

UIA ANTWERP CIRCULAR SOUTH

Zoom-In 2

“What if you could see how much energy you consume at home and that you could change it?”

Experimenting energy consumption behaviour change



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February 2020



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The Antwerp Circular South project positions circularity as a community challenge for the New South district (a newly created district in Antwerp). It engages the district’s new residents in co-creating online and offline initiatives and changing their consumption behaviours. A number of advanced technical solutions covering different resource streams (energy, water and waste) will be tested. You can find further details about the project on the [UIA website](#).

In January 2020, the Circular South Project started with their “nudging experiments” to test innovative ways of supporting consumers in changing their energy consumption behaviours. The first experiment took place over one month, combining online and offline interactions, technical and soft infrastructures, and academic research and actions on the ground: it was the outcome of 2 intensive years of work combined together in a major real-life experimentation!

This Zoom-In takes you all the way through the 10 steps required for this experiment:

1. Recruiting
2. Designing an app
3. Installing smart meters
4. Analysing the behaviours
5. Co-designing challenges
6. Co-designing nudges
7. Designing the reward system
8. Launching the nudging experiment
9. Closing the experiment
10. Lessons learnt, takeaways and looking forward

For each of the steps (1 to 9) you will see what the project did, its challenges, dos and don’ts for other European cities. In the 10th step, you will find an analysis of the experiment. Pick what is relevant for you, as a whole or with individual steps! The overall timeframe for the preparation of the experiment (steps 1 to 7) has been the first 2 years of the project. The launch of the experiment itself (step 8) was organised over 1 month. The analysis was done shortly after and will continue during the remainder of the project.

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BEFORE WE START, WHO DID WHAT?

	The City of Antwerp	Vito / EnergyVille	Digipolis	Imec	Pantopicon	EnergieID	de Kringwinkel	Ecopower
FIRST STEP: Recruiting	Coordination In charge of recruitment activities	Involvement in activities		Involvement in activities	Community engagement	Involvement in activities	Involvement in activities	Involvement in activities
SECOND STEP: Designing an app	Organising the cooperation between administration departments and partners.	Business logic energy (KPI's)	Providing A-card authentication. Designing the data-pipeline Business logic waste and water (KPI's)	Business logic energy (analysis and KPI's)	Methodology and moderating co-design sessions with end users.	In charge of the app design	Data materials (Business logic materials)	
THIRD STEP: Installing smart meters	Procurement for smart meters Installation of the meters Sourcing other data-streams (e.g. water)	Technical input for procurement for smart meters	Technical input for Procurement for smart meters Monitoring onboarding procedures (e.g. waste data)	Monitoring data-streams (energy)	Airtable licence	Monitoring app-onboarding		
FOURTH STEP: Analysing the behaviours	Analysis and User profiling			Analysis and User profiling				
FIFTH STEP: Co-designing challenges	Contribution to challenges' design		Designing the challengebuilder UI	Contribution to design of the challengebuilder's UI and deployment	Co-creation methodology	Supporting with expertise on smart contracts	Contribution to treasure hunt challenges' design	
SIXTH STEP: Co-designing nudges	Contribution to nudges' design and rules (Water/Waste)	Contribution to nudging rules (energy)		Design of programme and individual nudges including underlying rules. Rule engine	Co-creation methodology	Designing the app's notification centre		
SEVENTH STEP: Designing the reward system	Providing the community rewards & A-point loyalty system		Blockchain development	Designing the smart contracts		Exchange and crowdfunding functionality	Providing community rewards	
EIGHTH STEP: Launching the nudging experiment	Follow-up	Data analysis and processing	Data processing	Operating the nudge rule engine. Data analysis and processing Issuing challenges (smart contracts)		App processing		
NINTH STEP: Closing the experiment	Analysis	Analysis	Analysis	Analysis	Analysis	Analysis	Analysis	Analysis

FIRST STEP: Recruiting

WHAT THE PROJECT DID

The recruitment has been ongoing since the beginning of the project and will continue until the end of the experimentation period in July 2020.

In order for the City of Antwerp to launch its overall experimentation, it has to recruit volunteers to actually take part in the process. The recruitment was approached with the aim of ensuring that residents would 1- take part, 2-for the long run, 3-with enough motivation to follow all the steps of the process.

The process was divided in six parallel steps:

1. The first residents were recruited on the spot: breakfast sessions, information sessions, information screens in the street... Per activity about 20 people were reached out. In total 134 people subscribed for the online community of which 90 smart homes.
2. As the New South District is still being built, and many residents have not moved in the area yet, it appeared difficult to reach out to the planned 200 residents for the experimentation. The area for recruitment was therefore enlarged to the wider South area of the city.
3. A challenge, the 100-100-1000 Waste challenge, was organized in autumn 2018, to reduce waste at home engaged 157 participants. For the second wave, the recruitment area of the zero-waste campaign was expanded, 660 people subscribed.
4. In parallel, the project is also recruiting members for the local energy community developed within its scope. 75 residents took part in 3 of the events. During these 'energycafé's' participants are also informed and invited to participate at the smart homes.
5. In addition, activities organized at the physical community centre of the project, CIRCUIT, have communicated on the experiment.
6. Finally, the City's project team has occupied a container at the entrance of the site for one month in order to further communicate on the experiment.

At the outskirts of the experiment, 3 waves of emails were sent to all the interested residents. The messages shared were that citizens could join the experiment and try, for free, using smart meters and an app in order to follow their consumption, together with notifications via an app for reducing their energy consumption.

KEY CHALLENGES

Challenge	Observation
4. Participative approach for co-implementation	Ensuring all the partners are involved in the recruitment and communicate it in their activities. Matching a satisfying user experience whilst still developing an innovative application (not available to be shown yet).
5. Monitoring and evaluation	Ensuring a close follow-up of all the partners' activities, which might be beneficial for recruitment. Ensuring that a monitoring or logging framework is in place since the beginning of the experimentation to enable proper follow-up; and that the framework is not too time consuming.
6. Communication with target beneficiaries	Making the challenge sound interesting and motivating for participants, finding the right incentives. Being as concrete as possible even though the challenge is not designed yet. Finding the best vocabulary, place, attitude to talk and invite participants.

DONTS

- Do not stop your recruitment once you reached your target: if possible, recruit more people in case some drop out.
- Do not underestimate the time and investment needed for recruitment and mitigation strategies, which might happen all along the process.
- Do not approach this as a one off, isolated activity. It is a permanent process.

DOS

- Put the highly anticipated functionalities on the top of your priority list even if they don't immediately contribute to your project's targets, here to nearly real time consumption reporting.
- Start communicating on the challenge/event as soon as possible as part of a wider communication campaign – take advantage of all existing communication channels existing in the city/the project.
- Make it personal: face-to-face contact is the best to get people really engaged, where quality is concerned. You can also focus on online communication channels to reach out to a larger number, where quantity is concerned. However, you might not ensure the participants' long-term investment.

SECOND STEP: Designing an app

WHAT THE PROJECT DID

Since its launch, the project has started designing an app to monitor energy consumption. The information available enables information: the app enables following up the consumption of electricity, waste and later on also water. In addition, the app sends notifications for certain behaviours to adjust consumption: in terms of timing, frequency or length. The app also enables the comparison of data against own consumption average and to that of the other residents. The app also encompasses a reward system with virtual coins.

The app can be downloaded by any of the residents, who are part of the project for free, on their smartphone and on tablets. The app is connected to various smart meters.

The design of the app was co-created with residents. It enables easy and accessible information. In order to provide a direct value for the user (and incentive to make use of it), the app is not only a monitoring tool, but also contains a notification system.

The app is supported by a technical, logistical and data property framework to gather, store and protect the data which is used for electricity and water consumer (via smart meters), water (if validated – via city water distributor) and waste (via the local digital resident card, A-Card). Minimal Interoperability Mechanisms of the [OASC model](#) and more specifically the [Fiware NGSi standards](#) were incorporated to ensure the standardisation of the framework.



KEY CHALLENGES

Challenge	Observation
3. Organizational arrangements within the urban authority	<p>Ensuring the technicalities of data flow from the electricity meters, water providers and waste – via the A-Card (a card possessed by each Antwerp resident, enabling to throw away waste in digitally monitored public bins).</p> <p>Ensuring a safe subscription form and procedure for participants with a unique ID and following the GDPR had to be built.</p> <p>Setting up a data monitoring system.</p> <p>The app was initially set-up as a way to a means e.g. achieving the project's KPIs. However, reality is more complex and difficult to fit in an app.</p>
4. Participative approach for co-implementation	<p>Ensuring new residents apply for the A-card, which is not their priority when moving.</p> <p>Making an app, which is user-friendly and at the same time efficient in terms of information shared – not overloading users with available information.</p> <p>Providing information that is of interest to the users: e.g. for technical reasons, the app does not show data of interest to participants: e.g. real-time energy consumption; data related to budget cannot be shared because the project cannot provide data which could be perceived as “official” – although a mere estimate.</p>

DONTS

- Do not design the app's form and content separately: go out and test it so that users can ensure this is adequate to their needs.
- Do not underestimate the technical adjustments and time necessary for smooth run of the application.
- Do not reinvent the wheel and reuse what has already been developed, e.g. in OASC, Fiware or other organisations and projects. There are many initiatives on interoperability and open standards.

DOS

- Dedicate adequate timing for back and forth exchanges, co-creation of the app with not only the users but also all those involved in its functioning as designers, data stream managers, data protection officers ...
- Ensure that data is adequately protected (amongst others GDPR).

THIRD STEP: Installing smart meters

WHAT THE PROJECT DID

Smart meters were purchased via a public procurement launched in summer 2019. These are composed of: smart plugs and smart sensors, enabling monitoring the electricity and water consumed.

During three months, the project installed the smart meters in the flats of the residents of New South who had agreed to take part in the experiment: 90 people have agreed to be part of the smart homes. 134 confirmed their interest in the online community (dropouts were due to lack of time, interest or technical reasons for the installation of the meters or were only interested in the local energy group). 40 people received the smart meters on time for the first experiment, others will keep on receiving for further use and testing during the following experiments (6 or 7 in total).

The smart meters were installed and tested, together with an explanation of the ways to use them. The smart meters will remain the property of the residents at the end of the challenge.

The first smart meters were installed by Sam Verbelen, Innovation Manager Energy & Water, from the City of Antwerp, in charge of technical and technological aspects of the challenges, being the link between the citizens and the technical partners of the project. Once the system was in place, in technical terms as well in terms of exchanging, discussing and explaining to the residents, other colleagues became in charge of this installation.



KEY CHALLENGES

Challenge	Observation
2. (Smart) Public procurement	Difficulties in designing the most suitable appliances bearing in mind the variety of possible situations in households, from a technical viewpoint.
6. Communication with target beneficiaries	Delays and dropouts have occurred due to the length of the process, the change of minds of potential participants, and other upcoming priorities (e.g. getting settled in a new flat, new neighbourhood).

DONTS

- Do not underestimate the time for the public procurement for the smart meters.
- Do not overlook the specifications for the public procurement: do a thorough market analysis upfront and keep in mind the different types of installations at residents' homes.
- Do not install the meters in an area, which is totally inaccessible as you might want to be able to access them.
- Do not underestimate the time to chase up the residents who agreed to be part of the project.

DOS

- Make sure to choose a public procurement type that allows for flexibility in the quantity of devices to be delivered and ability to adapt to different circumstances (single phase vs three phase electricity).
- Ensure your smart meters correspond to your needs (on short term and long-term use after the projects closure) as the market is wide and you can find many different qualities and usages.
- Get someone from the City or highly involved to install the first meters in order to test the whole process and communication before delegating to another colleague or partner.
- Explain clearly to the users the way the smart meters work.
- Whenever possible try to make use of existing metering. Some countries already have switched to smart metering devices operated by the DSO. Using their data would greatly simplify the installation process. Opening up a fuse box to install a NILM (non-invasive line monitoring) is sometimes challenging and ideally requires a certified installer (somewhat underestimated in our project).

FOURTH STEP: Analysing the behaviours

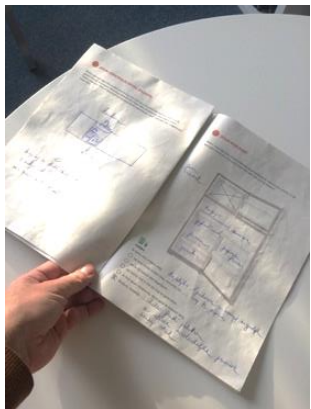
WHAT THE PROJECT DID

The project used an ex ante and ex post questionnaire during the first challenge organised in the project, the 100-100-100 waste challenge: it enabled creating a user profiling. This initial analysis showed that the participants were mostly women, middle aged, educated, already advanced in their consumption practices and willing to change even more.

These first results were discussed with a panel of experts for each of the streams (energy, water and waste) which led to the design of an innovative way of surveying via the Circular Passport: over 20 pages of questions, the paper questionnaire asked for more details about energy consumption of residents and their current practices. Finally, every person who subscribes to the project fills an intake questionnaire, which asks about attitudes in the four streams.

The data collected so far does not enable generalization of the wider population, yet it provides great insights of the given population and relevant basis for designing the nudging experiments. The experiment on waste will be executed during the second zero waste campaign. Tips will be also shared via the app.

The results show for example that still there is a high peak on energy consumption in the evening, also for the weekends. Although people have the ability to shift their energy consumption throughout time, they still stuck in old habits. Especially washing e.g. is not bound to a fixed moment and is something that could easily be shifted.



The results also showed that the participants clearly need guidance on adjusting their behaviour in such way that they can make better use of green energy sources such as wind and solar power. In terms of water consumption – showering is a huge “waster” of tap water. It appears that the shower is considered as a relaxing moment, where warm water is enjoyed throughout the whole showering moment (sometimes combined with other activities such as brushing your teeth). In terms of waste, most people do sort their waste, but only at one place of the house (e.g. the kitchen). In other places of the home waste is often collected in one and the same waste bin.

KEY CHALLENGES

Challenge	Observation
4. Participative approach for co-implementation	Co-creating a questionnaire that is more welcoming for answering using the skills of all the partners (in this case, the designers together with the researchers as well as the civil servants).
5. Monitoring and evaluation	Benchmarking the analysis against the literature on the subject. Assessing the limited (biased) sample against the overall general population.
6. Communication with target beneficiaries	Ensuring a sufficient enough response rate.

DONTS

- Do not design a questionnaire that is redundant, does not correspond to the reality of your target group.
- Do not stick to one way of communicating your questionnaire (only online, only offline).
- Do not generalise the findings to the overall population and to the rest of your public policies.

DOS

- Be innovative in the design of your questionnaire.
- Test your questionnaire. And ask for feedback on the experience of filling out the questionnaire.
- Use the results for what they are and not beyond.
- Keep the task of filling the questionnaire and send the results back as easy as possible.

FIFTH STEP: Co-designing challenges

WHAT THE PROJECT DID

Discussions with the residents and the experts (see FOURTH STEP) have stressed the reasons for high-energy consumption. Some relate to infrastructure limitation, which cannot be addressed by the experiment, but others relate to individual usage (e.g. having several showers in a flat, using a rain shower, showering not efficiently ...). These learnings led the focus on the top 2 activities under each of the three streams of energy (electricity, water and waste):

- Energy:
 - Use energy when the availability of renewable energy is high (preferably in the immediate surroundings – neighbourhood – but higher levels can be considered also – city, province, region, national, EU, global).
 - Residents should avoid using energy during peak time (when everybody else is using it).
- Water:
 - Residents should more efficiently run their washing machine e.g. when it is full and with the proper program.
 - Use toilet's water saving function, when appropriate.
- Waste:
 - Residents should separately sort, collect and dispose the different waste fractions (plastic, compostable, paper, glass and residual waste).
 - Residents should reduce their food waste by optimizing the way they buy, prepare and store it.



KEY CHALLENGES

Challenge	Observation
4. Participative approach for co-implementation	Learning and exchange takes time. Translating challenges into IT development has been complex.

DONTS

- Do not address issues which are out of your reach for impact (e.g. here infrastructure).

DOS

- Look for academic and street-level expertise and knowledge to identify the most relevant challenges for you to address.
- Try to get to the root cause of a problem. What are the main reasons why water consumption is high? Which of those reasons are linked to behavioural elements?



SIXTH STEP: Co-designing nudges

WHAT THE PROJECT DID

Nudges are prompts for people to behave in a certain way. Based on the analysis of the self-reported residents' behaviours, and on literature on behavioural change, such as the "7E Model", the project co-created nudges and their experiments with residents. A workshop was organized to identify the way residents deal with their waste, consume energy and water, their motivations and barriers to participate in the campaign and based on this information, define a nudge that could be implemented within the campaign. Consultants detected the most significant behavioural impact.

The nudges have been organized for the users of the app. It will take into account the different type of users of the application. The tone of the messages relates to Enlightening (about what users can do and how, or actual feedback), Enabling (links to tools and services), exemplification (information on the users' consumption), and Experience feedback (experience-enhancing). Regarding the ways to motivate users, the messages will Enthuse (promoting personal address on pride, autonomy and control), Encourage (referencing to profit and / or loss) and Engage (regarding the social norm). In addition, the messages will be sent on the basis of time of use, of data collected, specific context or depending on other rules. For example:

- To motivate residents to consume electricity between 11.00 and 15.00, a message is sent two times a week at 10.50 to remember the participants to make usage of green energy when it is available (especially for appliances that consume a lot of electricity, such as the washing machine).
- Recurrent messages are sent on a weekly basis about the average energy consumption per household. Participants are informed if they consumed more, less or an equal amount of energy compared to the previous week.
- A group challenge is defined for waste reduction. If all participants succeed in reducing their household waste, then circles (virtual tokens) are rewarded.



KEY CHALLENGES

Challenge	Observation
6. Communication with target beneficiaries	Designing rules is easy but writing the actual messages and using the right voice tone for the message is trickier.

DONTS

- Do not try and be exhaustive in the listing of nudges according to your analytical categories: remain relevant to what can and should be done.

DOS

- Design nudges which are applicable in the daily lives of your target group.
- Ensure the nudges are designed in relation to a clearly defined challenge.
- Given the set-up of the whole project – a fully controllable experiment is not feasible. Therefore, a more pragmatic approach is required but based on scientific and academic insights.
- Put reachable, but challenging targets for the participants in the experiments
- Start with the most basic one possible (e.g. use washing machine between 11 and 15. More complex ones, which require more complex data analyses, can be introduced later (e.g. reach a self-consumption ratio of 50%).

SEVENTH STEP: Designing the reward system

WHAT THE PROJECT DID

The behavioural nudging is supported by a blockchain-based reward system. The residents interact with the reward system through the Circular South app: the reward system is encouraging the residents who implement some specific behavioural changes and it takes the form of awarding a virtual token, circles, available and exchangeable via the app. The reward can affect individual challenges (a certain goal is set for the user to attain in order to get a reward e.g. 10% lower water consumption than the previous month), **group** targets (the challenge is defined for a group of people e.g. saving a thousand litres of water together) and **trigger** challenges (where a user is rewarded for performing an action, e.g. attending an information session or visiting the neighbourhood compost heap).

The use of “**circules**” was co-created with residents and they can currently be used at the City of Antwerp ‘s facilities (e.g. swimming pool, cultural events, Ecohouse), The circles can then be exchanged or re-inserted into the reward system.

The project uses the existing Antwerp loyalty system (A-card) which already provides for a spectrum of spending options. In addition, a « shop » for collective rewards was designed and will be operationalised (e.g. picnic box, customised city visit, workshop at CIRCUIT, neighbourhood get-together ...)

Regarding these activities, the City of Antwerp made available a budget of 5000 euros from its own internal budget. For accounting purpose, a euro value is given to each circle, yet it is not displayed officially. The technology supporting this system is based on a blockchain (incl. smart contracts), blockchain middleware and the Circular South app.



KEY CHALLENGES

Challenge	Observation
2. (Smart) Public procurement	It can be difficult to support innovative start-ups via public procurement for blockchain: challenging is the design of adequate specifications to address them.
4. Participative approach for co-implementation	Working with 6 IT partners, each with its own KPIs, makes the work extremely complex. Creating meaningful ways to spend the circles.

DONTS

- Do not isolate the technical (blockchain) part from its implementation (actual needs of the project).

DOS

- Follow the principles of blockchain technology to ensure protection of your data.
- Ensure an adequate abstraction layer to make the blockchain technology agnostic.
- Make sure your rewarding system is not counterproductive towards the achievement of behaviour change goals. People should in first place be intrinsically driven to reduce waste or lower their energy consumption, and a block-chain reward system could be supportive in it.

EIGHTH STEP: Launching the Nudging experiment

WHAT THE PROJECT DID

The nudging experiment was composed of at least 6 experiments: on energy, waste, energy again and water, as described below.

Timing: experimentations 1 - 6

	Experimentation 1	Experimentation 5 & 6	Experimentation 2	Experimentation 3 & 4
Theme	Energy	Waste	Energy	Water
Duration	4 weeks	8 weeks	4 weeks	4 weeks
Start	Week 6 (3 February)	Week 10 (2 March)	Week 20 (11 May)	Week 25 (15 June)
End	Week 9 (28 February)	week 18 (1 May)	Week 23 (5 June)	Week 28 (10 July)
Interviews/ survey/focus group	Week 10 (2 March)	week 19 (4 May)	Week 24 (8 June)	Week 29 (13 July)



The first experiment was organised in February 2020. It focused on energy: shifting the consumption of energy when the production of renewable energy is high, between 11h and 15h, and avoiding consumption during peak time.

It was organised in three steps. Before the actual launch of the experimentation, the rules had to be tested technically. Then, for four weeks, the volunteers actually received the nudges through the notification centre in the app. Finally, just after the experiment, the volunteers were asked about their feedback.

2 reminders were sent each week for consuming energy between 11h and 15h. Further, messages were sent when participants used their washing machines between 11 and 15 (“thank you message”), and a reminder to do so when they did not. Finally, also an alert was created if participants consumed 20% more energy than average on a weekly basis.

In total, 209 reminders (“when to consume”) were read by 33 participants, 111 thank you messages were read for using the washing machine between 11h and 15h (26 participants), and 159 messages were read to alert participants that they

used their washing machine outside 11h and 15h (30 participants). No alerts were sent to inform people that they were consuming more energy than on average.

KEY CHALLENGES

Challenge	Observation
4. Participative approach for co-implementation	The nudges are bound to the digital environmental and it is difficult to address real-time data in the messages. The complexity of partnership (with 6 IT partners) caused delays in the technical testing.
5. Monitoring and evaluation	Need an IT manager specialist in managing this kind of projects. Role should be attributed to one of the partners or should be procured.
6. Communication with target beneficiaries	Reaching out to the target group: people might have agreed to be part of the experiment but not available, or the concept might not be what they were looking for. Time need for the installation of the smart meters. Limits of what can be done technically with the notifications (both in terms of form and content).

DONTS

- Do not underestimate the time needed for technical readjustments.

DOS

- Keep a good eye on the incoming logging statistics and observe patterns in the data: which rules are triggered, and which rules are not that effective.
- Communicate clearly to the participants that it is a technical test, and that perhaps some issues might still occur. This helps to set the right expectations from users.



NINTH STEP: Closing (and analysing) the first experiment

Feedback received

After the first experiment, residents were invited to a focus group to discuss their experiences related towards: (1) the technical installation of the smart meters, and any remaining issues; (2) the usability and user friendliness of the application; and (3) the nudging, and in particular:

- their perception of the information provided via the app for their usefulness;
- the adequacy of the information provided regarding their practices;
- the relevance of the way the information is provided (via pushes or notification);
- the applicability of the timing when the information is received;
- if people actually use the app; and
- the impact on their actual change of energy consumption.

The first feedback has been very positive:

- Residents were happy when received their first circles though which they got access to some A-Card services;
- They could see directly on the app how much they were using and found the graphs insightful;
- They loved the nudges (notifications and tips) in terms of quantity and quality;
- They like the mascot, CEZAAR, which communicates about consumption levels; and
- They wanted more explanation about the reasons to change their energy consumption patterns for a particular timeslot.

Residents would be happy to see the following modifications:

- The exact measure of quantity of waste thrown away;
- Enabling an archive mechanism for messages; and
- As technical issues arose, they could not see their circles nor the ways they could use them.



Behavioural shift

In total, there were 479 washing cycles in February and 561 washing cycles in January. For the particular timeslot that was promoted, there were 171 washing cycles between 11h and 15h in February and 227 in January. The decrease in the number of washing cycles is positive, however, from statistical analysis it appeared that these decreases are not significant.

On average, all the participants used their washing machine 10 to 11 times in February and the majority did so outside 11h and 15h. Only 5 participants washed more between 11h and 15h, than outside 11h and 15h.

As such, the team has observed no behavioural shift in terms of usage of washing machine. This is not a big surprise, since the main scope of the first experiment was to test the technical performance and the user-friendliness of the app. In the second experiment, more advanced nudging techniques will be used to shift behaviours.

Most participants of the first experiment were retired: although this is a good target group, with flexible time, to see how feasible it is to change habits, no generalisation can be made to the wider population.

For sure, the participants have got into a learning curve while increasing reading messages along the time and following recommendations.



TENTH STEP: Lessons learnt, takeaways and looking forward

Some learnings

- Do not get stuck to your original proposal/idea: you will have to adjust the scope of the recruitment, the way you proceed, the target, the target area... Many things might happen because of unforeseen consequences and you need a risk management plan.
- Launch a pilot/smaller experimentation first: here, the first challenge in November 2018 was already a trigger for citizens' interest with concrete actions to be implemented: they were already part of it and could further get interested or share with their acquaintances.
- Be clear about what you want to achieve in your experiment from the very beginning.
- Provide at least one killer app that prompts people in even if it does not contribute directly to the project's results. You need a "crowbar" to get on to residents' devices and into their lives.

Next steps

Based on the experiences of the first experiment, some improvements will be made on the next 5 experiments:

- Technical issues related to the rewarding system will be fixed.
- More information and rationale for the experiments (e.g. usage of washing machines during a certain timeframe) will be provided.
- More promotion about what participants can do with their circles, especially via the group rewards will be shared.
- Greater comparison of data (against consumption prior the experimentation) will be organised in order to draw more conclusions about the behavioural shift obtained via the usage of the app.

It was decided that the two waste reduction campaigns (reduction of household waste, and reduction of food waste) would be combined into one and would run in parallel with the offline 100-100-100 waste campaign. Further, before the start of the summer of 2020, a second experiment around electricity usage and a first experiment around water consumption was scheduled. For each of these experiments, a specific nudging technique was determined:

Experiment	Nudging techniques
Waste	<ul style="list-style-type: none"> Group challenge with individual rewards (circles) if participants are able to lower their household waste with a notable amount (interactive) Tips for knowledge increase (e.g. It takes up to 450 years to decompose plastic. Reusing plastic bottles is environmentally friendly, and also cheaper for you in the end. Therefore, consider buying your own drinking bottle and take it with you when you are on the move. Are you often buying plastic bottles when you are on the move? No, I have my personal bottle - Yes, I often buy new plastic bottles Individual challenge with 'treasure' hunts (e.g. looking for information throughout the city)
Electricity	<ul style="list-style-type: none"> Social norms and social identity (e.g. 'Your home used an average of XX hundred cubic feet of water per day in the last week. You used ____ (more or less) than the average home in your neighbourhood. Below the mean: happy face, above the mean: sad face) Social identity (e.g. Our water supply is shrinking while our city's demand for water continues to grow, we could soon face a crippling scarcity. That's why we need help, we are asking everyone to contribute for the good of our city. Starting today, let's do our absolute best to conserve our precious water resources! We are including a list of expert tips on conserving water, please read them and integrate as many of these features as possible into your household and lifestyle) (interactive) Tips for knowledge increase
Water	<ul style="list-style-type: none"> Group challenge with individual rewards (interactive) Tips for knowledge increase (e.g. with a different tone of voice (emotions): Saving water = saving money; Saving water = saving life)

