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WP7: Motivating citizens towards the vision

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1 Introduction

Air quality is a very important factor that has a severe impact to the health of millions of people around the globe. Together with climate change, they play a most important role to the quality and the expectance of the population, with those residing in or close to urban environments being the most affected. To address the growing problems, more and more policies and measures are being adopted in Europe, as all over the world. To successfully improve air quality and revert climate change – especially in urban environments – the behavior of the citizens would needs also to change. This has been understood long time ago and thus numerous campaigns and activities targeting to the sensitization of the general population are being organized by public and private institutions. The promotion of behavioral change is done through many available means, such as informational campaigns through the press, events and activities organized in several places and, of course, through the use of modern technology.

ICARUS user-centric tools aim to combine the data and the know-how acquired by the Consortium and combine it with the possibilities that the web, mobile applications and smartphone-based sensor devices offer to raise awareness on the effects of citizen behaviors on air quality and climate change so as to actively engage them towards a shift to a more environment-friendly lifestyle.

The purpose of this deliverable is to analyze the requirements of the user-centric tools, in order to serve the aforementioned goal. The functional and non-functional requirements have been defined based on feedback received via interviews with citizens from the ICARUS participating cities. The design and the analysis of the interviews was done based on the Design Thinking methodology. A very sufficient insight to the target users' needs, habits, points of view and attitudes has been achieved. Then, based on the functional requirements, the functional specifications have been defined, in the form of user stories related to the functionalities exposed to the three user groups of the user-centric tools.

In the final part of this deliverable, a traceability matrix is given as a validation of the requirements, along with some conclusions and some noteworthy material of the requirements collection process in Appendix.

2 Requirements Collection Procedure

2.1 Introduction

In this chapter we will describe the procedure we followed for the elaboration of the user requirements of ICARUS user-centric tools. As defined in the Project's workplan, the user-centric tools will be based on the paradigm of international initiatives such as the CoolClimate Carbon Footprint Calculator, developed by the University of California, Berkeley. Numerous tools of this kind have been processed and analyzed and the findings of this research are detailed in D7.4 "Interim ICARUS Business plan", in the chapters related to the user-centric tools. Since, according to the workplan, the tools are required to provide personalized information to the users and motivate them through incentives to a more environment-friendly lifestyle, the Partners participating in Task 7.2 worked in order to understand and analyze what the expectations of the citizens would be of such a tool. To this end, the Design Thinking methodology has been employed, aiming to provide a clear insight to the thoughts, expectations and concerns of the target end-users of the tools.

The participating Partners have collectively drafted a questionnaire (see §7 Appendix I: Design Thinking questionnaire), which was then translated in the various languages of the countries where it was administered. The questionnaire was intended to establish connections between the knowledge and the know-how acquired by the Consortium during the project and the expectations, needs and concerns of the citizens. Once the questions had been finalized, they were distributed to the nine participating cities, to be translated in the local language(s).

The participating cities then undertook the task of interviewing six citizens each, one from each of the following age (and occupation) groups:

1. A 15- to 18-year old pupil
2. A student
3. One person from 25 to 35 years old
4. One person from 35 to 45 years old
5. One person from 45 to 55 years old
6. One person older than 55 years

During the interviews, the interviewees were informed on the principal targets of the ICARUS Project and the emphasis that is put on the air quality and climate change impact on several aspect including health and the importance of citizen engagement. The interviewer had the task of creating an open and comfortable discussion with the subjects, lead by but not restricted to the ten questions of the questionnaire. Main purpose of the interview would be to understand whether the interviewees were disposed to adopt a tool that would:

- Provide information based on data analysis
- Recommend actions
- Measure end-user activities

- Reward environment-friendly behaviors.

The collected answers have been transcribed and translated to English, so that they could be processed and analyzed according to the Design Thinking methodology.

2.2 Methodology adopted

Design Thinking is a methodology aiming to create practical and innovative solutions for products, services, processes and strategies based on an anthropocentric approach in the understanding of the users' needs. The approach proposed by Design Thinking methodology consists of five non-linear stages, i.e. they could (and *should*) overlap with each other:

1. Empathize: This is about understanding the needs of the users: the team must learn what they need, what they want, how they behave, feel and think, and why they present such behaviors, feelings and thoughts when they interact with products in a real environment. Understanding all these will help the team discover innovative solutions that users would rarely be able to think of and propose themselves.

2. Define: The team needs to understand the nature of the problem and the gap in the market that a possible solution would cover. The clear definition of the problem is a key factor to the production of ideas towards the right direction, otherwise the team risks to continue working in the blind.

3. Ideate: The purpose of this stage is the team to think of as many ideas as possible. At the beginning, the team should work based on the principle that "there are no bad or bad ideas; only ideas". Then most of them will be filtered out, so that only the best, most practical or innovative solutions stay at the end. Many techniques have been proposed for this stage, with Brainstorming being the most popular.

4. Prototype: At this stage, simpler and experimental models of the proposed solutions are designed and produced in order to test the ideated standards/procedures/solutions by the members of the team.

5. Test: In the final stage, the solution is tested in a wider, external scale. It is important to closely monitor users' behaviors and reactions and empathize with them, in order to collect valuable feedback and perform the necessary modifications that will shape out the final product.

To put in action the Design Thinking methodology working groups are formed to process the feedback received from the interviews. Their members are introduced to the principles of the methodology, encouraged to focus on and identify users' actions, thoughts, feelings and desires, leaving aside their own stereotypes. The first output of the process is the elaboration of scenarios responding to who, what and why, i.e.

(The user) needs to (user's need) why (user's vision)

Then, based on these scenarios, the working groups focus on the creation of a small group of personas. A persona is a fictitious character representing a type of users who could use the ICARUS user-centric tools. To do this, the team needed to come up with plausible answers to questions like the following:

- What does the user want?
- What did the user do?
- How does the user feel? What feelings can the user feel?
- What did the user think? What are his motives, his goals, his needs, his desires? What is their hierarchy?

The team can use these personas, that provide a clear insight to the thoughts, needs and priorities of the target users, as a solid foundation to get started with the “define” stage, as described in step 3 above. Then, a first approach of the prototyping has been accomplished, only in a theoretical level, with the creation of the wireframes for some of the features of the user-centric tools.

3 Definition of the user requirements of the ICARUS user-centric tools

3.1 General Requirements

According to the ICARUS workplan, the tools should apply the integrated approach for air quality and climate forcing reduction developed in the frame of the Project so as to provide innovative methods for the promotion of environment-friendly behaviors; these methods will make use of the tools that smartphone technology provides to offer incentives provided by administration authorities and corporations to the end-users. Based on this skeleton, the requirements were further elaborated using the conclusions of the Design Thinking methodology that has been applied as described in the previous chapter. The principal output of the methodology was the creation of three personas, that are presented in 8. Appendix II: Design Thinking Personas.

It has been clearly pointed out that citizens seek information related to the air quality and to their environment. Their motivations have been first and foremost to improve their health and well-being, and to protect the environment. Furthermore, they expressed a variable interest (depending on the age group) on financial aspects, regarding the positive impact that a more environment-friendly lifestyle could have to their budget and to rewards for behavior change.

The user-centric tools are expected to provide personalized information. The personalized information should be based on the user's location and their activities; the activity information provided both by user input and tracking using smartphone-based sensor devices. The users expect to be informed on air quality, environmental initiatives and activities in their area. They would also use the tools to get personalized advice on the issues analyzed in the previous paragraph. The tools should provide not only advice, but also the estimated impact that the adoption of each proposition can have to the user.

The user-centric tools will promote environment-friendly behaviors through user engagement. This can be achieved in three ways: making the user aware of the personal and social/environmental impact of their behavior, as already mentioned; rewarding the adoption of such behaviors with offers from corporations and administrative authorities and finally through gamification. The extent of the adoption of environment-friendly behaviors can be proved thanks to smartphone-based sensor devices, that enable applications to track and analyze user activity in the course of time.

In order to support these features, the user-centric tools must also provide an interface for stakeholders (corporations and regional authorities) for the management of the rewards and the definition of the selection criteria. The stakeholders will be able to create campaigns of a given duration, during which one or more rewards can be set; each of them with one or more possible recipients. Two schemata have been foreseen for the selection of the winners: rewards can be awarded to either the first X users that fulfil a goal, or to the X users having the best score once the campaign is over.

3.2 End-users

The main end-users group of the ICARUS user-centric tools is the citizens. The user-centric tools are expected to promote environment-friendly behaviors and provide personalized information to citizens

which is related to air quality, carbon footprint and their living environment. The implementation of the design thinking methodology revealed that the citizens motivations are (in descending importance) to improve their health and well-being, to protect the environment, as well as financial aspects including rewarding the adoption of environment-friendly behaviors. Gamification is also included in the list of means to maximize citizens engagement.

Initially, the citizens were divided into the six citizens groups presented in Chapter 2.1. The implementation of the Design Thinking questionnaires and the application of the respective methodology resulted to the creation of three personas that represent the thoughts, needs and priorities of all the citizens' groups that were interviewed. In a glance, the three personas grouped the citizens to the following age groups (please see Appendix II: Design Thinking Personas):

1. 15- to 18-year-old pupil and student;
2. 25 to 55 years old and
3. over 55 years old.

Another end-users group is corporations and administrative authorities (mainly municipal and regional). These end-users must have an interface in order to be able to provide incentives and rewards to the citizens. Corporate users and regional authorities must be able to set goals and create campaigns of a given duration, offering incentives and rewards for environment-friendly behavior.

Last but not least, a platform administrator is foreseen for creating and managing corporate users/ regional authorities accounts. The platform administrator will be an involved partner of the ICARUS consortium.

The User Stories addressing the functional requirements for the aforementioned users are analyzed in §4.1.

3.3 User requirements

The requirements collected during this project phase and confirmed by the relevant stakeholders, are outlined below:

3.3.1 Non-Functional Requirements

Identifier	Name	Priority[1]
UR_NF1	The user-centric tools must be available through a web-interface	Must
UR_NF2	The user-centric tools must also be available as a mobile application	Must
UR_NF3	The user-centric tools must be as user-friendly as possible	Must
UR_NF4	The user-centric tools must present environment-friendly advice and incentives in an attractive and comprehensible way	Must
UR_NF5	The user-centric tools must make use of the capabilities of "smart" and IoT devices (location, various sensors)	Must
UR_NF6	The user-centric tools should promote user engagement towards a consistently improving environmental-friendly lifestyle	Should

[1] The MOSCoW method of specifying the priority of a user requirement has been adopted (MoSCoW Analysis (6.1.5.2)". A Guide to the Business Analysis Body of Knowledge (2 ed.). International Institute of Business Analysis. 2009. ISBN 978-0-9811292-1-1)

3.3.2 Functional Requirements

Identifier	Name	Priority[2]
UR_F1	The user-centric tools must provide information to the user based on the location	Must
UR_F2	The user-centric tools must provide personalized information to the users based on their personal habits	Must
UR_F3	The user-centric tools must give advice based on the environmental impact of the user's lifestyle	Must
UR_F4	The user-centric tools must give advice based on the personal health impact of the user's lifestyle	Must
UR_F5	The user-centric tools could give advice based on the user's lifestyle as tracked by smartphone-based sensor devices	Could
UR_F6	The user-centric tools should promote the participation of the user to local community initiatives for the environment	Should
UR_F7	The user-centric tools could give advice on environment-friendly behaviors that lead to a less costly lifestyle	Could
UR_F8	The user-centric tools must be able to enable rewarding for proven adoption of a more environment-friendly lifestyle	Must
UR_F9	The user-centric tools must be able to propose also non-financial incentives towards the adoption of a more environment-friendly lifestyle	Must
UR_F10	The user-centric tools should use gamification techniques to promote the adoption of a more environment-friendly lifestyle	Should
UR_F11	The user-centric tools must enable corporations and local authorities provide rewards to users based on their location and proven adoption of environment-friendly behaviors	Must
UR_F12	The user-centric tools must provide a user authentication mechanism	Must
UR_F13	The user-centric tools should enable the user to self-evaluate their eventual shift to a more environment-friendly behavior	Should

[2] The MOSCoW method of specifying the priority of a user requirement has been adopted.

4 Functional specifications

In order to address the functional user requirements and after taking into consideration the non-functional requirements, we have concluded to the following sets of user stories, that define the functional specifications of the ICARUS user-centric tools.

4.1 User stories

4.1.1 Citizens

Identifier	UC1.1
Title	User registration
Description	**As a** citizen **I want to** register to the user-centric tools **so that** I can have access to personalized information and rewards
Acceptance Criteria	- The citizen can download and install the mobile application to their smartphone - The citizen can create an account through the web interface and through the mobile app as well - The citizen must use their e-mail address and create a safe password to create their account - The citizen will receive a confirmation e-mail with an activation link they have to follow in order to activate their account - A phone number along with an authentication code sent by SMS could be used instead of or along with the account activation via e-mail - The citizen cannot access their account unless they have validated their e-mail address through the activation link or with the code sent by SMS - The citizen must be able to log-in using their e-mail and password

Identifier	**UC1.2**
Title	Estimation of the environmental footprint of the citizen's lifestyle
Description	**As a** citizen **I want to** see the environmental footprint of my lifestyle **so that** I can be aware of the impact of my lifestyle to the environment
Acceptance Criteria	- The citizen can input information about the composition of their household and the location of their domicile - The citizen can input information about their income - The citizen can input information about the means of transport they use - The citizen can input information on the energy and water their household consumes, as long as the habitable surface of their domicile - The citizen can input information about the money they spend on each type of food - The citizen can input information about the money they spend on several types of products and services - Based on the aforementioned input, the user-centric tools will provide personalized information to the citizen regarding environmental impact of their lifestyle both in terms of Air Quality and Carbon Footprint Based on the aforementioned input, the user-centric tools will provide personalized advice on environment-friendly behaviors the citizen can adopt, along with their environmental impact

Identifier	**UC1.3**
Title	Estimation of the health impact of the citizen's lifestyle
Description	**As a** citizen **I want to** be aware of the health impact that my lifestyle has **so that** I become more sensitized and identify harmful behaviors
Acceptance Criteria	- The citizen can see information regarding their personal activities and other aspects influencing health that they have provided themselves to the user-centric tools - The citizen can see information collected by smartphone-based sensor devices (activity, possibly location) - The citizen can see information about the impact of their activities and habits - The citizen can see advice on behaviors they can adopt to improve their lifestyle with regard to its health impact - The citizen can see the expected impact of following this advice

Identifier	**UC1.4**
Title	Setting engagement goals
Description	**As a** citizen **I want to** set goals to achieve **so that** I stay engaged to improving air quality and my health
Acceptance Criteria	- I can select one or more of the personalized advice given by the user-centric tools - I can set the extent to which I aim to engage to this goal, which can be higher or lower than the one suggested by the user-centric tools - I can set a date until which I want to achieve the goal - I can see the estimated impact of this goal regarding health and/or air quality and carbon footprint

Identifier	**UC1.5**
Title	Managing the goals set
Description	**As a** citizen **I want to** manage the goals I have set to myself **so that** I can monitor my engagement to them
Acceptance Criteria	- I can see the list of goals that I have set - I can see the details of each goal that I have set - I can modify the dates and/or the other parameters of the goal - I can compare the tracking data collected by smartphone-based sensor devices regarding my activities against the levels defined by the goals - I can see the percentage of compliance to the goals set - I can delete a goal I have set

Identifier	**UC1.6**
Title	Self-monitoring of behavioral changes
Description	**As a** citizen **I want to** keep track of the changes in my habits **so that** I can evaluate my engagement in improving air quality and my health
Acceptance Criteria	- The citizen can see select a pair of time periods - The citizen then selects one or more tracked activities - The citizen can see the differences regarding the selected activities between the specified periods in a comprehensible, clear and user-friendly way - The citizen could also be presented with the estimated impact of the change to their health and to the air quality of his surroundings

Identifier	**UC1.7**
Title	Localized air quality and environmental information
Description	**As a** citizen **I want to** be informed about aspects regarding my urban environment **so that** I am aware of the air quality in my area and I can protect my family and myself
Acceptance Criteria	- The user-centric tools will link the user to the air quality maps of those of the nine participating cities that provide this information on the web (with the possibility to be expanded to more cities) - The user-centric tools could provide links to environment and air quality oriented actions in the area of the citizen - The user-centric tools could provide links to the local authorities' portals where information about excessive levels of air pollution and measures to be taken are published - The user-centric tools will provide information on user-reported incidents in the area of the user

Identifier	**UC1.8**
Title	Get informed about campaigns in the area
Description	**As a** citizen **I want to** be informed about campaigns organized in my area **so that** I can participate in them
Acceptance Criteria	- I can see what the available campaigns are organized in my area - I can see only the goals for which I am eligible (e.g. if reducing private car usage is involved and I never use private car) - I can filter the goals based on their type (kind of activity involved) - I can filter the available goals based on their type (highest score vs. “first to achieve”) - I can filter the goals based on the promoter - I can filter the goals based on the reward

Identifier	**UC1.9**
Title	Participate in a campaign
Description	**As a** citizen **I want to** participate to campaigns **so that** I can be rewarded for helping improve air quality in my region
Acceptance Criteria	- I can select one or more goals set by the corporate users - I can track my progress regarding the fulfilment of the goal's requirements - I could possibly see competition while the campaign is still going on - Once the campaign is over or the goal is achieved, I can see if I have fulfilled the goal and if I am eligible for the reward - In case I am entitled to a reward, I will receive information on how to claim it

Identifier	**UC1.10**
Title	Reporting air quality related event
Description	**As a** citizen **I want to** report air-quality related information I come across **so that** I can actively participate in air quality monitoring and improvement.
Acceptance Criteria	- The citizen can define the coordinates of the AQ event on a map, by placing a marker on the corresponding location - To help the citizen easily identify the position of the AQ event, the map will show a marker at the citizen's current position, if available. - The citizen can select from a non-exhaustive list the category of AQ event they are reporting (such as a particular odor, smog, smoke etc.). - The citizen can type in the category of the AQ event, if not included in the above list. - The citizen can type in a description of the AQ event. - The citizen can review the AQ event that they have reported.

4.1.2 Corporate users

Corporate users also include administrative authorities.

Identifier	UC2.1
Title	Creation of a campaign
Description	**As a** corporate user **I want to** create a campaign **so that** I can give rewards to citizens in my area
Acceptance Criteria	- The corporate user can create a new campaign - The corporate user can set the region of which the residents can participate in the campaign - The corporate user can set the starting and ending date of a campaign, as well as its description, photos, possibly videos and links - The corporate user can set the publishing date of the campaign - The corporate user can add rewards to the campaign

Identifier	**UC2.2**
Title	Creation of goals and rewards
Description	**As a** corporate user **I want to** create goals and rewards **so that** I can motivate citizens towards a more environment-friendly lifestyle
Acceptance Criteria	- A corporate user can create goals within a future campaign - A corporate user can create set rewards for those who achieve those goals - A corporate user can set goals related to any type of activities tracked and identified by the user-centric tools (bicycling, walking, running, use of public transport, transportation by car etc.) - A corporate user can define a specific number of citizens that will be rewarded, either as the first to reach the goal or the ones with the highest score at the end of the campaign

Identifier	**UC2.3**
Title	Management of goals and rewards
Description	**As a** corporate user **I want to** manage the goals and the rewards of my campaigns **so that** I have a clear image of its progress
Acceptance Criteria	- The corporate user can select among their campaigns - The corporate user can see all the rewards related to the selected campaign - The corporate user can select a reward and review it - The corporate user can edit the properties of a reward belonging to a campaign that has not been published yet - The corporate user can delete a reward of a campaign that has not been published yet - The corporate user can see the qualifying citizens for a reward - The corporate user can mark as rewarded the qualifying users for each reward that have already claimed their reward - The corporate user can see the list of the reward winners for each campaign and goal

Identifier	**UC2.4**
Title	Management of the campaigns
Description	**As a** corporate user **I want to** manage my campaigns **so that** I have control on my activities and feedback on their impact
Acceptance Criteria	- The corporate user can see its past, ongoing and future (scheduled) campaigns - The corporate user can see how many citizens are being / have been involved into each ongoing/past campaign and its goals - The corporate user can see which citizens have been qualified for a reward and which of them have already claimed their reward

Identifier	**UC2.5**
Title	Management of corporations/regional authorities by the corporate users
Description	**As a** corporate user **I want to** manage my corporation/regional authority **so that** I can update the information the citizens and the platform operator see about it
Acceptance Criteria	- The corporate users can view and edit the information of the corporations/regional authorities they are assigned to (apart from the geographical region attribution)

4.1.3 Platform administrators

Identifier	UC3.1
Title	Manage corporate user accounts
Description	**As a** platform administrator **I want to** manage corporate users **so that** I can have control over who can create campaigns
Acceptance Criteria	- The platform administrator can view the corporate user accounts - The platform administrator can edit the accounts of the corporate users - The platform administrator can delete an account of a corporate user - The platform administrator can enable/disable a corporate user account - The platform administrator can attribute one or more geographical regions to the corporate user accounts

Identifier	**UC3.2**
Title	Creation of a corporation/regional authority
Description	**As a** platform administrator **I want to** create corporate corporations/regional authorities **so that** I can expand the usage of the system to new corporations/regional authorities
Acceptance Criteria	- The platform administrator can create a new corporation/regional authority - The platform administrator fills in the needed information for a corporation/regional authority, such as its name, type (corporation or authority and its level) location, images, description, links etc. - The platform administrator can assign one or more geographical regions to the corporation/regional authority - The platform administrator can assign the management of the corporation/regional authority to one or more corporate user accounts.

Identifier	**UC3.3**
Title	Management of corporations/regional authorities by the platform administrator
Description	**As a** platform administrator **I want to** manage corporations/regional authorities **so that** I have control over the entities that can create campaigns
Acceptance Criteria	- The platform administrator can view all the corporations/regional authorities in the platform - The platform administrator can enable/disable corporations/regional authorities - The platform administrator can (un)assign corporations/regional authorities to corporate user accounts - The platform administrator can edit corporations/regional authorities - The platform administrator can delete corporations/regional authorities - The platform administrator can see to which corporate user account(s) the management of a corporation/regional authority is assigned to. - The platform administrator can view the geographical regions assigned to each corporation/regional authority - The platform administrator can (un)assign geographical regions to a corporation/regional authority

Identifier	**UC3.4**
Title	Management of user-reported incidents
Description	**As a** platform administrator **I want to** manage user-reported incidents **so that** I can be aware of the incidents and ensure the proper usage of this feature
Acceptance Criteria	- The platform administrator can view all incidents reported by the citizens. - The platform administrator can view all the recently reported incidents. - The platform administrator can delete an incident. - The platform administrator can prohibit a user account from reporting incidents.

5 Validation of the requirements

On the following page the traceability matrix, that maps the user requirements to user stories, is presented. It is obvious that many of the user requirements need several user stories to be addressed and vice versa, i.e. sometimes a single user story can cover more than one user requirement. It is concluded that a user requirement is covered by the user stories if there is at least one "X" mark in the user requirement's column.

5.1 Traceability matrix

UR_F	1	2	3	4	5	6	7	8	9	10	11	12	13
UC1.1												√	
UC1.2		√	√				√						
UC1.3	√	√		√	√								
UC1.4									√	√			√
UC 1.5					√					√			√
UC 1.6			√	√	√				√	√			√
UC 1.7	√					√							
UC 1.8	√							√					
UC 1.9								√					√
UC 1.10	√									√			
UC 2.1	√										√		
UC 2.2	√										√		
UC 2.3	√										√		
UC 2.4	√										√		
UC 2.5	√										√		
UC 3.1												√	
UC 3.2												√	
UC 3.3												√	
UC 3.4	√									√			

6 Conclusions

In the present deliverable we analyzed the methodology used for the definition of the user requirements and the functional specifications of the ICARUS user-centric tools. Apart from the high level of empathy that has been achieved and the experience acquired by all partners that participated in the Design Thinking based process of requirements gathering, the working groups managed to successfully combine all the feedback in three concrete personas (§Appendix II: Design Thinking Personas). Based on them, the functional and non-functional requirements were defined with confidence. The user stories in this deliverable are mostly oriented in presenting the functionalities that the user-centric must have, instead of getting into low-level details of the exact way they will be implemented; thus, leaving space for an agile-based development methodology. The completeness and the sufficiency of the defined user stories has been verified in the traceability matrix of §5.1.

7 Appendix I: Design Thinking questionnaire

1. What do you think/feel about air pollution?
   Please elaborate. (Is it a problem today/ in the future? Can you do something about it? Do you want to do something about it?)

2. Are you informed about air pollution in your area?
   How?
3. What do you do in cases of high air pollution?
   Why?
4. Do you want to receive personalized information about air pollution levels?
   Why?
5. If yes, based on which parameters (your location, sources of pollution nearby etc.) and why?
6. How do you react on the recommendations of the public authorities towards environmental friendly behaviors?
   Why?
7. Would you react differently if the recommendations were personalized, taking into account your personal profile?
   Why?
8. Would you mind sharing personal activities with authorities, sponsoring companies and the ICARUS research team to be personally rewarded for environment-friendly behaviors? If yes, what motivates you to follow the recommendations?
   a. To protect the environment
   b. To improve my health and well-being
   c. Financial impact (on a personal or household basis, by following recommendations that are not only environment-friendly, but maybe also less costly)
   d. Rewards (offers and promotions by collaborating authorities and sponsors, gamification awards etc.)
   e. Other (please specify)
9. Environmental protection is a long-term goal. Which short/medium term goals/rewards would increase your willingness to follow the recommendations?
10. Do you have any other comments or suggestions that you would like to share with us regarding this topic?

8 Appendix II: Design Thinking Personas

The following three personas have been created as an output of the processing of the interviews:

1. A 21-year-old student (Adam), representing the groups of the 15- to 18-year-old pupil and the student;
2. 42-year-old Elen, representing the age groups from 25 to 55 years old and
3. 65-year-old Jensen, representing the age group of over 55 years old.

8.1 Persona I (Adam)

MY MOTIVATIONS	FRUSTRATIONS
• To improve my health and well being (30%) • To protect the environment (with the desire to be involved in the local community) (30%) • Financial impact (on a personal or household basis, by following recommendations that are not only environment-friendly, but maybe also less costly) (20%) • Rewards (offers and promotions by collaborating authorities and sponsors, gamification awards etc.) (20%)	• I dislike seeing people not respect the environment (not following the instructions) • In some cases the state does not care (may be because there are business interests or because they don't apply penalties for environmental violations)

PERSONAL INFO

Name	Adam
Age	21
Gender	Male
Status	Single
Occupation	University Student

PERSONALITY

Quiet	
Responsible	
Dedicated	
Adventurous	

MY TYPICAL DAY

MORNING	NOON	EVENING
Wake up at 8:00 to go to school. It takes me 30 minutes to go to school. I use mass transportation (bus, metro).	I attend lessons, then I have a break for lunch and after lessons I hang out with friends. In the afternoon I return home, I study and complete my homework.	After dinner, I go out to meet my friends, we go for fun. I use mass transportation for my movements but also taxi or my parents car if it is available.

MY GOALS

END GOALS	LIFE GOALS	EXPERIENCE GOALS
• Protect the environment for our and future generations • Improve our health and well being	• Taxes reduction • Cycle paths construction • Reductions in prices for green products and services • Recycling	• Reward citizens (seminars, gymnastics, blood tests, coupons) of an area by their own public authorities when the pollutants in the area are low • Volunteering / cleaning of parks and beaches

8.2 Persona II (Elen)

MY MOTIVATIONS	FRUSTRATIONS
• To improve my health and well being (34%) • To protect the environment (with the desire to be involved in the local community) (30%) • Financial impact (on a personal or household basis, by following recommendations that are not only environment-friendly, but maybe also less costly) (23%) • Rewards (offers and promotions by collaborating authorities and sponsors, gamification awards etc.) (13%)	• I dislike seeing people not respect the environment (not following the instructions) • Many times we have no information • In some cases the state does not care (may be because there are business interests or because they don't apply penalties for environmental violations) • May be it is better to have awareness and behavior change instead of instructions

PERSONAL INFO

Name	Elen
Age	42
Gender	Female
Status	Married (two kids)
Occupation	Teacher

PERSONALITY

Meticulous	
Organized	
Loyal	
Diligent	

MY TYPICAL DAY

MORNING	NOON	EVENING
Wake up at 7:00 to prepare breakfast for my kids. It takes me 30 minutes to drop my kids at school and then go to my school where I teach. I use my car for transportation.	I work until 2:00 p.m., then I return home to prepare lunch and at 4:00 p.m. I pick up my kids. I help my kids to their homework and then I take them to extra curricular activities.	I prepare dinner. If I have time and don't feel tired may be I will go to gym. Around 11:00 pm I go to bed.

MY GOALS

END GOALS	LIFE GOALS	EXPERIENCE GOALS
• Protect the environment for us and future generations • Improve our health and well being	• Tax reduction in companies with electric cars and ecological houses • Discounts on green products / services • Improvement of mass transport • Change behavior	• Need for civil education (which can also socialize people) • Research on alternative forms of energy • Reforestation / Paths / Teamwork

8.3 Persona III (Jensen)

MY MOTIVATIONS	FRUSTRATIONS
• To improve my health and well being (30%) • To protect the environment (with the desire to be involved in the local community) (26%) • Financial impact (on a personal or household basis, by following recommendations that are not only environment-friendly, but maybe also less costly) (18%) • Rewards (offers and promotions by collaborating authorities and sponsors, gamification awards etc.) (26%)	• People must change behavior (to be more responsible) • State doesn't care, in reverse must inspire citizens

PERSONAL INFO

Name	Jensen
Age	65
Gender	Male
Status	Married
Occupation	Retired

PERSONALITY

Spontaneous	
Outgoing	
Laid back	
Disorganized	

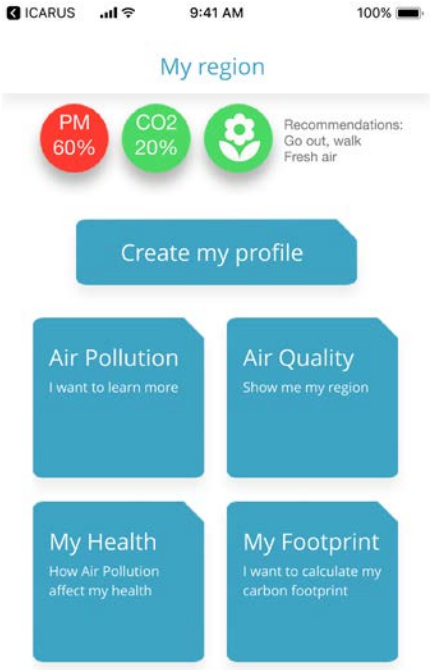
MY TYPICAL DAY

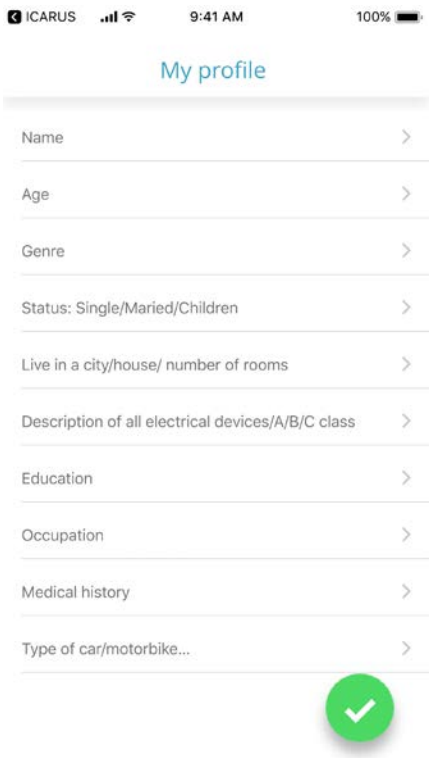
MORNING	NOON	EVENING
Wake up at 6:30. I prepare breakfast and I savor it with my wife. At 10:00 I go shopping for the house or to meet my friends in the neighborhood café.	I return home, help my wife prepare lunch and after lunch I have a nap. In the afternoon I like gardening.	After a light dinner around 7:00 pm, I go with my wife for a walk in the nearby park. My typical day ends around 10:00 pm,

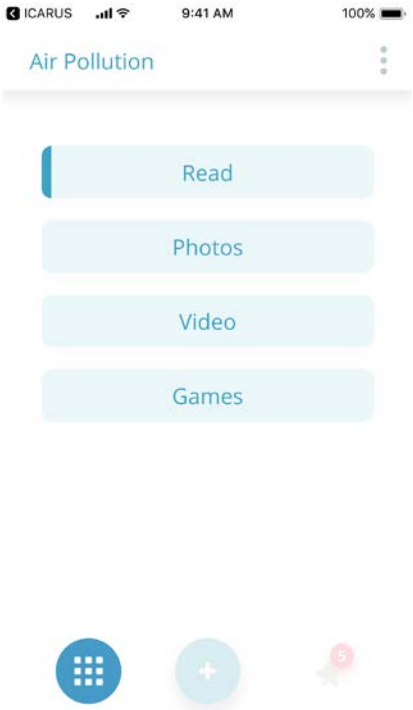
MY GOALS

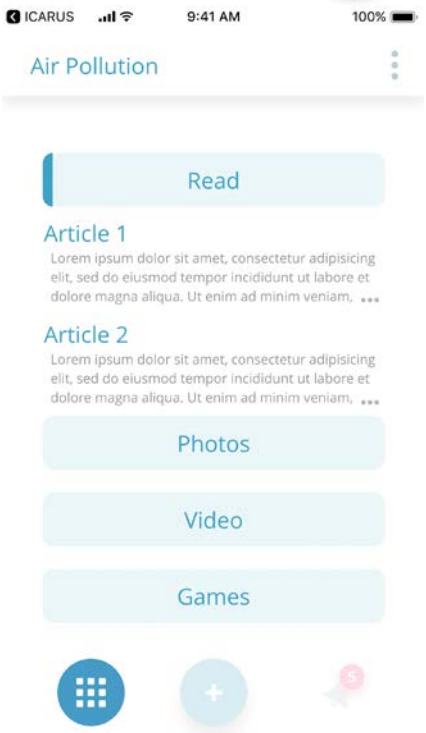
END GOALS	LIFE GOALS	EXPERIENCE GOALS
• Protect the environment for our and future generations • Improve our health and well being	• Taxes reduction • Reduce travel / group transfers in the same direction / • Tax reduction in innovative solutions • Effective rather than populist measures by the state	• Financial impact (on a personal or household basis, by following recommendations that are not only environment-friendly, but also less costly)

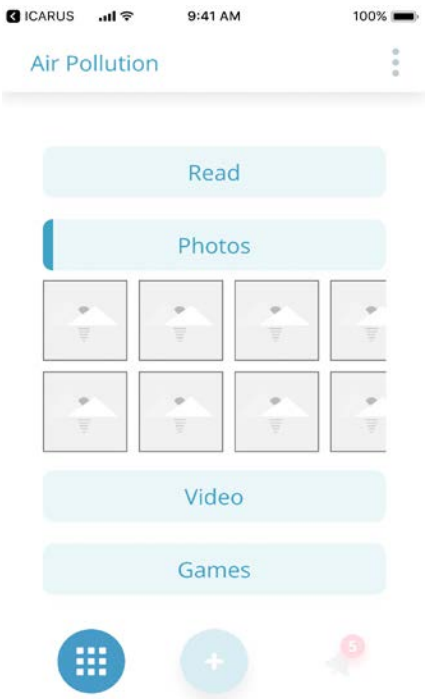
9 Appendix III: Wireframes

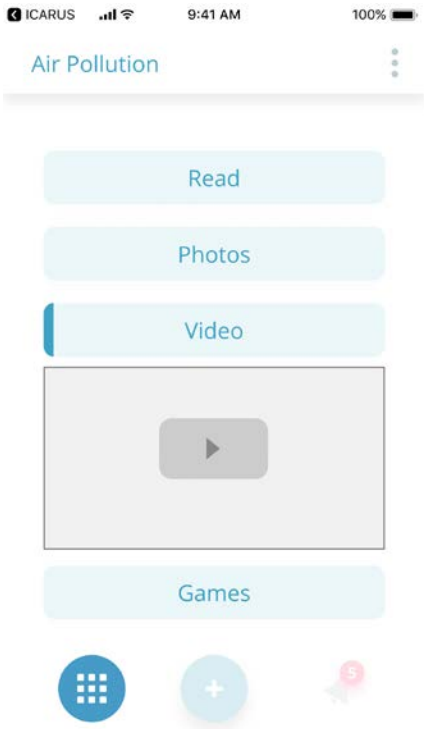


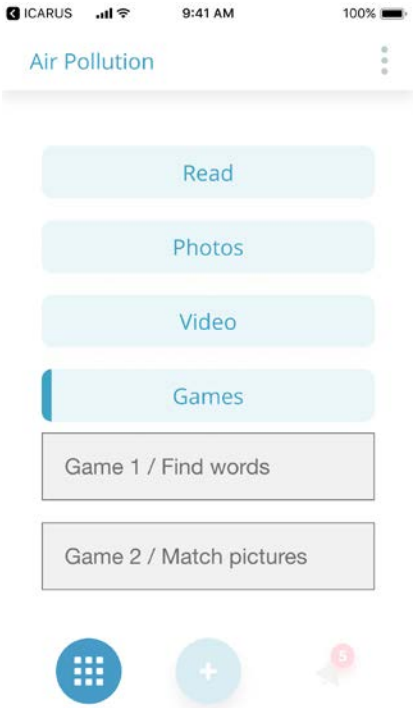


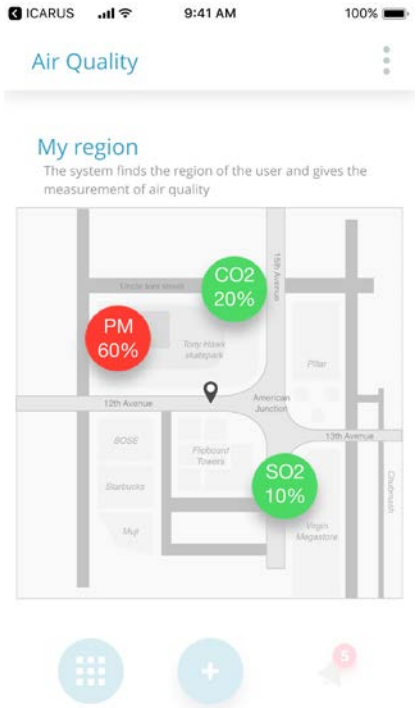


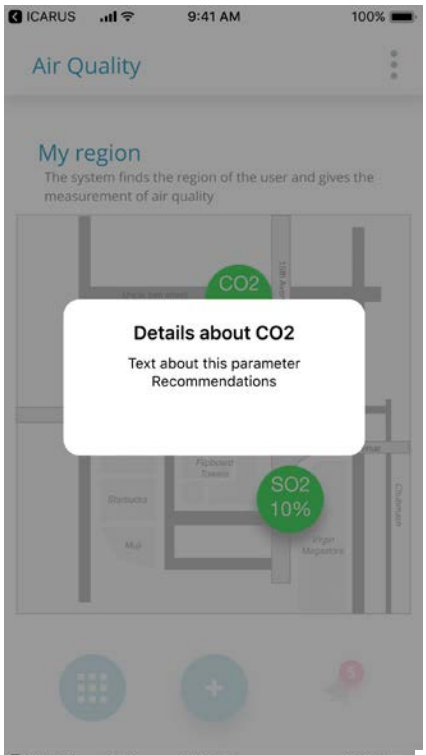



ICARUS
9:41 AM
100%
Air Pollution
Read
Photos
Video
Games

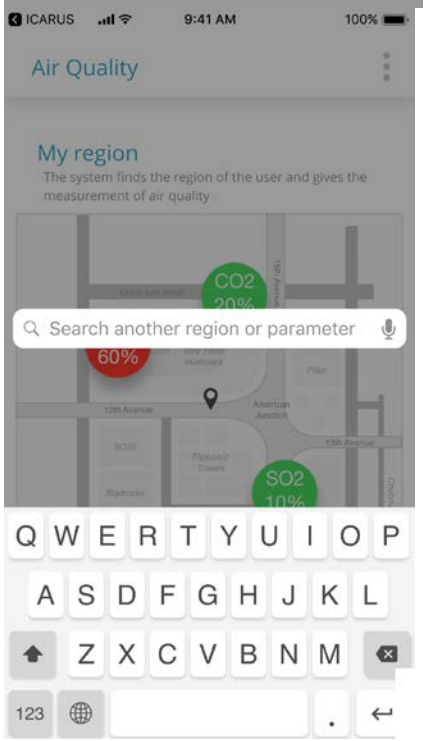

ICARUS
9:41 AM
100%
Air Pollution
Read
Photos
Video
Games


ICARUS
9:41 AM
100%
Air Pollution
Read
Photos
Video
Games
Game 1 / Find words
Game 2 / Match pictures


ICARUS
9:41 AM
100%
Air Quality
My region
The system finds the region of the user and gives the measurement of air quality
CO2 20%
PM 60%
SO2 10%


ICARUS
9:41 AM
100%
Air Quality
My region
The system finds the region of the user and gives the measurement of air quality
CO2
Details about CO2
Text about this parameter
Recommendations
SO2
10%


ICARUS
9:41 AM
100%
Air Quality
My region
The system finds the region of the user and gives the measurement of air quality
CO2
20%
PM
60%
SO2
10%


ICARUS
9:41 AM
100%
Air Quality
My region
The system finds the region of the user and gives the measurement of air quality
CO2
Search another region or parameter
60%
SO2
Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
123

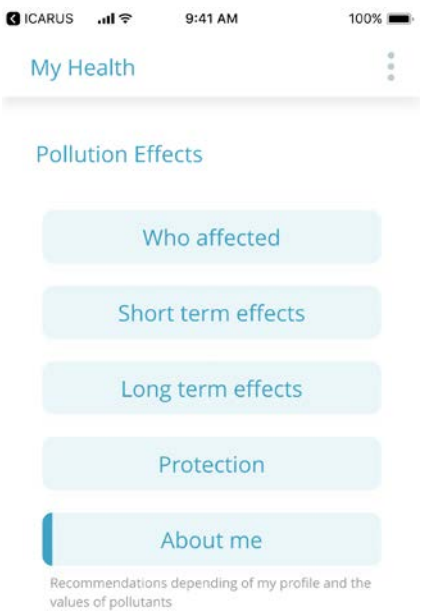

ICARUS
9:41 AM
100%
My Health
Pollution Effects
Who affected
Short term effects
Long term effects
Protection
About me

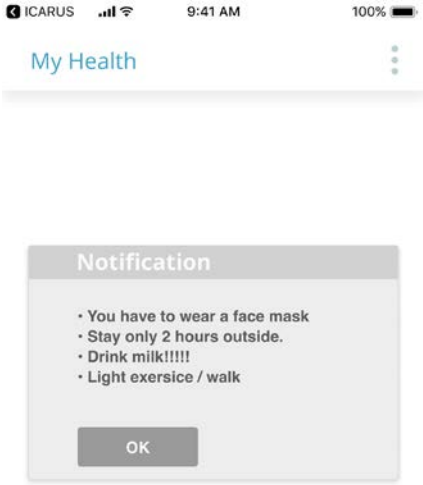

ICARUS
9:41 AM
100%
My Health
Pollution Effects
Who affected
• People with chronic Lung/Heart disease/Diabetes
• Seniors
• Children
• Pregnant women
• People who work/exercise outdoors
Details/Guidelines for all the categories
Short term effects
Long term effects
Protection

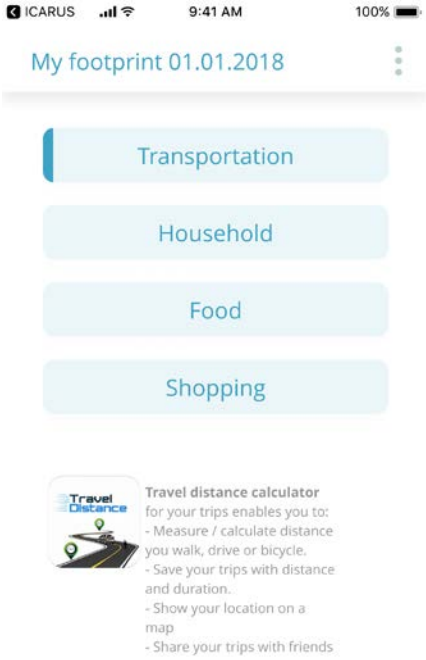

ICARUS
9:41 AM
100%
My Health
Pollution Effects
Who affected
Short term effects
• Headache
• Eyes inflammation
• Skin irritation, etc
Long term effects
Protection
About me

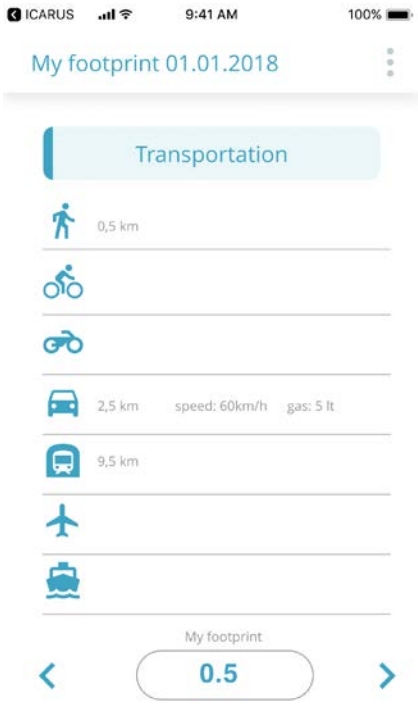

ICARUS
9:41 AM
100%
My Health
Pollution Effects
Who affected
Short term effects
Long term effects
• Respiratory diseases (Asthma, cancer)
• Central nervous system
• Cardiovascular diseases, etc
Protection
About me


ICARUS
9:41 AM
100%
My Health
Pollution Effects
Who affected
Short term effects
Long term effects
Protection
• Use a face mask
• Stay home
• Keep windows closed, etc
About me

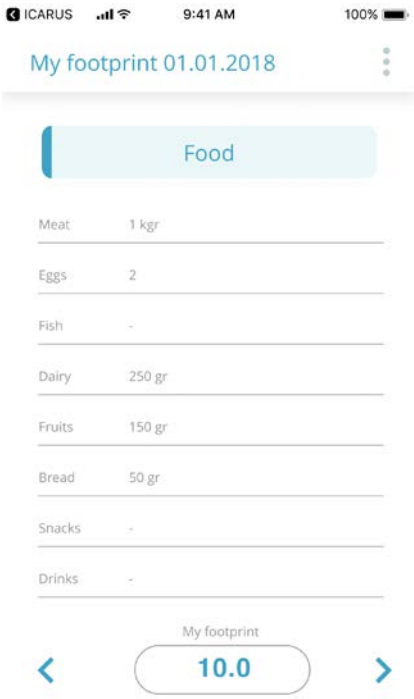

ICARUS
9:41 AM
100%
My Health
Pollution Effects
Who affected
Short term effects
Long term effects
Protection
About me
Recommendations depending of my profile and the values of pollutants

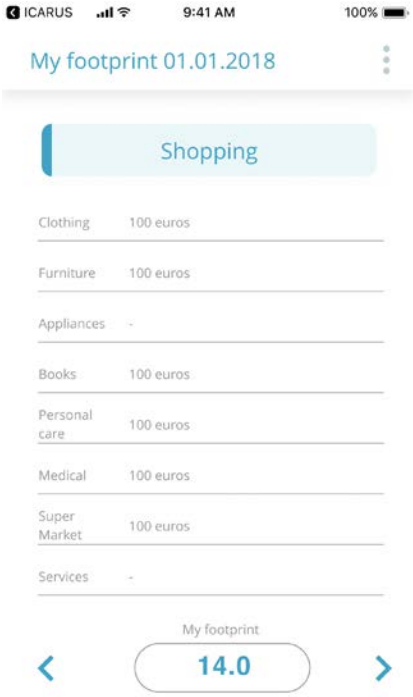

ICARUS
9:41 AM
100%
My Health
Notification
• You have to wear a face mask
• Stay only 2 hours outside.
• Drink milk!!!!!
• Light exersice / walk
OK


ICARUS
9:41 AM
100%
My footprint 01.01.2018
Transportation
Household
Food
Shopping
Travel Distance
Travel distance calculator
for your trips enables you to:
- Measure / calculate distance you walk, drive or bicycle.
- Save your trips with distance and duration.
- Show your location on a map
- Share your trips with friends

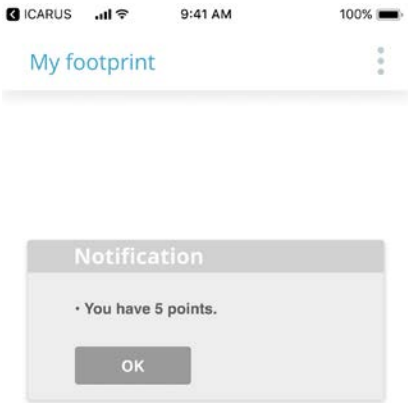

ICARUS
9:41 AM
100%
My footprint 01.01.2018
Transportation
0,5 km
2,5 km
speed: 60km/h
gas: 5 lt
9,5 km
My footprint
0.5


ICARUS 9:41 AM 100%
My footprint 01.01.2018
Household
Electricity
Cooking 30 min
Aircondition 180 min
water heater 30 min
TV 120 min
Lights 180 min
Computer 60 min
Heating 180 min
My footprint
11.0


ICARUS 9:41 AM 100%
My footprint 01.01.2018
Food
Meat 1 kgr
Eggs 2
Fish -
Dairy 250 gr
Fruits 150 gr
Bread 50 gr
Snacks -
Drinks -
My footprint
10.0


ICARUS 9:41 AM 100%
My footprint 01.01.2018
Shopping
Clothing 100 euros
Furniture 100 euros
Appliances -
Books 100 euros
Personal care 100 euros
Medical 100 euros
Super Market 100 euros
Services -
My footprint
14.0


ICARUS 9:41 AM 100%
My footprint
My footprint Points
01.01.2018 30.0 3
31.01.2018 35.0 2


ICARUS
9:41 AM
100%
My footprint
Notification
• You have 5 points.
OK