secondary. This project aims at drafting a new model focused on users and on new players in the market rooted in an innovative approach to the services. These services without user activity are simply not working. If energy is becoming a dynamic entity, it requires attention and, therefore can become another load to manage for people instead of a solution. But core processes, developed in Work Package 2 of the research are there to avoid this risk. No good interface can be delivered if the process itself doesn't change. Google changed the interface of search engines because they deeply innovated the way search worked. ReDREAM aims to approach the energy topic with at least the same disrupting will.

We truly believe that the most we can show the dynamic flux of energy of the new market rooted in renewables, the more we are able to provide people with a clear overview of what happens, the more they will be confident in the innovation they are embracing. That is why the interfaces developed for the ReDREAM Ecosystem aim to put the user at the centre of the development process but at the same time have them feel involved directly in the energy transition process.

To pursue this goal, the Ecosystem needs data and people providing them, directly or through devices that they accept to install. This ambitious challenge will require the collection of energy and non-energy tools developed in WP3. Energy tools are capable of enabling the capacity for the consumers of participating in the energy market through an improvement of predictability of consumption patterns and consumer behaviour (D3.1-D3.3). Non-Energy tools will be focused on helping the user with new energy, mobility and comfort habits (D3.4-D3.7). The system will centralise the portfolio of innovations to develop this new paradigm.

The ecosystem interface, the object of this Deliverable, is fuelled by data using API described in D2.6, and all of them can be designed up to a point, that is the one reached at this time, where the full structure is deployed, together with its graphical layout and the links to the backend APIs for energy and non-energy services. As for any dynamic software product, we expect a second step to be performed once more data is introduced into the system and more feedback comes from real use, so

we conceived the whole system as flexible and expandable. Comments on further expansions are provided in the single chapters.

To accommodate the use of each national language, the platform will be accessible from four different URLs, one for each demo site:

- Italian demo: redreamenergy.it
- Spanish demo: redreamenergy.es
- UK demo: redreamenergy.uk
- Croatian demo: redreamenergy.hr

This Deliverable presents a consumer interface that is constantly evolving with the feedback of demo leaders and social partners in ReDREAM.

2 Interface for consumers in ReDREAM

As mentioned earlier, the development process of the interfaces was strictly connected to the outputs of T1.1. In fact, D1.1 was the main reference for the definition of the base structure and design of the app and the website. Additionally, continuous collaboration with Soulsight was held active throughout the advancement of the project in order for us to maintain a user-centric view and to have constant feedback from them regarding users' goals and characteristics. This relationship will be kept active until the very end of the project.

The interfaces first went through a design process using the outputs given in D1.1. This process consisted in defining typography styles and colour palettes and drawing the first mock-ups in order to gather feedback from partners as soon as the design process started. The constant feedback allowed us to quickly experiment with different interface styles (Figure 2) before finding the one presented at this stage of the project.
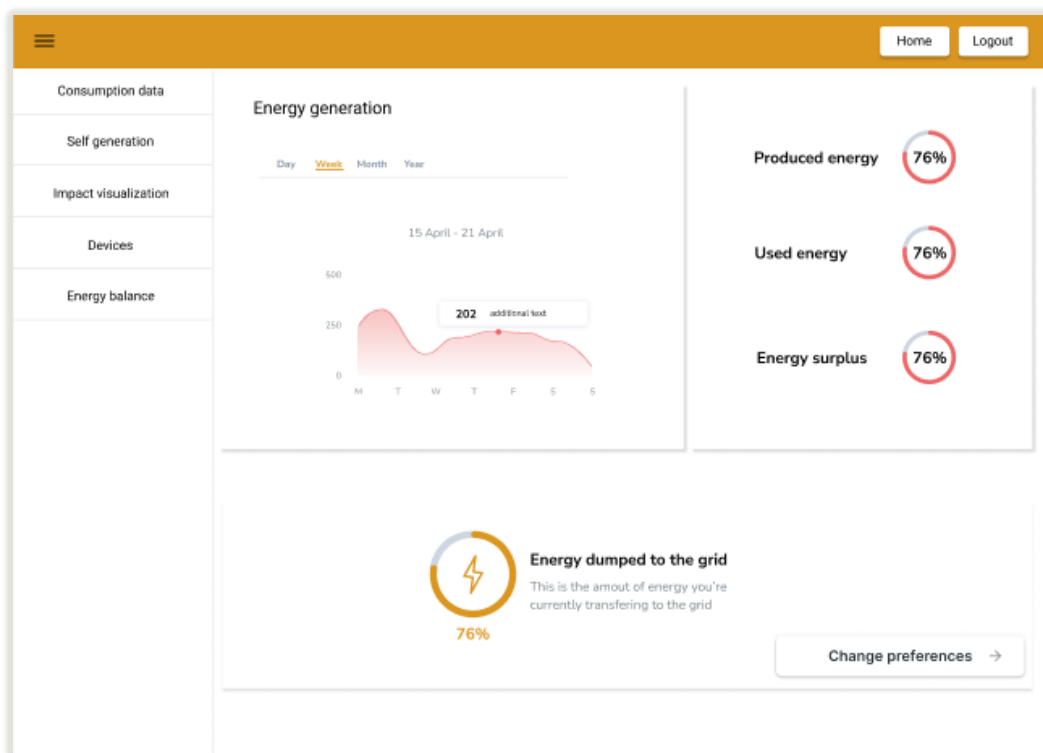

Figure 2 First draft of the interface

This first work was conducted mainly graphically through a platform called FIGMA, where it was possible for the team to test not just static layouts but also links and page interaction. The interaction in this environment provided enough flexibility to explore static pages or also linked sequences according to the depth of interaction at given times on the different topics.

As soon as the interaction defined a more refined version of the mock-ups in some parts, the actual development of the software started providing feedback on another level: existing graphical patterns and constraints, availability of libraries for additional functionalities and so on.

Therefore, the work was developed with continuous communication and collaboration between designers and software developers in a versioning process that was the key to building the interfaces as they are presented now. The flexibility of the adopted method is conceived to allow the system to

host new development and open paths to the interface, to host suggestions and feedback during the project development and further.

This concept is strongly supported by the technical choices for the implementation of the service. After discussions and evaluation of different options, the team chose to develop the platform as a single-page application (SPA) using the **Angular** framework (www.angular.io). This development path was chosen due to the advantages given by working with a highly supported and stable framework along with speed and reduced waiting time of a SPA.
A SPA is a web app implementation that loads only a single web document and then updates the body content of that single document via JavaScript APIs when different content is to be shown (MDN Contributors, 2021).

Around this base choice, additional libraries that have been used during the development are *Apache ECharts* for displaying the dynamic charts that showcase the user's data and *Leaflet* that was used for displaying the maps in the mobility service interface.

The mobile application for the interface is going to be published for Android and iOS. Xamarin .NET is the framework which we have chosen to develop both Applications, but because of some constraints of the Smartphones operating system, the interface would not be exactly similar to what Rimond has developed for the web. On the other hand, the functionality of mobile apps and web application is going to be the same.

For the sake of simplicity, the interfaces shown in the following section are all taken from the web application, but the structure of the mobile app is exactly the same; therefore, the functionalities described here are not different from the ones implemented in the mobile application.

3 Consumer Application Structure

The structure of the platform can be easily summarised by the side menu (Figure 3) that is used to navigate the website and is always available to the user. The menu shows the main sections: Dashboard and Settings. These two sections can be easily opened to display the corresponding submenus.

The Dashboard submenu includes Energy Balance, Consumption Data, Comparison, Virtualization, Self-Generation, Impact Visualization and Devices.

The Settings items are Profile, Alerts and Notifications, Data & Privacy, FAQ, Contact Details and Channels.
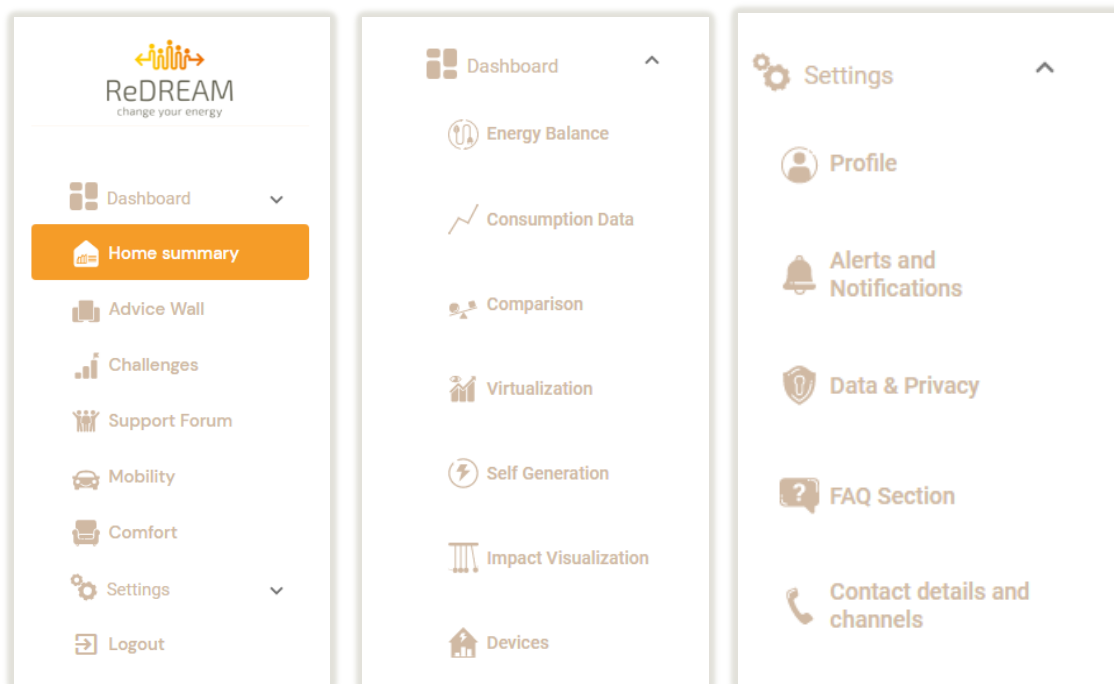

Figure 3 Navigation menu of the website

3.1 Home Summary

When the users first enters the application, they will get the *"Home summary"*, shown below in Figure 4. Here the user can have an overview of the current situation of the house regarding temperature, comfort and house settings.
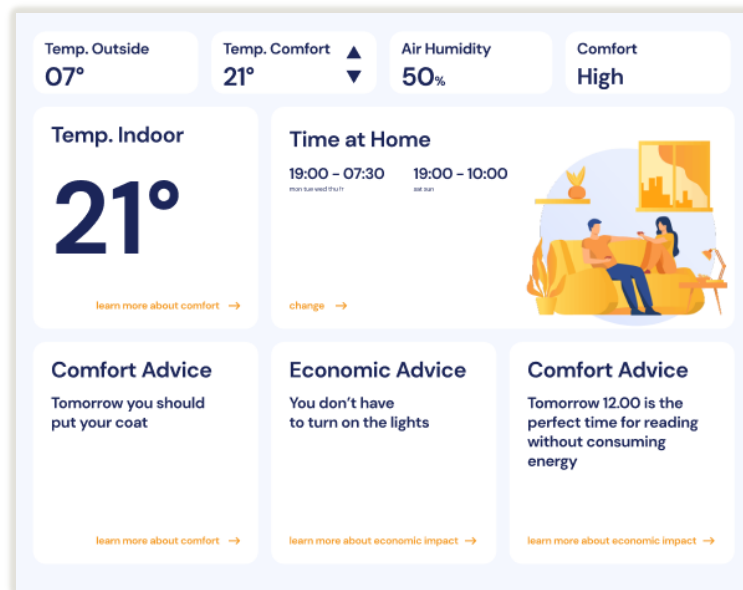
Figure 4 Home Summary page

The first four cards on the upper part of the page (Figure 5) show from left to right: the outside temperature, the comfort temperature, the humidity level, and the comfort level of the house. The humidity level will be the indoor humidity if the user has chosen to install an additional device to measure humidity in their house; if not, the humidity level described on the page will be an average humidity level calculated based on the data taken from the users from the same location that have chosen to install a humidity sensor in their house; if neither of those cases can be applied to the user, then the outdoor humidity will be shown based on the user's location, and the possibility to compute a calculated mean value from literature and best practices is also an option to be explored. All humidity data will be retrieved from NTUA's Comfort API.

The comfort temperature can be raised or lowered through the arrows located in the second card.

Figure 5 Home Summary detail – top cards: comfort conditions

The central body of the page is formed by two main cards (Figure 6): the first one shows the current indoor temperature and the second one displays the time slots that the user sets as "time at home". The time at home can be different between weekdays and weekends and it can be set and modified in the **Profile** page under the *Settings* menu.
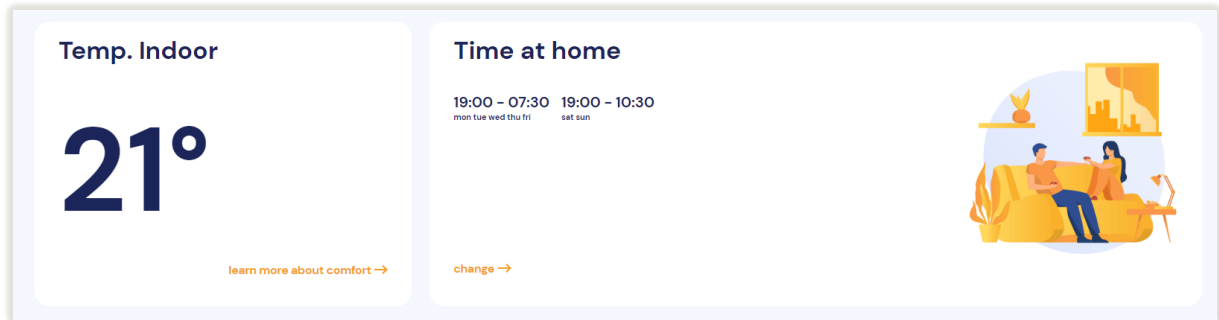
Figure 6 Home Summary detail – central cards: temperature and time at home

The last three cards (Figure 7) represent the most recent advice that the user gets through Stemy's advisory tool or through NTUA's comfort service; the different pieces of advice shown are not fixed as they will vary based on the different situations that the user faces each day. It is a space open for any other "what if" type of contribution, according to the "open" and expandable character of the interface structure. It is also the space where one can get pure feedback on how the house is performing.
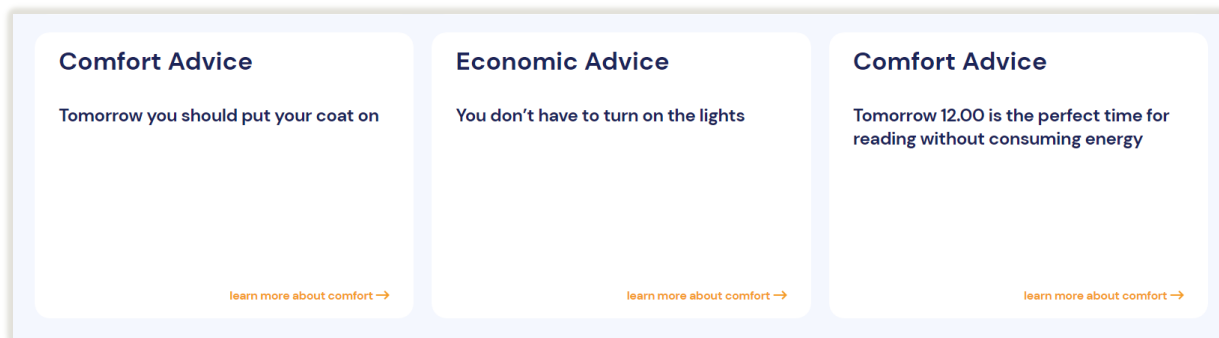

Figure 7 Home Summary detail – bottom cards: dynamic pieces of advice

All of these parameters, in the house, and these cards at the bottom more in depth, open up then to the technical "roots" of the ReDREAM interface: the Dashboard.

3.2 Dashboard

As mentioned in the D1.1, the Dashboard of the Ecosystem is designed as a group of functionalities spread between different pages that will let users visualise their energy-related data with the aim to make them aware of their current energy behaviour and triggering their motivation to act on it and eventually change it. It is, somehow, the "place of the action".

An important feature common to all parts of the Dashboard, is the possibility to "switch" at any moment between personal data and community data through a single Toggle button in the profile card, further shown as "Card A" in the Energy Balance paragraph. This highlights how much the project is about the single contribution to a community.

3.2.1 Energy Balance

The *Energy Balance* page (Figure 8) summarises the information about the user's energy consumption and generation, giving them the possibility to have a view at a glance of the current energy situation. What is my net balance? Am I consuming or producing? And how is the community going?

The data is currently expressed in kWh, but we are already working towards several hypotheses to move graphics to the simplest display and numbers to a more user-friendly unit since research conducted by Soulsight in D1.1 showed that people are more likely to engage with the platform if the data is represented to them in the most simple and understandable way. So we are currently exploring the translation of balance in Euro instead of kWh and of a clearer "balance" parameter instead of a long graph.
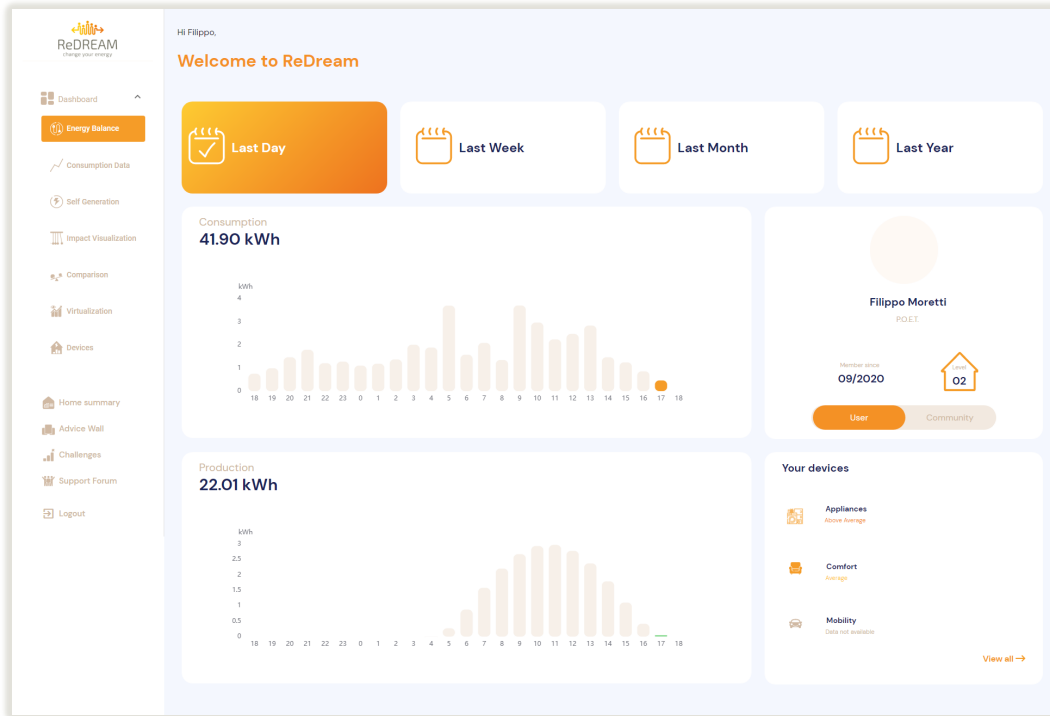

Figure 8 Energy Balance page

In the basic version of the energy balance page on the left side, the user can see the information about their consumption in the *Consumption Card* and their production in the *Production Card*. Both cards can be updated to show data per day (last 24 hours), per week (last seven days), per month (last 31 days), or per year (last 12 months) by toggling the four buttons at the top of the page. One enhancement that will be done in future versions is to give the user the possibility to choose precisely which date they want to see the data for in order to explore the consequences of special days (guests, no sun, etc).
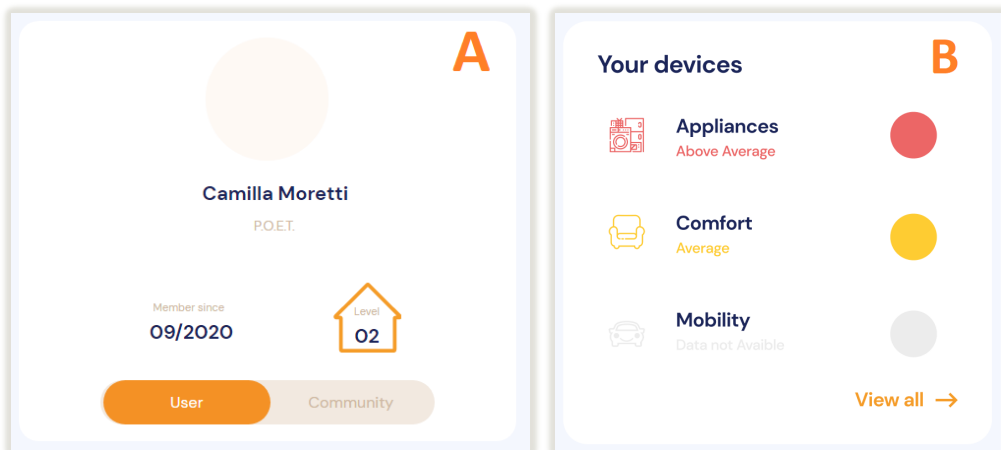

Figure 9 Energy Balance detail

On the right side of the page, the other two cards show respectively an overview of the user profile and a summary of the user's devices situation, taking Figure 9 as reference:

- **Card A - Personal Profile:** this card displays the name of the user alongside information like the date they joined the community and the current level of their home defined through the participation to the challenges as explained in section 3.3. The toggle at the bottom of the card allows users to switch between seeing their own data in the charts and the aggregated data of their community. As anticipated, this card will be repeated throughout the platform in almost every page.
- **Card B - Your Devices:** in this card, the user can have an outline of their devices' consumption by seeing if the consumption is above average, below average or on average compared to the average user in their community. The devices are divided into three main categories: *appliances*, *comfort* and *mobility*. The Ecosystem will only have information about the user's appliances through the use of the gamification service that will collect data about said devices. The status of the category's consumption is colour-coded: if the consumption is above average the icon, the caption and the circle next to the category's section will be coloured in red. If the consumption is on average, those elements will be yellow and if it is below average, everything will be coloured in green.

  If the user does not have any device in one or more of the categories the icon corresponding to that category will be greyed out and the caption will point out that the data about said devices is not currently available.

Figure 10 Future enhancement of Energy Balance pageFigure 10 shows an already-designed improvement to the Energy Balance page, where users will be able to closely witness the relationship between the energy they consume and the one they produce.
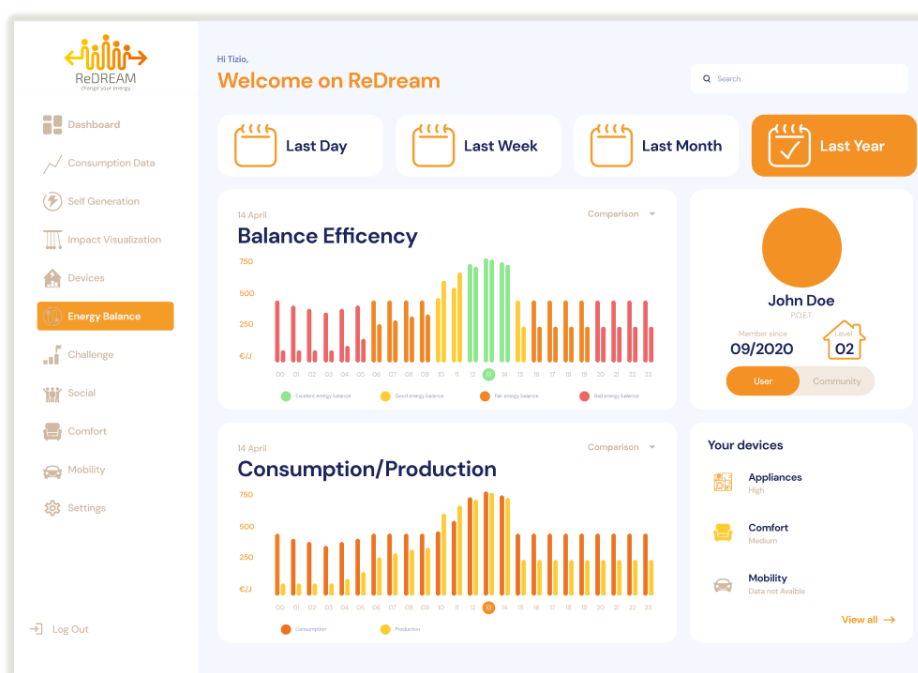

Figure 10 Future enhancement of Energy Balance page

3.2.2 Consumption Data

The *Consumption Data* page (Figure 11) shows details about the user's electric consumption in a given period of time (day, week, month, year). Here, the most important aspect of being highlighted is that the user can understand the components of its energy behaviour: where am I spending the most? It is the perfect starting page for decision making on new acquisitions (a new car, new appliances, HVAC or

envelope refurbishment, and so on). For many users, for example, it would show how much the house is "flexibilised" and how far the user is from that goal. In the plans there is a possible button to directly connect this with the virtualization page.

Figure 11 Consumption Data page

The right side of the page is the same as the *Energy Balance* page, whereas the two cards on the left side show details about the energy consumption both in general through a line chart and in detail dividing the consumption between the three devices categories (appliances, comfort and mobility) when possible.

3.2.3 Self-Generation

Similarly, to the *Consumption Data* page, *Self-Generation* shows details about the user's energy generation in a given period of time (day, week, month, year), as shown in Figure 12.
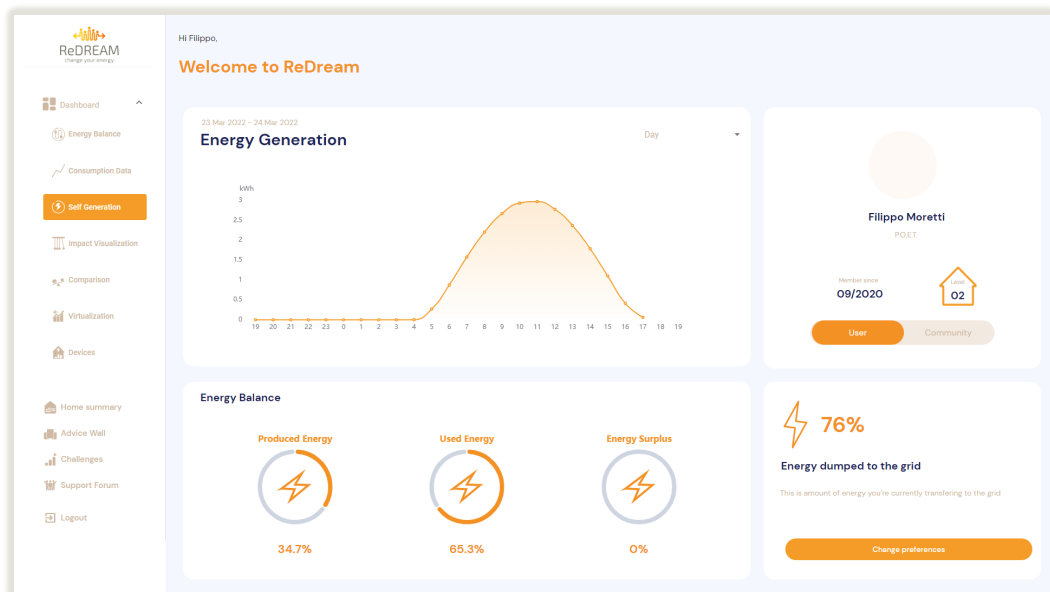

Figure 12 Self Generation page

The *Energy Generation* card displays a line chart filled with the energy generation data that can be filtered by the period of time, whereas the *Energy Balance* one shows the produced energy percentage compared with the consumed energy and the eventual energy surplus, that is, the energy produced by the user but never consumed.

The card in the bottom-right corner displays the amount of energy that the user is dumping into the grid: if the user has a battery, they can change preferences and choose not to transfer any energy to the grid; otherwise, the operation is automatic, and they would not be able to express any preference about it.

3.2.4 Impact Visualisation

This page displays details about the user's impact on three main levels: planet, economic and social.

Figure 13 Impact Visualization page

As seen in Figure 13, there is a chart for each level that shows the detail of the relevant data about the user's impact (per day, week, month and year) and another one that "translates" it to make it understandable to the user.

The data about CO_2 emissions and economic savings come directly from Stemy as it is calculated in their system.

The messages are currently limited to the ones shown in this document, but more examples will be added as the development process continues.

3.2.4.1 Planet Impact

The data displayed in this tab is the CO_2 emissions that were saved by the user expressed in kilograms. In the bottom card, the user will see the total amount of saved CO_2 in the chosen time period and a translation in trees. The correspondence between trees and kg of CO_2 is calculated based on the principle that over one year, a tree will take up about 22 kg of CO_2 from the atmosphere (European Environment Agency, 2012).

3.2.4.2 Economic Impact

In this tab, the user will see in detail the economic savings made by being part of the Ecosystem, the bottom card of the page will sum up the total amount of money that a user saved in the chosen time period and will give them clues about what that amount of money corresponds to, to make it easier

for the user to understand and quantify energy and the impact of conscious energy usage based on a unit they're already acquainted with (Figure 14). The shown message displays how many months of an average streaming service subscription correspond to the amount of money the user has saved, assuming that the average streaming service subscription costs 10 euros.
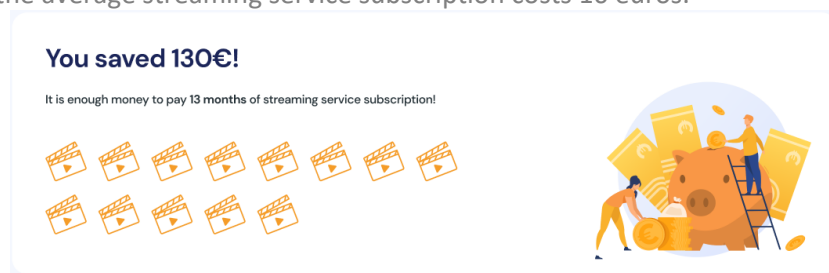

Figure 14 Impact Visualization (economic) detail

3.2.4.3 Social Impact

In this tab, users can understand the level of influence and impact they are having on the Flex Community. This aspect is relevant for people with motivation and/or attachment to their communities (city, neighbourhood association). Therefore, a scale from 0-to 100 has been established to grade the level of influence capacity the users have in their community.

The level is defined by the sum of points the user earns by performing different actions that create positive impacts, such as energy they have flexibilised, energy saved by efficient management or contributions to the challenges or the support forum. Thus, consumers gain awareness of how individual behaviours, choices, and actions impact, not only in their pockets or the environment but also in the communities they live and belong to.

The calculation and display of such information is currently in the works and will be released in a future version of the platform as we first focused on the technical development of the website and on linking the currently available data provided by Stemy to the new interfaces. The table below provides information about the current draft of the social impact level design: each action category grants the user a certain range of points (e.g. challenges completion can give from a minimum of 0 to a maximum of 40 points), the number of points given to the user is defined by the specific actions that the user performs that fall under that category, for instance if a user takes part to one challenge they would get the minimum amount of points in the range of the "Challenges Completion" category. Each specific action will correspond to a certain amount of points based on the complexity of the action itself; the sum of all of the points earned throughout the categories will define the social impact level. This feature is expected to be released in the next update of the platform.

Action Category	Points Range	Min action to get points	Action to get max points
Flexibilised Energy	0 - 20	Time Span of Energy Balance Optimized	Balance Optimized and Flexibilized Power Sources
Challenges Completion	0 - 40	One Challenge	All Challenges
Forum Interaction	0 - 40	Simple interaction (questions, base answers)	Publication of commented data (challenge results, other relevant data)

Table 1: Current social impact level design draft

3.2.5 Comparison

The *Comparison* functionality aims to let the user be more aware of their current energy and impact situation by letting them perform a historical comparison with the data collected by the Ecosystem in the previous year or the comparison with an average user calculated by taking into account the user's community data aggregated by average (i.e. the data of each member of the community that uses the Ecosystem divided by the number of users).
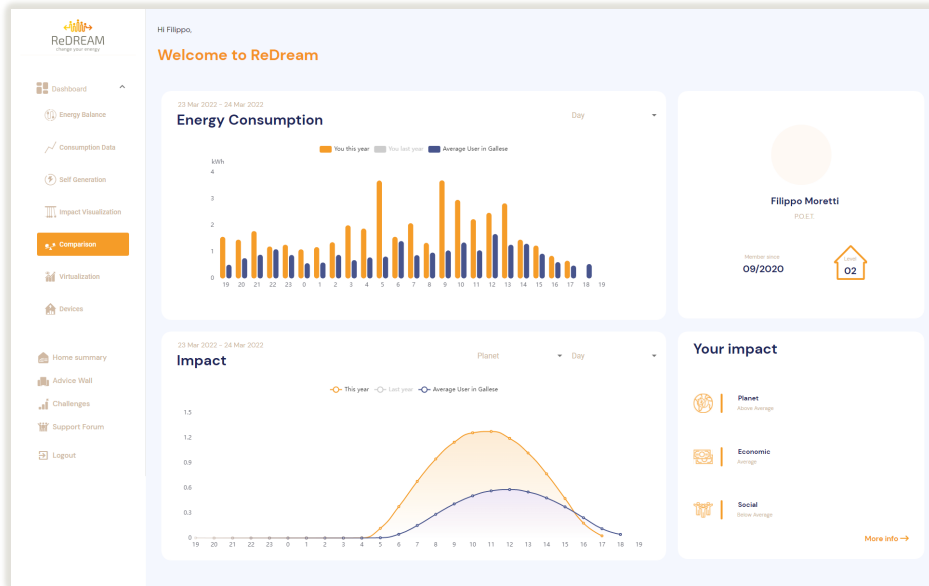

Figure 15 Comparison page

On the left side of the page displayed in Figure 15, a bar chart and a linear chart show respectively the comparison based on energy consumption and on impact data. The impact data shown in this chart at the moment only regards the planet impact (kg of saved CO_2) and the economic impact (money saved by being part of the Ecosystem), whereas the consumption data (Figure 16) is expressed in kWh but will be converted in a more user-friendly unit in the next update of the platform, for instance, euros.
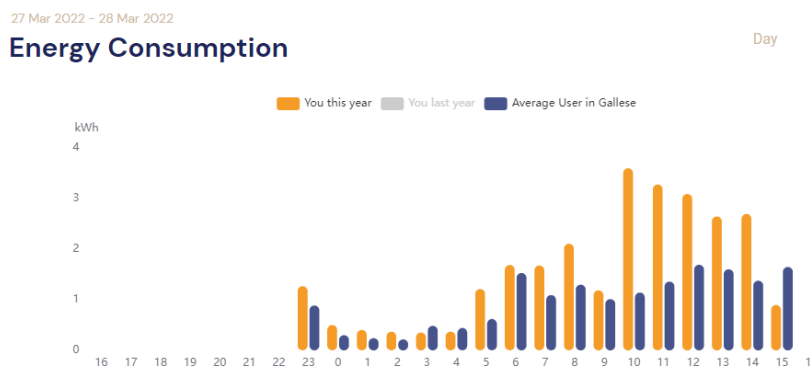

Figure 16 Comparison Detail (consumption)

The right side of the page has the same structure as the other dashboard tabs, with the profile card in the upper right corner and a card that summarises the user's current impact position (above average, average, below average compared to the average user in their location) in the bottom right corner.

3.2.6 Virtualisation

This section was planned in D1.1 and it aimed to virtualise certain actions to the user (like for example, installing a PV panel) and show them the comparison between their current situation and the virtualised one.
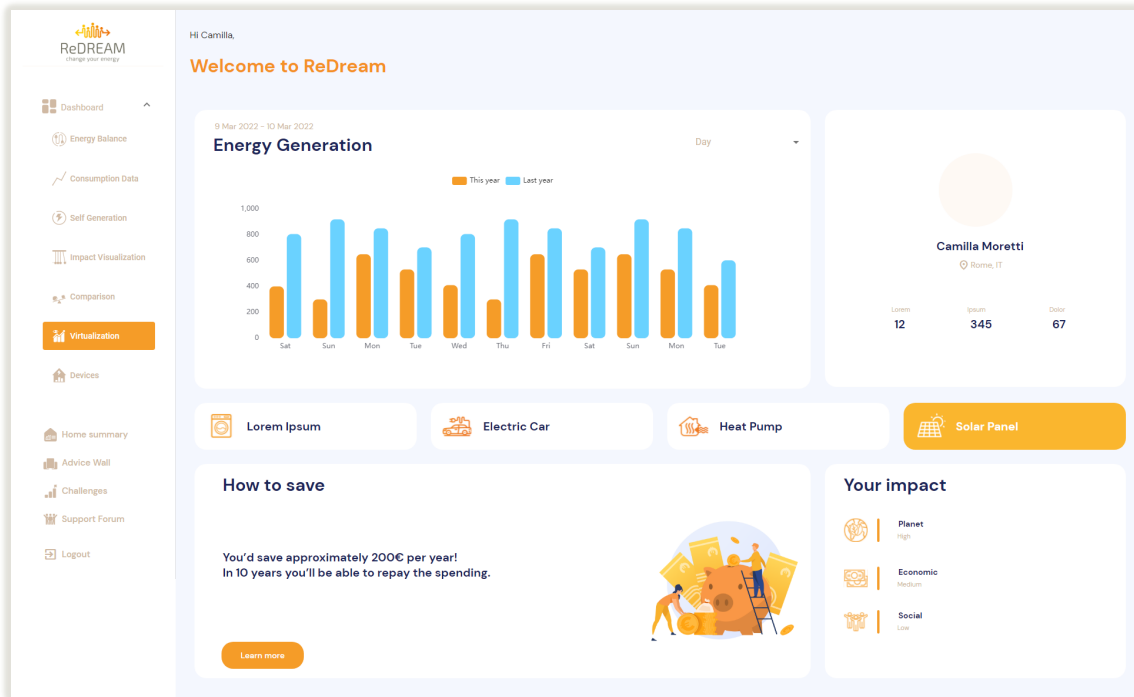

Figure 17 Virtualization page

The page follows the same card structure as the other ones, showing a comparison chart between current and virtualised behaviour in the first card, the profile summary in the second one and a summary of the possible impact situation based on the implementation of the proposed solution in the last one. The "How to save" card would display relevant information about the virtualised situation. The central cards act as buttons and allow the user to choose the virtualised situation they want to check.

The template for the interface (Figure 17) is ready but still needs inputs that would be received in a future phase of the project as an output of task T2.6. For this reason, this part of the interface will be omitted for the first launch of the website.

3.2.7 Devices

On this page (Figure 18), the user can have an overview of all devices registered on ReDREAM. The current available devices are the ones detected through Stemy's API, but in the future, they would be divided in three main sections: Appliances, Comfort and Mobility. The currently available devices mostly fall under the Comfort and Mobility categories, but concerning Appliances, we expect to collect data about single users' devices directly from users through the gamification service, by making it a challenge for them to measure their appliances consumption through a smart plug. This mechanism is further explained in D3.7.
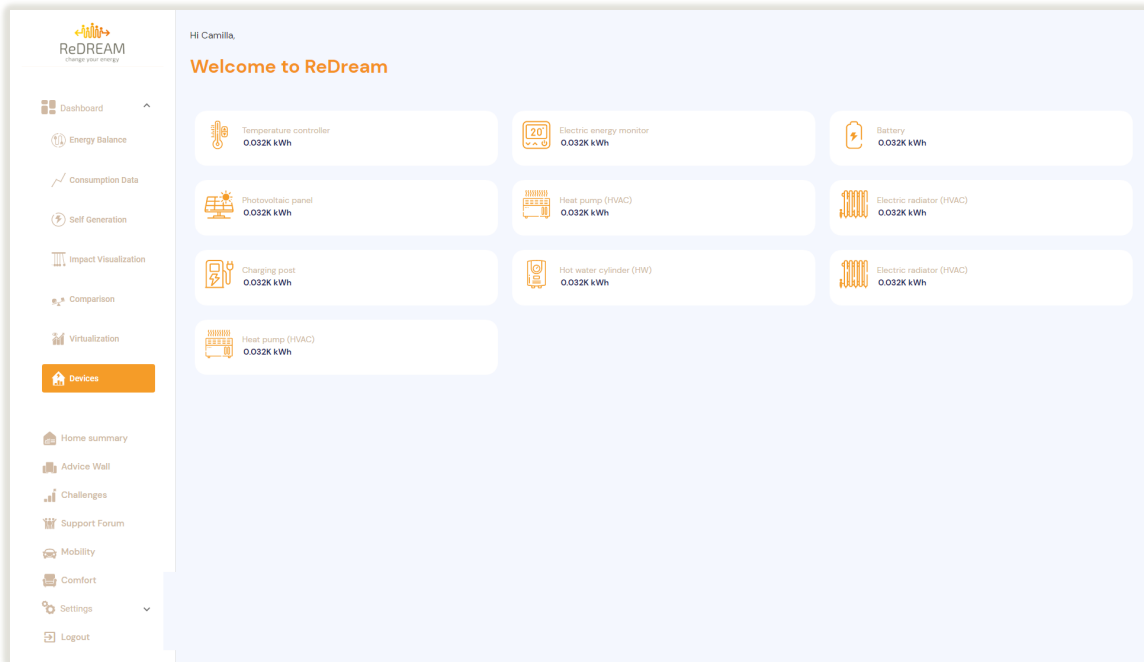
Figure 18 Devices page

Each card on this page represents one device and gives basic information like name and consumption (if it's the case). Each element acts as a button that, when clicked, will redirect to the *Device detail* page.

3.2.8 Device detail

Figure 19 is the page that was designed to display the detailed data about each device. The following image is just an example, as the actual interface would slightly change based on the properties of each device (for instance, a PV panel would have "Energy Generation" instead of "Energy Consumption").
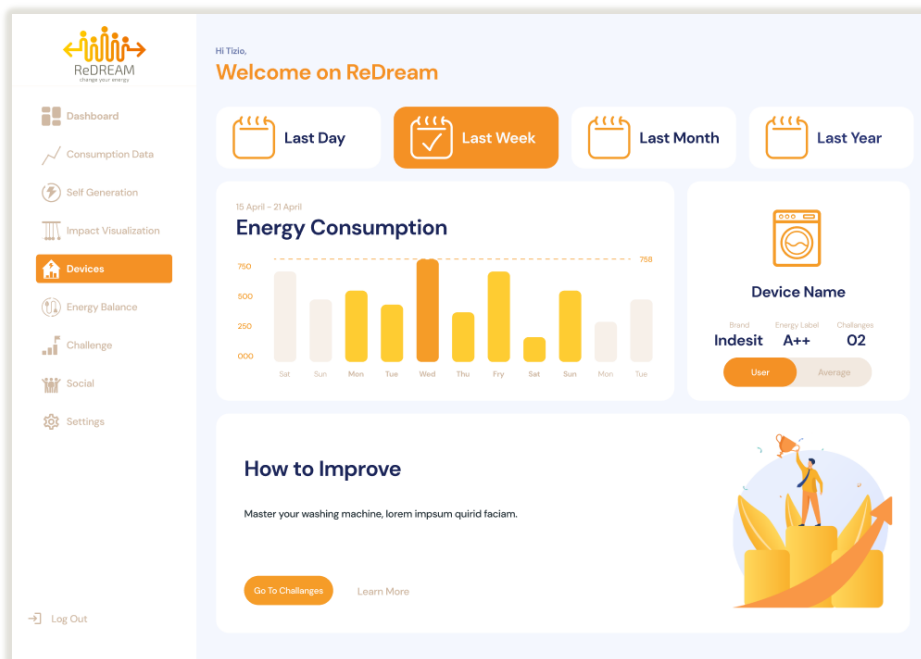

Figure 19 Device Detail page

The first four cards on the upper side of the page act as buttons that let the user filter the device data based on the chosen time period. The other cards respectively represent (from left to right and top to bottom):

- **Energy Consumption:** this card would contain the energy consumption chart if the device is an appliance or if the energy consumption data of the device can be tracked; otherwise, it would contain relevant information about the properties of each device.
- **Device card:** this card will sum up the basic features of the device (name, brand, energy label) and the number of challenges the user has taken part in with that device (if any); the switch at the bottom enables the user to compare their data with an average user's data relative to that device, if available.
- **Suggestions card:** this card would display suggestions concerning the device; for example, if there is an available challenge that involves such device it would be displayed here, encouraging the user to take part in it. The message shown will be fixed at first but with further development of the different services of the project the content displayed to the user will also develop, and different messages will be provided and shown on rotation.

3.3 Advice Wall

This page displays the outputs of the Advisory Tool described in deliverable D3.1.
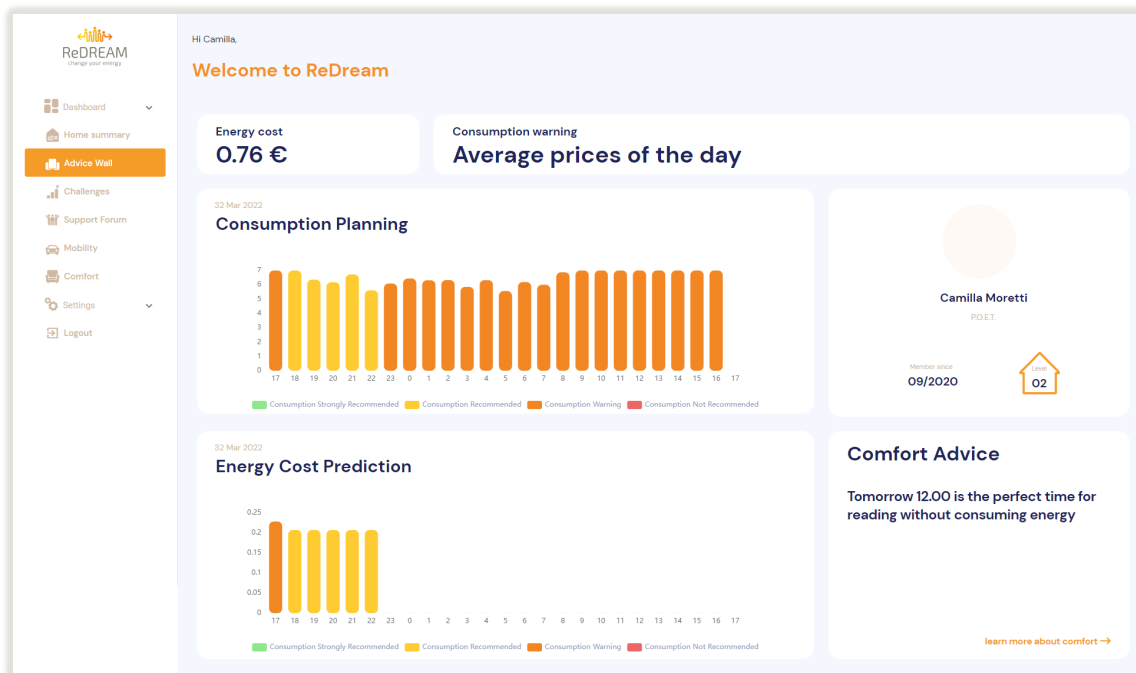

Figure 20 Advice Wall page

As shown in Figure 20, the layout of the page is similar to the other pages in the dashboard, the top three cards display the predicted energy cost at the current time and the recommendation value relative to the selected time (the default is the current time).

The two visible charts respectively display the Consumption Planning and the Energy Cost prediction based on the inputs received from the Advisory Tool as described in D3.1 and using the API delineated in D2.6. The remaining cards are the usual profile card and an advice card which will display advices like the ones displayed on the H*ome Summary* page.

In future versions of the interface, this page would probably be reached only by users who are actively interested in knowing the technical part of their energy behaviour. The majority of users will mainly interact with the actual advices displayed on the *Home Summary* page.

3.4 Challenges

This section of the interface is linked to the Gamification Tool described in the deliverable D3.7. This interface was built to display the various challenges that a user could take part in (Figure 21).
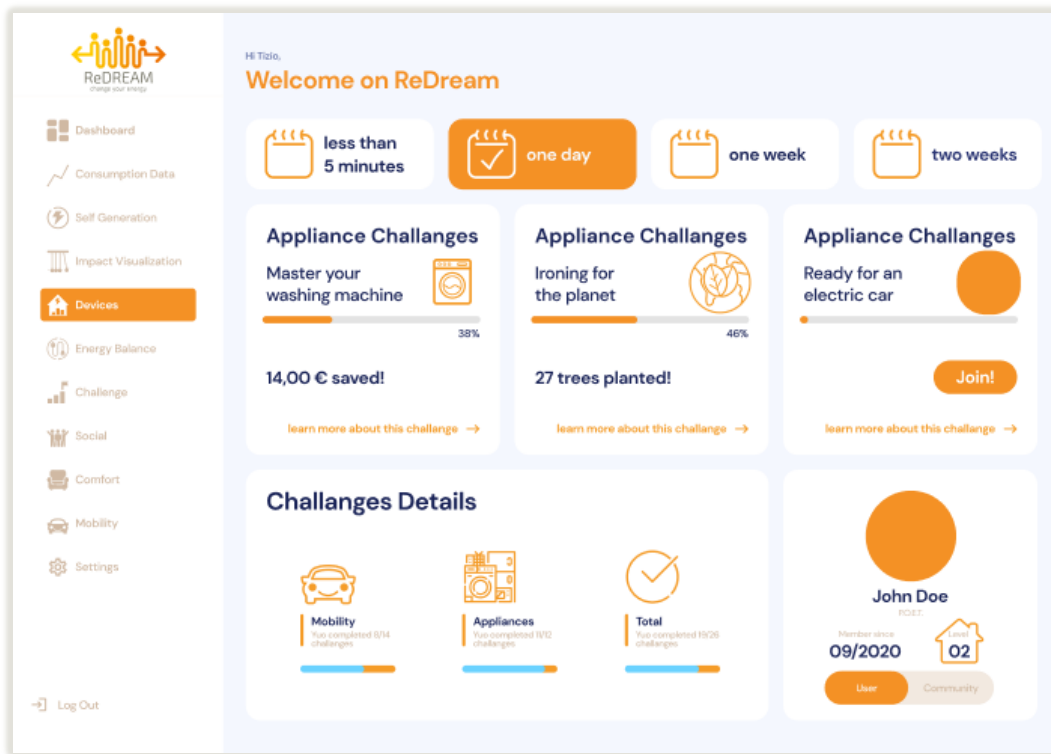

Figure 21 Challenges page

The page is structured as follows: the top four cards allow the user to filter the challenges by duration, while the middle part is a horizontally scrollable collection of cards that showcases all the available challenges for the user. The "*Challenges details*" card displays a summary of the user's challenges situation, that means the number of completed challenges divided by mobility and appliances sections and the total number of challenges taken.

The challenges presented in Figure 21 are only an example to show the current state of the interface, they will be further developed in future versions of the platform. The current available challenges are described in D3.7.

This page displays the details of a single challenge such as description, steps, progress of the user in the challenge (Figure 22).

The top progress bar indicates the overall progress of the user in the challenge, while the four cards below respectively represent:

- **Card A:** description of the challenge
- **Card B:** steps of the challenge and user progress in each step. Each challenge is divided in steps (or levels). Each step needs to be completed to unlock the next one.

- **Card C:** additional information about the challenge or the entities the challenge is based on and a link to the social network thread dedicated to the challenge, where users can discuss the challenge itself or share their progress with the community
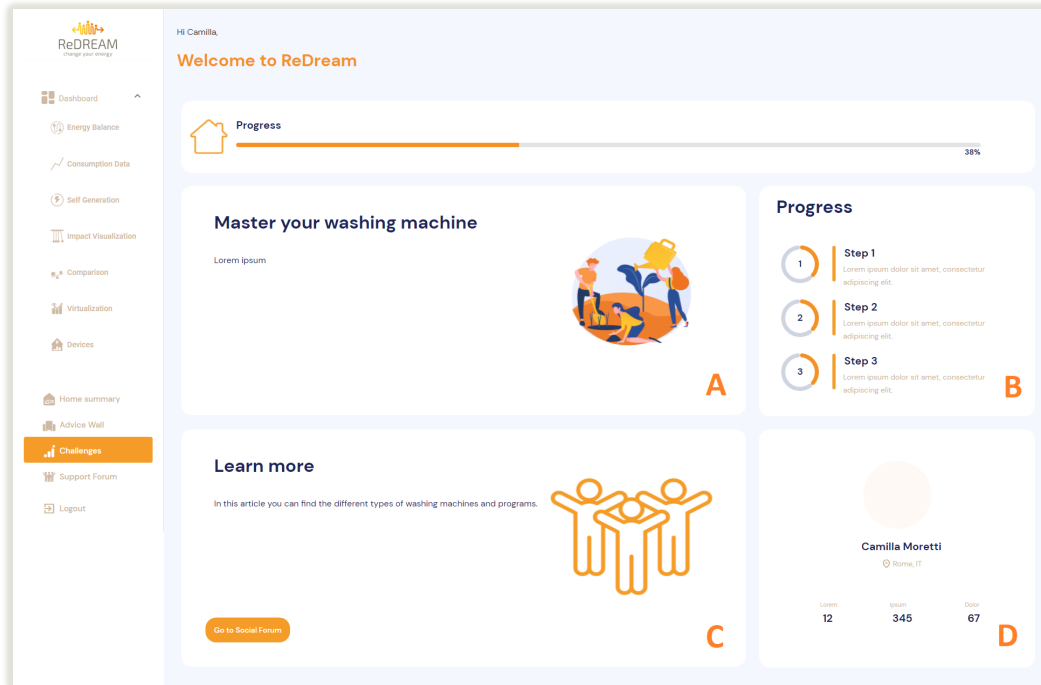- **Card D:** profile summary card

Figure 22 Challenge Detail page

3.5 Mobility

This page implements part of the *Mobility Service* described in D3.5.

The main functionality of that service is the "Routing tool" that is shown in the image below (Figure 23).
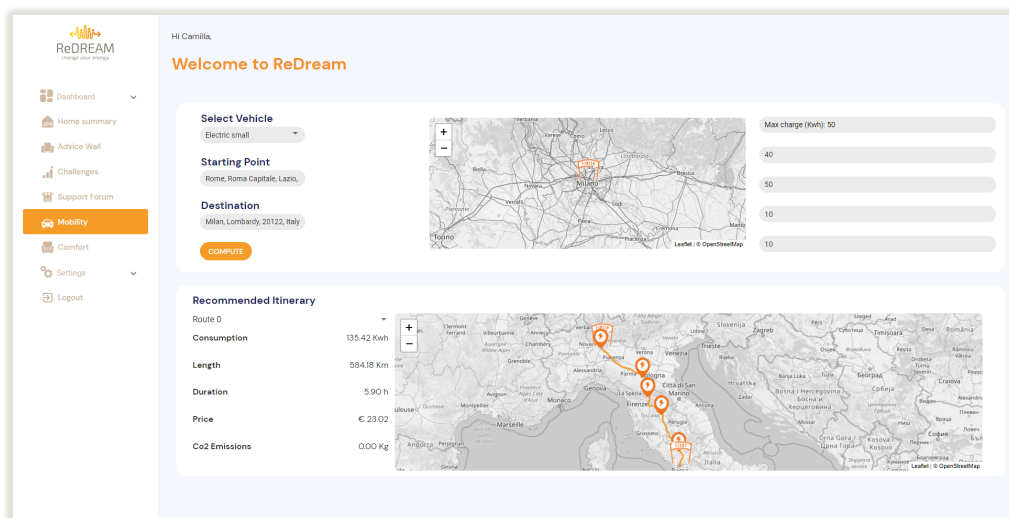

Figure 23 Mobility page

With this tool, it is possible to calculate the consumption and the cost of travel depending on the chosen vehicle: the user will be able to choose the closest vehicle type to the one they own and based on that, they would need to fill in the form on the top right part of the page that contains information about the charging situation of the vehicle (only for electric vehicles). After that, the user only needs to insert the starting point and the destination and the mobility service will return a list of possible routes that will be shown on the resulting map, along with the information about energy consumption and CO_2 emissions related to the route. If the chosen vehicle is electric, the route will also include the positions of the necessary charging posts where a stop is needed to arrive at the destination with the desired charge level.

As the Ecosystem is in constant evolution, the next version of this interface will comprehend the possibility to choose public transportation or pedestrian as an alternative to the current vehicle choices to calculate the route or the possibility to choose a hybrid option.

3.6 Comfort

This interface implements the *Comfort Service* described in D3.6 (Figure 24). The main Dashboard is presented with four cards: a card for *Inputs* a card with a *Psychrometric Chart (Card A in the image),* a card with a *Radar Chart (Card B)*, and a card showing *Tips (Card C)*, featuring a human character, to highlight from the very beginning the strict relationship between comfort levels and personal conditions, including behaviour.
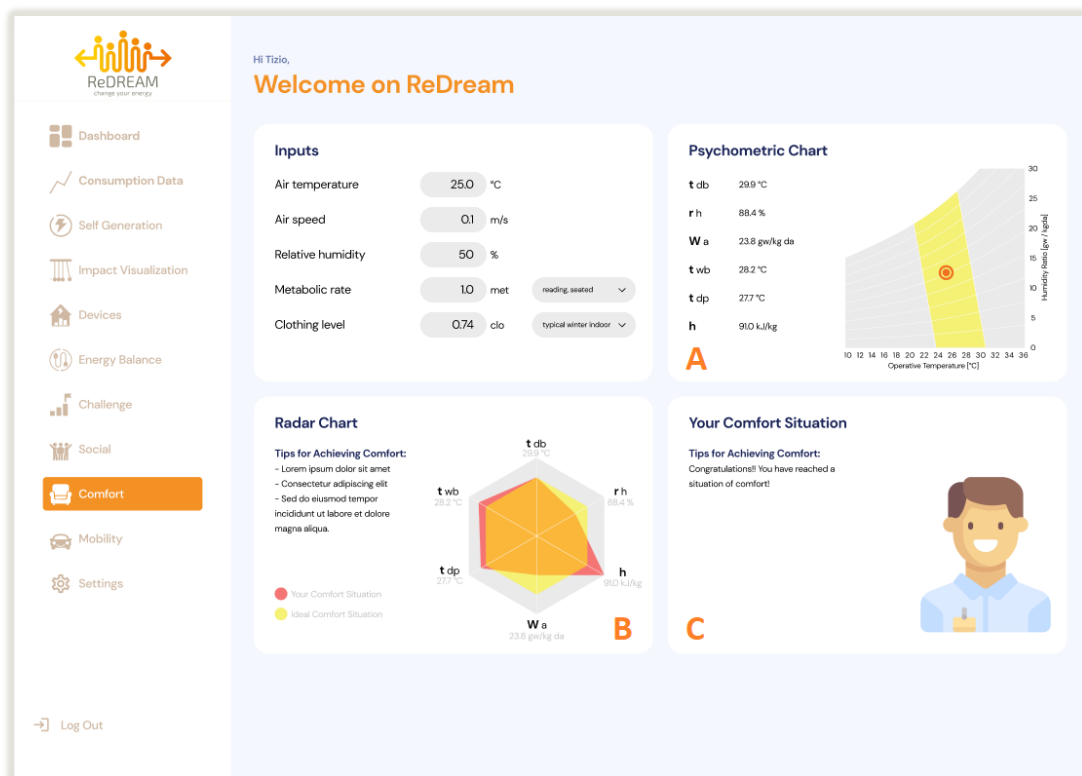

Figure 24 – Comfort page

The *Inputs* card displays all of the parameters needed to calculate the current comfort level: air temperature, air speed and relative humidity will be auto filled with data taken from Stemy devices, public APIs or from the humidity sensor for the users that agreed to install it as an additional device, whereas the metabolic rate and clothing level will be filled in by the user through a drop-down menu

(Figure 25). The values will be expressed as words that are understandable to the user, each term corresponding to a specific numerical value that will be sent to NTUA's back end for the needed calculations. The metabolic rate represents the level of activity of the user (e.g. reading, walking, etc.), whereas the clothing level specifies how the user is dressed (e.g. trousers and a long-sleeve shirt, trousers and short-sleeve shirt, etc.). All of the above-mentioned values are needed to calculate the user's current comfort level through NTUA's Comfort Service, that is thoroughly explained in D3.6.
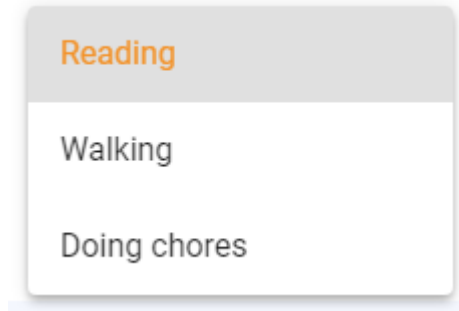

Figure 25 Example of drop-down menu for metabolic rate

The remaining three cards show the result of the calculations done in the back end by the comfort tool developed by NTUA, in detail:

- **A Card:** displays the technical psychrometric chart that shows the comfort zone highlighted in yellow in the example and the current comfort situation of the user pointed with a dot on the chart: if the dot is within the yellow area the user's comfort situation is optimal, if it's outside that area they might need to perform some actions to go back to the optimal comfort level in their home
- **B Card:** this card displays the same comparison between the user's current comfort level and the optimal one by using a less technical and more user-friendly chart. The choice of this chart still needs to be defined as the lower technical level might affect the accuracy of the user's perception of the displayed data and might lead to some misunderstandings
- **C Card:** this card will explicitly inform the user about their comfort level and if it's the case it will display tips for the user to improve their comfort based on the information received through the calculations. They could be related to the physical environment and its systems, but also personal behaviour (i.e. clothing, activity). These tips will also be displayed as text (e.g. *"Your comfort temperature is currently set at 23º. To save energy you could lower it at 20º and put on a sweater."*) in the *Home Summary* page.

3.7 Social Forum

This section presents the interfaces of the Energy Social Network described in D2.4, the Deliverable that explains in detail all its functionalities. The interfaces for the Social Network were designed in order to maintain continuity and coherence with the rest of the platform by keeping the same "look and feel" of the dashboard. In this way there is no risk that the user gets confused by feeling like they are entering a totally different platform.
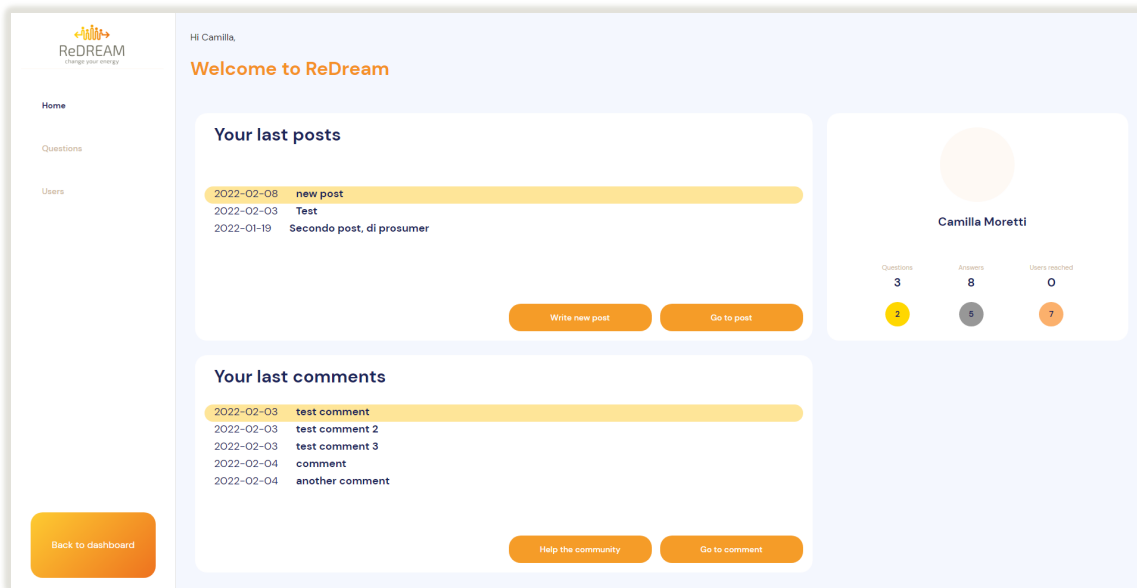
3.7.1 Home

Figure 26 Social Forum Home Page

The home page of the social network (Figure 26) displays in its main space an overview of the last personal activities of the user, such as the latest posts and comments. It also provides a quick link to the user's social profile and to functionalities like writing a new post (Figure 27). The side menu shows three links to its sections: *Home*, *Questions*, and *Users*.
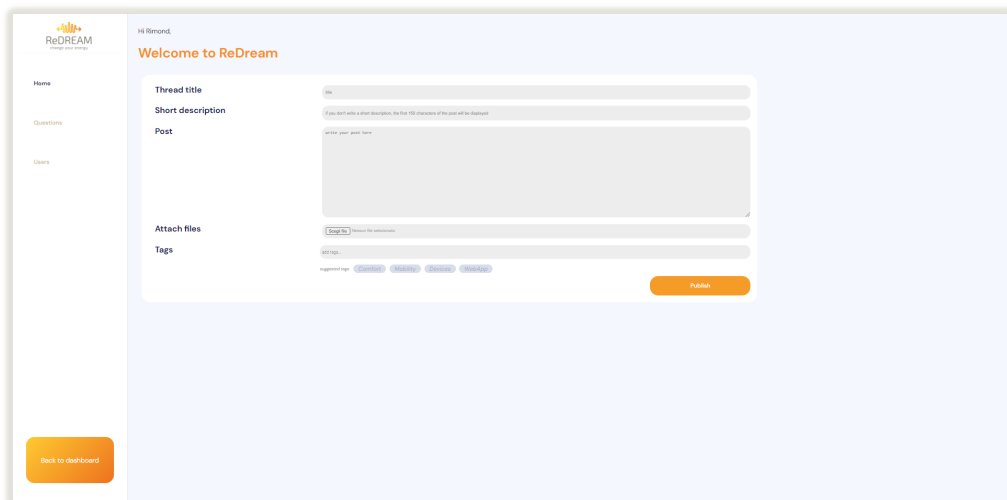

Figure 27 Social Forum New Post page

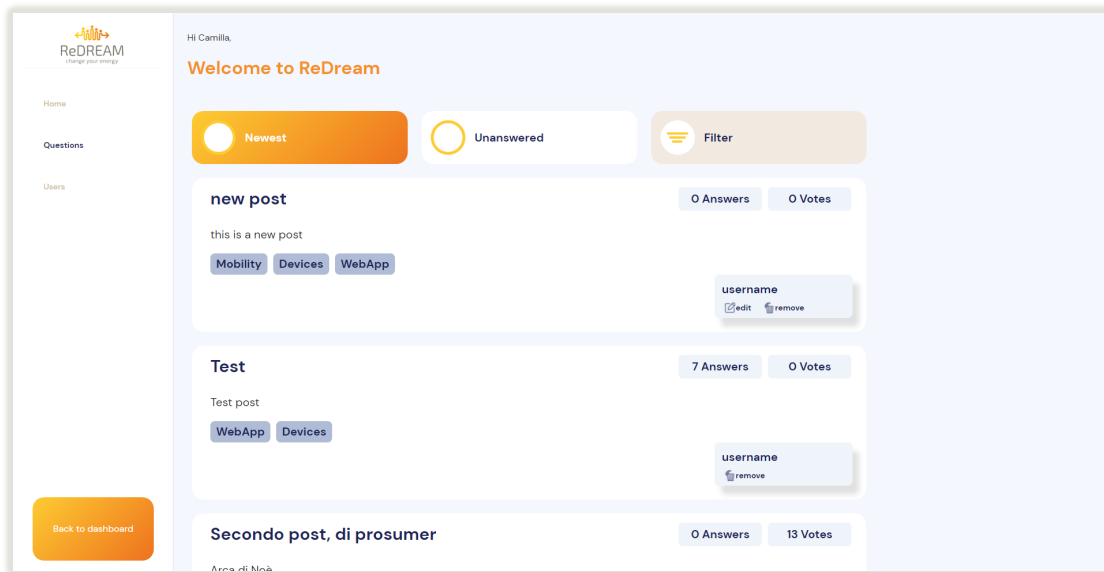### 3.7.2 Questions feed

Figure 28 Social Forum Feed

This page (Figure 28) represents the core of the social network, where the user can see the posts from the community and interact with them by commenting or voting on the posts based on their content. The user is also able to filter the questions displayed in the feed based on parameters like publish date or tag.
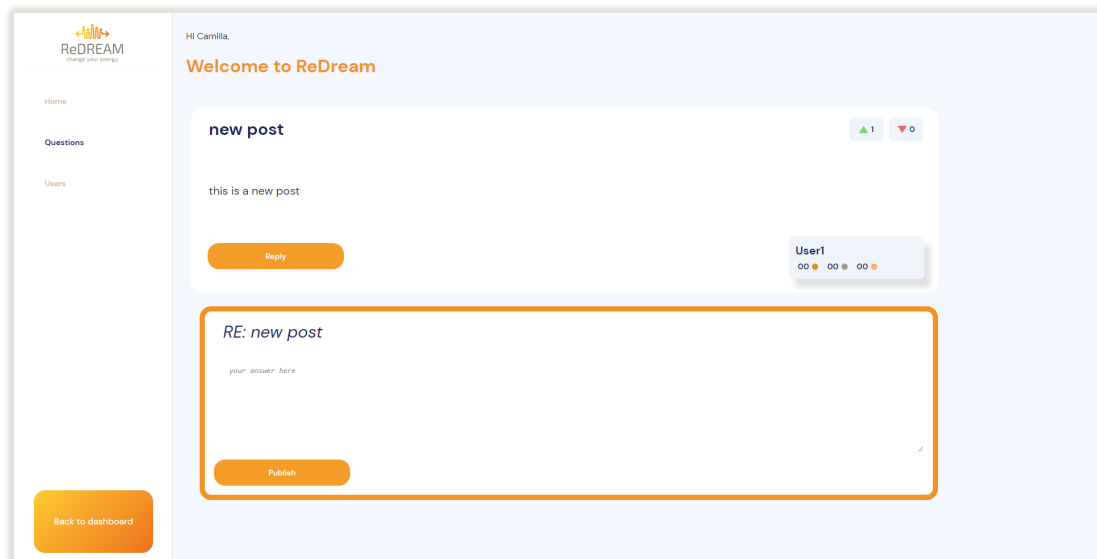

Figure 29 Social Forum Post Detail and Add Comment

By clicking on a post title the page will switch to the post detail that displays all the information related to the post (content, upvotes, downvotes, comments). Any user will then be able to comment the post (Figure 29) and upvote or downvote it by clicking on the upvote/downvote buttons on the top-right corner of the card (Figure 30).
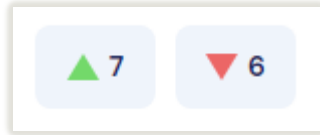
Figure 30 Upvote and Downvote buttons
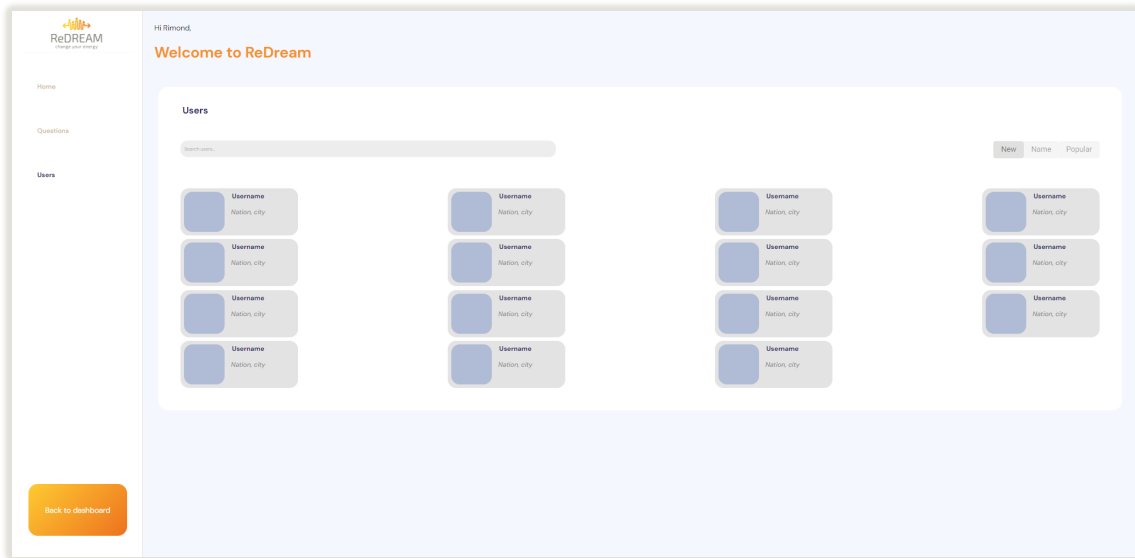
3.7.3 Users

Figure 31 Social Forum Search Users page

This page (Figure 31) will show a list of the users in the user's community along with their basic information. Each user can choose the level of privacy and how much information to share with the community. By clicking on an element of the list, the user will be redirected to the selected user's profile (Figure 32), where they will be able to see what the other user has chosen to share, like profile stats and badges. The badges shown in the social network profile are linked with the interaction with the forum itself, so the users will be able to earn badges based on how much they post, comment or cast votes in the forum, as will be further explained in D2.4.
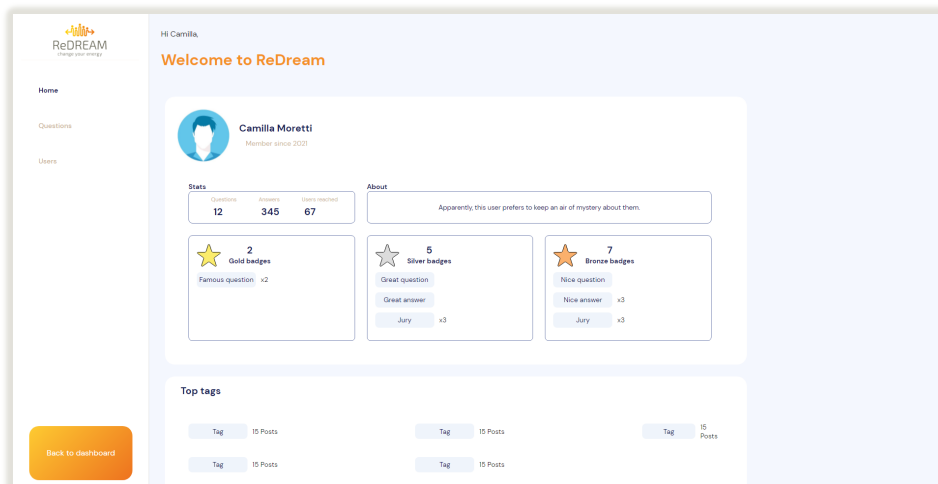

Figure 32 Social Forum User Profile

3.8 Settings

This section of the platform includes a group of functionalities that let the user update their information and personalize the platform.

3.8.1 My Profile

This page (Figure 33) aims to give the user the possibility to update their information and keep track of their progress within the platform.
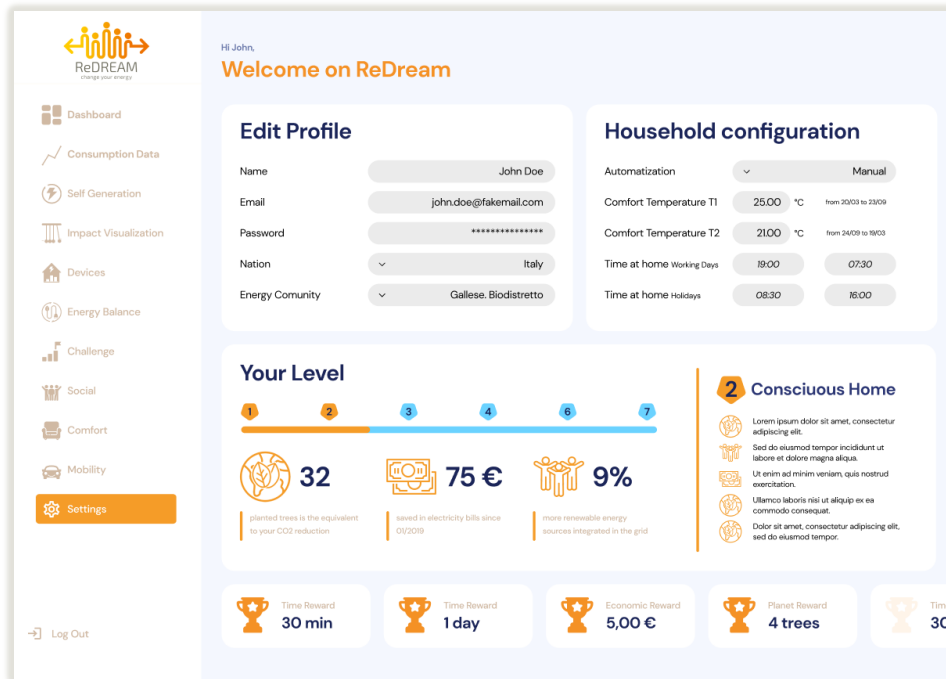

Figure 33 My Profile page

In the "Edit Profile" card the user will be able to update their personal information such as name, email, password and address, whereas in the "House Configuration" card they will have the possibility to overview and set up parameters like the comfort temperature of the house or the automatization mode as well as the time at home during working days or holidays.

The second half of the page showcases the current situation of the user under a gamified perspective by showing the *Home Level* of the user calculated based on the level they get to by taking part in the challenges developed in the Gamification Service. The slider at the bottom contains all the rewards earned by the user through participation in challenges.

At this stage of development, the only factor considered for the user's level is the participation to challenges, but as the development is still in progress, we are researching for ways to include other factors in the computation of the level of each user, such as the badges earned through the interaction with the social network or the user's flexibility status.

3.8.2 Alerts & Notifications

This section aims to let the users manage their preferences in terms of how and which alerts and notifications they want to receive from the platform.

As mentioned in D1.1, **notifications** will be those events related to the regular use of the application, while **alerts** will concern extraordinary events.
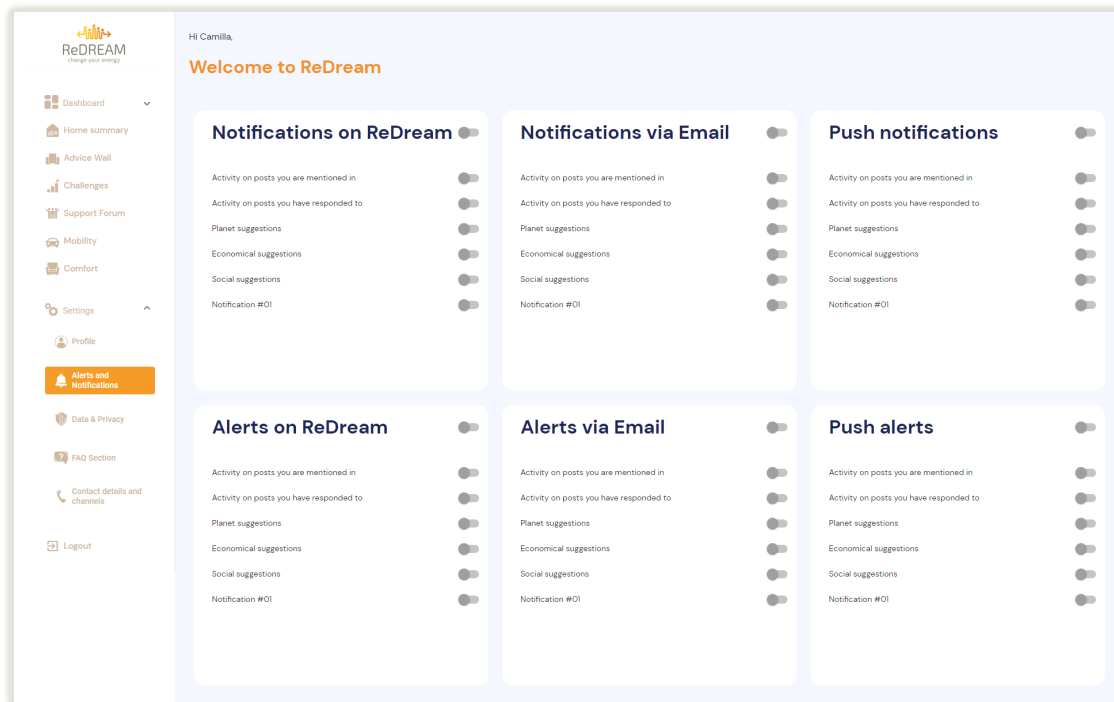
Figure 34 Alerts and Notifications page

Through this page (Figure 34) the user will have full control over which alerts/notifications they want to receive and how they want to receive them. The structure of the interface is simple: it is a collection of six cards each containing a set of slide toggles that can be actioned individually or by groups (the slide toggle next to the title on each card activates all of the toggles inside that card). At this stage alerts and notifications are still not being sent, so we decided to provide a general vision of the possibility that the users might have in terms of personalization of their experience even though the notification groups seen in Figure 34 will be narrowed down to less, more specific notification types. We will mainly use push notifications in the first stages that will redirect the user to the specific section of the app that concerns the received notification.

3.8.3 Data & Privacy

This page (Figure 35) contains information about privacy settings and aims to inform the user about the purposes of the usage of their data. Data are an asset, and they are today as we know at the root of many successful businesses, but people are rarely aware of the power they own. The idea behind this interface, again, beyond its technical need, is to provide a "comprehensive" view to the user of their, let's say, "data portfolio".
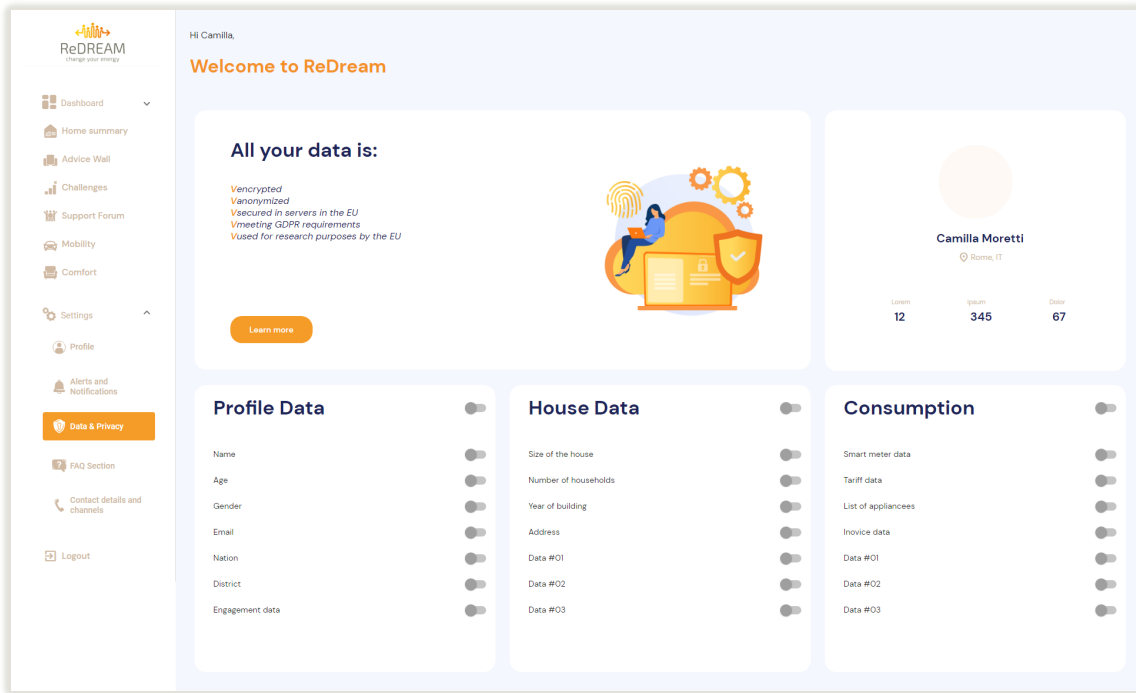
Figure 35 Data & Privacy page

In the upper part of the page, the basic concepts about the way user data is treated are summarized and the user may be presented with more information about it by clicking on the "Learn more" button. The bottom half of the page contains three cards that follow the same principle as the cards in the *Alerts and Notifications* page, in this case, the user is able to choose which information they want to share with the community in order to make them visible in other parts of the platform such as *Social Network* or *Challenges* section.

3.8.4 FAQ

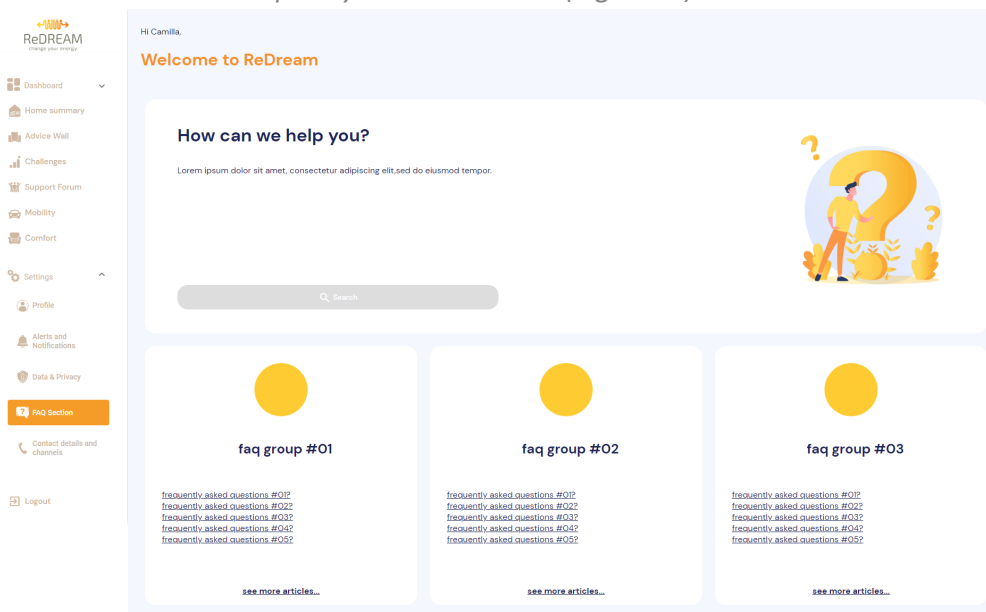This page contains the list of *Frequently Asked Questions (*Figure 36*).*

Figure 36 FAQ page

The questions are divided into groups, but they can also be searched through a search bar located on the first card. This page could also be connected to the social forum by gathering a list of very common questions posed by the users in the forum and displaying them in one of the *faq groups*. This operation will be done manually: moderators of the social forum could be the ones in charge of that as they can easily keep track of the most asked questions on the platform.

On the first launch, the FAQ will be the ones currently displayed in Stemy's platform. Then the list will be further developed based on feedback from users.

3.8.5 Contact details and channels

The purpose of this section is to provide assistance to users with a human perspective in mind. The idea was to assign each user to an adviser and to help them communicate with said adviser whenever they have issues regarding the Ecosystem.
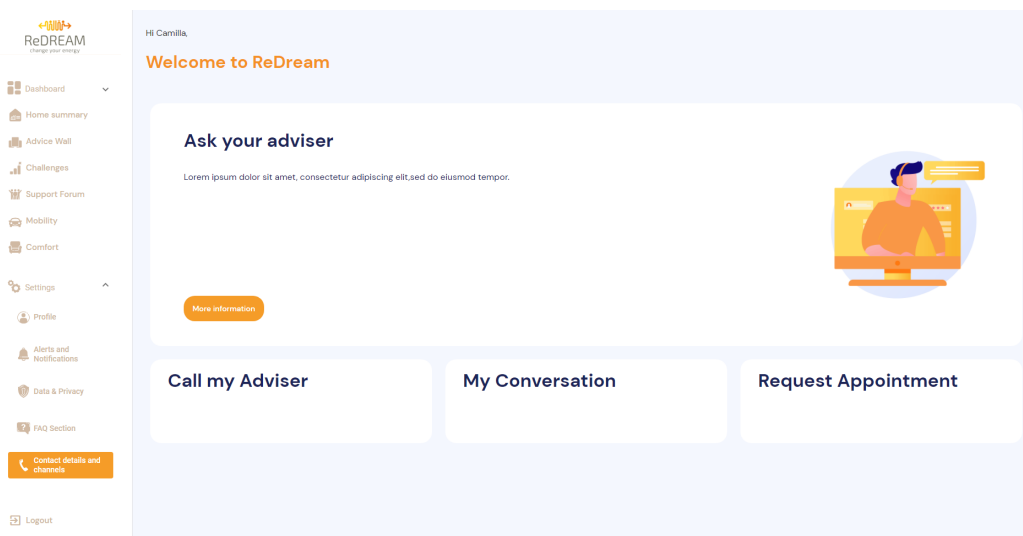

Figure 37 Contact Details and Channels page

This service is one of the least developed ones as at this stage of the project a lot of parameters still need to be defined in order to provide such a utility. It is shown here to ensure that the template is ready to be used whenever the service will be further developed but for the first launch of the website it will be omitted and a list of the relevant contacts for customer support will be shown (Stemy and/or Demo contacts).

4 Summary of functionalities and current status of the platform

	Functionality	Source of Data	Status
	Dashboard		
	Energy Balance	Stemy	Fully Developed
	Consumption Data	Stemy	Fully Developed
	Comparison	Stemy	Fully Developed
	Virtualization	Stemy	Template Developed
	Self-Generation	Stemy	Fully Developed
	Impact Visualization	Stemy	Template developed. Social Impact is still being designed
	Devices	Stemy, Rimond	Template Developed. Relationships with challenges are still being designed.
	Home Summary	Stemy, NTUA	Template Developed. Pending some inputs.
	Advice Wall	Stemy	Template Developed. Pending some inputs.
	Challenges	Rimond	Template Developed to be connected with the Gamification Tool
	Support Forum	Rimond	Fully Developed
	Mobility	UBFC	Fully Developed

	Comfort	NTUA	Template Developed
	Settings		
	Profile	Stemy, Rimond	Template Developed, pending some inputs
	Alerts and Notifications	Rimond	Template Developed
	Data & Privacy	TBD (Timelex?)	Template Developed
	FAQ Section	Stemy	Template Developed
	Contact details and channels	TBD	Template Developed

Table 2: Summary of functionalities and status

5 References

European Environment Agency. (2012, Jan 6). *Trees help tackle climate change.* Retrieved from European Environment Agency: https://www.eea.europa.eu/articles/forests-health-and-climate-change/key-facts/trees-help-tackle-climate-change

MDN Contributors. (2021, Oct 8). *SPA (Single-page application)*. Retrieved from MDN Web Docs: https://developer.mozilla.org/en-US/docs/Glossary/SPA