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DELIVERABLE 8.1 – INNOVATION AND DESIGN NEEDS

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1. INTRODUCTION

More and more energy saving initiatives are being launched. One such initiative, ACT4ECO, created under the ECO2 research project, offers its users, European citizens, a comprehensive set of knowledge and feasible energy saving measures on which they can act. However, this top-down approach of providing information for the citizen to act upon is not enough. In several qualitative interviews, users of the platform expressed barriers (financial, time, knowledge, digital skills, technology, etc.) and gaps in the market that prevent them from taking action in implementing the solutions proposed in the platform. These barriers, gaps, ideas and needs expressed by the users are presented as 103 quotes in the Catalogue of Needs and Ideas (see supporting material 5.1). Thus, even if the motivation is there, these challenges hinder action.

Hence, the objective of this task was to provide ideas and recommendations to help industrial organisations and decision-makers overcome these challenges and fill the gaps in missing objects, services and solutions in order to accelerate the adoption of energy efficient practices and solutions.

Following the identification of needs and gaps expressed by platform users and ECO2 consortium partners, 15 designers were invited to participate in a Design Jam, a two-day creative workshop, to generate ideas to address the challenges. The insights, ideas and design concepts that emerged from this creative workshop were then used to elaborate the Consumers' Sustainable Design Catalogue.

2. METHODOLOGY

2.1 – Objectives

The objective of Task 8.1 was to produce a catalogue that inspires industrial organisations and policy makers to remove barriers and bridge gaps in what is missing to encourage consumers to adopt energy efficient solutions.

Task 8.1 has two main outputs, which also divide the methodology into two phases: the Catalogue of Needs and Ideas and the Catalogue of Sustainable Consumer Design.

The Catalogue of Needs and Ideas

To overcome the shortcoming of the implementation of the ECO2 groups, which was initially designed to inform the needs and ideas of the users of the platform, the consortium used a different method to gather user feedback.

The Needs and Ideas Catalogue is presented here as a document with a series of 103 user quotes collected during interviews, pilot sessions and workshops. These quotes are user feedback on issues



related to the design of energy efficiency solutions. For example, suggestions for practical solutions to induce behavioural change, the functionality of energy efficiency tools, and other new ideas for innovative solutions that have been suggested by users of the platform.



User quote cards, ECO2 Design Jam, June 2021, Brussels Belgium - Credit: Strategic Design Scenarios

The Consumers’ Sustainable Design Catalogue

The Catalogue of Needs and Ideas which, communicates demands for new solutions by innovation and design, was used as a starting block to create the Consumers’ Sustainable Design Catalogue. Designers came together for a two day Design Jam to come up with solutions that tackle the needs and problems raised by users.

A design jam is a collaborative design event that aims to generate ideas, develop concepts and even go further and prototype them in a collaborative environment during a very short period of time, usually one to two days. Although inspired by design thinking, the methodology of each design jam is unique depending on the design context, the approach of the design team and the profile of the participants.





Participants of the ECO2 Design Jam, June 2021, Brussels Belgium - Photo: Strategic Design Scenarios

During the workshop, in addition to the catalogue of needs and problems and a presentation of the project, participants received additional tools to give more context, such as city profiles, user profiles, and a benchmark of existing innovative solutions that they can use to initiate the creative process.



Participants of the ECO2 Design Jam, June 2021, Brussels Belgium - Photo: Strategic Design Scenarios



2.2 – Participation

SDS, as task leader, closely collaborated with all consortium partners and 15 designers that were invited for a creative workshop to develop the Deliverable 8.1.

Consortium partners contributed by:

- Giving feedback to the proposed methodology
- Reviewing and analysing users feedback from the pilots to extract needs and barriers expressed by users of the act4eco.eu platform
- Disseminating the designer recruitment invitation in their networks

Recruitment process of the designers that took part in the creative workshop

In order to ensure that the consortium take into consideration both gender balance and a European perspective in the solutions to be generated, the consortium made sure to have a variety of profiles from all over Europe. Nine women and six men participated in the workshop. The designers came from Belgium, France, Italy, Spain, Greece, Germany, Denmark and the Netherlands.

2.3 – Timeline

The different tasks in D8.1 were adapted due to events leading to the adjustment of the project plan for the following reasons:

- 6 months extension of the project;
- new Covid-19 related uncertainties in regard to holding in-person workshops;
- and technical difficulty in implementing the ECO2 groups functionality.



Actions	New time-frame	Partners involved
Template for the ideas catalogue	November/December 2020	SDS and ARC Fund
Task group on needs	January/February 2021	SDS and all partners
Template of Consumers' Sustainable Design Catalogue	March 2021	SDS and ARC Fund
Workshop on designs: methodology	April 2021	SDS
Workshop on designs: the event	June 2021	SDS with the support of all partners
D8.1 Consumers' Sustainable Design Catalogue	August 2021	SDS

Despite all the changes to the timetable, the consortium managed to organise an offline creative workshop, to ensure a good level of collaboration, and ensured the right timeframe for finalising the final output.

3. RESULTS

3.1 Catalogue of Needs and Ideas

The Catalogue is a document with a series of **103 user quotes** collected during interviews, pilot sessions and workshops for the ECO2 project. These quotes are user feedback on issues related to the design of energy efficiency solutions. For example, suggestions for practical solutions to induce behavioural change, the functionality of energy efficiency tools, and other new ideas for innovative solutions that have been suggested by users of the platform.

All quotes are anonymous and were collected from different interviews done with actual users of the Act4eco.eu platform.

The quotes are organized in the following 5 clusters that cover different sorts of needs, barriers or gaps expressed by users:

1. **How can energy consumption be made more apparent?**
Visible, noticeable, tangible, audible, etc.
2. **How can we create better awareness about energy use and its impact?**
Creating awareness, education to make informed decisions, providing relevant information at the right time, etc.



- 3. How can we enable households to be in control of their energy consumption?**
Know your energy use profile, set targets and take active steps to reduce energy consumption, self-assess and be aware of your habits etc.
- 4. How can we engage households to adopt new responsible energy consumption habits?**
Motivate, inspire, coach, show impact and progress and track evolution etc.
- 5. How to ensure that reducing energy use requires as little effort as possible and excessive use requires more?**
Adjust existing energy services, ask for more effort or make it easily accessible depending on energy uses etc.

This document is prepared as a supportive material to the Consumer’s Sustainable Design Catalogue (D 8.1).

3.2 Consumers’ Sustainable Design Catalogue

The Consumers’ Sustainable Design Catalogue presents seven paths, presented below, that could be explored when designing solutions to support households in reducing their energy consumption.

These paths are presented to provide inspiration for tackling certain existing challenges and to also bridge gaps in missing objects, services and solutions that could help to accelerate the adoption of energy efficiency practices and solutions by households.

1/ Making decisions

Provide guidance or the right resources to the consumer so that they can easily make the appropriate and informed decision.

2/ Changing habits

Consider ways to help users adapt or change their daily practices and habits to become responsible energy consumers.

3/ Easy control

Identify ways in which energy consumers can become more active and have the possibility to better manage their energy consumption.

4/ Acting responsibly

Ensure that consumers behave responsibly on an individual and collective level when it comes to energy consumption.

5/ No-care solutions

Develop solutions that do not require any effort on the part of the consumer to reduce energy consumption on a daily basis.

6/ Picturing energy

Give a more meaningful representation of energy consumption to households.

7/ Considering every use

Remind users that all energy consumption, however small, should be considered and used responsibly.



4. SUPPORTING MATERIALS

The Catalogue of Needs and Ideas and the Consumers' Sustainable Design Catalogue will be annexed to this report as supporting documents.

4.1 The Catalogue of Needs and Ideas (p.11)

4.2 The Consumers' Sustainable Design Catalogue (p.32)



CATALOGUE OF NEEDS AND IDEAS

August 2021

By Strategic Design Scenarios



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CATALOGUE OF NEEDS AND IDEAS

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- 5. How to ensure that reducing energy use requires as little effort as possible and excessive use requires more?**
Adjust existing energy services, ask for more effort or make it easily accessible depending on energy uses etc.

Theme #1

HOW CAN ENERGY CONSUMPTION BE MADE MORE APPARENT?

Visible, noticeable, tangible,
audible, etc.

« I have no idea how much my appliances consume when they are used at different times and in different ways. »

« I know all the appliances in my home consume energy, but I'm not sure how much they consume separately, so it's hard for me to decide which ones I should use less. »

« I find it difficult to tell when devices are consuming electricity. It would be nice if there was a global indicator to determine when devices are consuming or not (even at low doses). »

« I prefer to have real time information, to be aware in the moment. And to avoid saying "ok, next month I'll make an effort. »

« I know appliances on "standby", consume small amounts of energy but combined it becomes significant. Proving this could help me to convince my kids to turn off and avoid standby mode. »

« It's true that we're so used to having all these gadgets they became normal and we don't really question their 'real' necessity... »

« It would be really great if I could fix consumption limits per appliance (with a monthly goal) in my home, but I'm not sure how to do that. »

« Sometimes I use some appliances even though they're not necessary, if I had more info maybe I'd think twice before I use them... »

« I rarely take the time to reflect on my energy consumption because it's invisible. The only time I think about it is when the bill comes. »

« I receive my energy bill and I have a table comparing it to the past months. But it doesn't necessarily encourage me to make a big change. What if we made a review or an analysis of my energy behaviors instead? How would that work? »

« It's hard to explain that just because you have a new, more efficient appliance that uses less energy that you can afford to use it more... because at the end of the day you end up with a higher energy bill. »

« Isn't it possible to have a choice in the eco programme for a quicker or longer wash. It's usually just only one option and I feel like it's the longest option, maybe even the least efficient one... »

« I don't really monitor my energy consumption as my bills are on a flat rate basis anyway. So whatever efforts I make in this area, I feel like I can't really see the difference ... it's too bad. »

« I am a tenant and do not have access to my electricity bills. My landlord takes care of the administration and is not based in the same country. I just pay a fixed amount and that's it. »

« It's really a shame that energy bills are just too complex and lack meaningful information on how to manage and reduce energy consumption. »

« In all things energy the units of measurement are too complex, until they are converted into euros. And sometimes it would also be nice if we had something to do with the environment, our goal or something else... »

« kWh means nothing to me. For me, energy just allows me to live in my flat with access to electricity... so all the communication based on kWh or technical elements seems useless to me. »

« Sometimes, the efforts you make to reduce energy use is not that significant on your energy bills. But, personally, if I see how it would concretely benefit the environment it would help me make more efforts? I guess... »

« Energy consumption is indeed an important issue. But monitoring it takes lots of time, requires motivation and attention. It's based on a

numerical scale that is difficult to visualise. It should be much easier and fun to engage with otherwise it's really hard to get in to it... »

« The often childish tone of the energy use campaigns does not help me to stay motivated. The situation is sometimes a bit depressing, how can I stay motivated? »

« I don't know how impactful it would be if I renovate the insulation of my home. Impact wise it's not that clear, would it be possible to have an idea even if it's a simulation but based on my routines and how I actually use energy currently. »

Theme #2

HOW CAN WE CREATE BETTER AWARENESS ABOUT ENERGY USE AND ITS IMPACT?

Creating awareness, education to make informed decisions, providing relevant information at the right time, etc.

« I don't have a basis for knowing where I stand in terms of personal energy consumption and whether I am considered efficient or not. »

« I understand that there is a lot to do to reduce energy consumption and all. But to be honest, I don't know where to start and what is the most interesting depending on my motivation and what I can afford, etc.»

« To establish a consumption budget it's crucial to have a reference point for comparison, either a family, a similar house or just the data with efficient use of appliances. But then, every household is different, so how can you know what your ideal consumption is and be reasonable? »

« I have less guilt about falling asleep with the light on after reading now that I have switched to energy-saving lighting. »

« Buying new low-energy products does not necessarily mean I will reduce my bills. It all depends on how I use them and my habits... »

« What is the best way to make your flatmates understand that there is no point in switching to energy-saving light bulbs and then leaving them on all day? We risk paying the same price as before!! »

« I want my whole family to do an assessment and see that household appliances use a lot of energy. How can I do that in an engaging and fun way so they don't hate me for it? »

« It's hard to get my daughter to understand that she has to be mindful of always turning off the lights. Telling her is not enough, what can I put in place to make it easier? »

« Setting goals (challenges) to reduce consumption motivates me!! It's like fitness goals. It could be nice if I could see the impact it makes directly. »

« Ah, I didn't even know my house wasn't airtight. In this case, it's quite possible that it's an energy drain. »

« Um, I don't understand: why does my house have to be airtight and at the same time have air vents? »

« I find it hard to make my children aware not to abuse water consumption and sometimes I even wonder if solutions like loudspeakers to prevent misuse could work? You can imagine, a bit like a toilet flush that screams all the time when it runs. »

« There is a real social pressure today to have the latest and most powerful technological devices, but I have to admit their level of energy efficiency or environmental footprint is not much of a sexy topic among peers. »

« I'm not sure if the appliances I have at home are the right size. Is my oven too big? ... therefore consumes more energy than I should? »

« We have a bi-hourly tariff but the children can't seem to remember when the lowest prices start and end. I don't know how to make sure they see when all electrical devices and appliances use the least amount of energy during the day. »

« Indoor air quality is important to me because my daughter has asthma, but the only thing I do to improve it is to open my windows once a day. But maybe I do this too much, and waste more energy by heating too much. What can help me figure out if this is really good or not? »

« I'm not sure if power strips consume energy at all times, I want some form of proof that power strips don't actually consume energy once they are switched off. »

« Checking the temperature of the fridge and freezer is indeed a good thing to do, but to be honest, I hardly ever think about it. »

« When buying appliances or electrical devices it would be great to maybe include an approximate cost of energy consumption per year in euros on the label. This could improve more transparency from sellers. »

« Whenever I buy smart devices, to be honest I don't read their instruction manuals because it's just too technical... I just need an intro session just like when you install a new app. »

« Knowing how much I'm paying is not the first of my worries. But if I know that I can make a significant profit on my consumption (e.g. 10€/month) I would be ready to change my habits. »

« I should not focus only on the most powerful, innovative and efficient device to buy. But rather on the one that is the most suitable for my needs and that is still an efficient one. But it's not that easy to find information about that in stores and on the market... »

« With my colleagues we were wondering if a durability and repairability index (how reparable they are) on different appliances could help consumers make better choices. »

« A usage meter for devices could be indicated for some products (washing machine, television, etc.) for when we want to sell them or to even just check maintenance dates... »

« I try to explain to my children that daily showers are not absolutely necessary. But they find it hard to accept this as it is frowned upon by their friends. »

« I find that the eco mode for washing machines does not wash well. That demotivates me to select that mode... »

« I should do a complete audit to check all the elements that can be renovated in the home, but it would require a professional. How would I do that by myself? It seems like there is too much to do... or I could have a coach that could also help in renovating. »

Theme #3

HOW CAN WE ENABLE HOUSEHOLDS TO BE IN CONTROL OF THEIR ENERGY CONSUMPTION?

Know your energy use profile, set targets and take active steps to reduce energy consumption, self-assess and be aware of your habits etc.

« I don't have a basis for knowing where I stand in terms of personal energy consumption and whether I am considered efficient or not. »

« It's necessary to make an assessment according to where I live, my habits and all the electrical appliances and devices I have in the house. That's how you get the full picture, otherwise it wouldn't be adequate. »

« I have a home that is super-connected, it manages itself, I don't have to look at it nor worry about it, except that I don't really know if my home is more efficient than the neighbor's or if I'm actually doing good or not. »

« I became more efficient, look I changed my light bulbs for energy-saving ones! I know that it is not enough, but it's a first step and it should be celebrated. »

« What's the equivalent of a homemade Sherlock Holmes magnifying glass for finding air leaks and other energy-wasting problems in the home? »

« I'm not an engineer, I can't spend my time checking and evaluating everything! »

« Ventilating a house is really recommended, but is there an ideal "moment" to ventilate without lowering the room temperature too much, or creating strong draughts. How do you know the ideal time to do that? Or maybe I should try air purification without indoor air ventilation? »

« How can I pinpoint all the areas that cause air drafts in my home. How do I pinpoint them without having to call for an energy professional... ? Is there any Pokémon go style solution I can apply? or a DIY kit? »

« Apart from the real draughts that you can feel, I don't even know where to look for air leaks in the house: joints, socket boxes, keyholes? »

« I would like to focus my energy reduction efforts on my current consumption levels, not generic ones. But I don't know how to do that... »

« Is measuring the energy consumption of appliances in its full lifecycle, with the possibility of checking it at any time on the producers' website possible? It could inform on when to do maintenance and check if replacements are needed before it becomes too energy demanding... »

« Bills are not interactive, clear and simple enough. I would like to be able to follow the evolution of certain devices easily. Because for now, even if there is data on the devices, I have to make calculations etc. to get an idea so I just never do it. »

« I would be interested in tracking my consumption but not really how much I pay per month. More to see where I have to improve. I would be interested in being able to feel closer to my consumption, be more aware of my routine and have more control over it. »

« I bought a washing machine 4 years ago and it was A++, at the time it was considered very efficient but now I'm not sure if it's still up to the standard or if it's making me consume more energy than what I should. »

« I know maintaining appliances is one of the best way to stabilise energy consumption, but I never remember when to do it, how often I should do it, the last time I did it... »

« Energy labels are not adequate for when we buy second hand, it should be reviewed when it's being sold again. »

Theme #4

**HOW CAN WE
ENGAGE
HOUSEHOLDS TO
ADOPT NEW
RESPONSIBLE
ENERGY
CONSUMPTION
HABITS?**

Motivate, inspire, coach, show impact and progress and track evolution etc.

« We would use a tumble dryer for only 3-4 times a year in winter... so should we get a new one that performs well or a second hand one that does not perform as well? »

« I turn off my heater when I leave the house, but I shouldn't do that if I'm leaving for a short amount of time. Then why do I have to turn it off when I open my windows? It's only going to last 10 min. »

« Well, my television, when it's on standby, doesn't consume anything so it should be fine right? »

« Since I adopted a cat, I leave the heating on in the whole apartment and it even stays on when I leave my home, I would feel so bad if she gets cold. My energy consumption has skyrocketed... »

« I always leave my phone charger plugged in at the same place, so I don't forget to charge it in the evening for the next day. »

« I don't have many sockets at home, so I use power strips, but well...I leave them on, it's easier. »

« Sometimes, since we're on the 3rd floor, hot water tends to come slowly. So I use less hot water, which helps me use less energy. But my kids prefer waiting until the water becomes hot before they go in. What a waste of energy and water... »

« It is advisable to prepare several dishes in the oven at the same time to reduce energy consumption. But this requires a lot of organisation and preparation time. This is a difficult habit to get into in my daily life. »

« We have a washing machine to share in the flat. We're 3, so we have lots of laundry. We use the fastest programme which uses a high temperature so that we don't have to mix our clothes. It's not ideal since it's the mode that consumes the most energy... »

« During winter, I ask everyone in the home to wear warmer clothes so we can reduce a little the temperature. But they all have a hard time because they're just not comfortable with lots of layers. »

« I want to encourage my flatmates to check if all devices are unplugged or switched off before going to work or university. But the plugs are all over the house so you have to go and check in several rooms, which is inconvenient when you're in a hurry so I never check... »

« I don't have enough space in my flat or at the window to hang the clothes out in the open, so I use a tumble dryer. »

« There are no instructions on how to integrate them into our habits when we buy smart appliances that are supposed to reduce our energy use. We only have the how to use or set-up, but it's not enough. »

« My personality/ lifestyle definitely influences my energy consumption but it's not visible to the people in my circle so I'm way less accountable for doing what's right... you know? »

« How can efforts to become more aware be valued or rewarded? »

« I don't know how to motivate my family to make an effort to reduce their energy use, punishments and lectures don't help! »

« It would be great if we were rewarded for using our electronic equipment in the right way. »

« To me, knowing my energy consumption and wanting to reduce it would be mostly motivated by the challenge, to see if I can do better than before or even than my friends or neighbours. »

« Reducing energy consumption is like going on a diet. It seems insurmountable before you start, but once you start, you realise it's

achievable. How can coaches and apps help us progress and stay motivated? »

« When it comes to making energy use improvements I'm always full of goodwill at the beginning, but then it just fades away. »

« Sometimes, the efforts you make to reduce energy use is not that significant on your energy bills. But, personally, if I see how it would concretely benefit the environment it would help me make more efforts? »

« I really try to make an effort to reduce my shower time, but I'm not sure how to track my progress. I feel like I'm not making any progress. »

« There is a lack of feedback or reminders, specific signage on appliances to remind us to take small actions to reduce energy consumption. »

« I bought a new high-tech thermostat but I just can't manage to integrate it into my routine, so I only use the basic functionalities it offers. »

Theme #5

**HOW TO ENSURE
THAT REDUCING
ENERGY USE
REQUIRES AS
LITTLE EFFORT AS
POSSIBLE AND
EXCESSIVE USE
REQUIRES MORE?**

Adjust existing energy services, ask for more effort or make it easily accessible depending on energy uses etc.

« My washing machine is old and noisy so I only use it when I really have to. »

« I leave my TV & decoder in standby because it's easier. We should be more informed about the impact of our consumption with standby modes, but I've heard that it's a lot. A single remote control with a button that disconnects everything would be great! This button should be green. »

« The taps give the impression that water is endless. You can really have everything you want with very little effort nowadays. I believe you won't have any issues reducing your consumption if we had to fetch water from a spring! »

« I admit that it's difficult to unplug a device when not in use. Even more when it's something you use often but at different times of the day. Like when I'm watching TV, clearly my computer doesn't need to be plugged in, but I leave it on anyway because it's convenient. »

« Reversing the application procedure for subsidies to receive financial help in renovating could be great! Like, the user presents a project and will be offered with all the possibilities he can ask for his home upgrad /renovation project. »

« The bureaucracy to ask for financial aid for installing solar panels is just too complicated. There are too many documents, fees... All these hinders households from investing in renewable energy. »

« Why aren't there eco modes on the shower and heating systems, it would require less effort for people to figure out by themselves. »

« I always wanted to find a way that automatically dims the lights or turns them off when there is enough light in the room - it could work with lumen sensors? »

« All these little energy saving tasks can be very stressful, it's a mental load, you always have to think about it! »

« A power strip with a timer function to control the power supply could be useful. A bit like a thermostat... »

« The switch on the power strip should be in a very easy to reach place, on the wall or on the telephone and not just on the power strip. »

« Having a centralized thermostat doesn't really help me. I often stay in different rooms for different lengths of time, so I'm more interested in heating where I am and not the whole apartment. »

« Some appliances could offer a manual version where they would work without using energy (it could be practical for camping and if a blackout ever happens...). »

« Turning on power-hungry appliances during off-peak hours seems easy to do, but I have a really hard time remembering when I'm in the middle of the action. »

« I bought a 2nd hand appliance but there was no instruction manual so I couldn't program it on eco-mode so I just use the default mode. »

**This document is prepared as a supportive material to the
Consumer's Sustainable Design Catalogue.**

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Watt- less

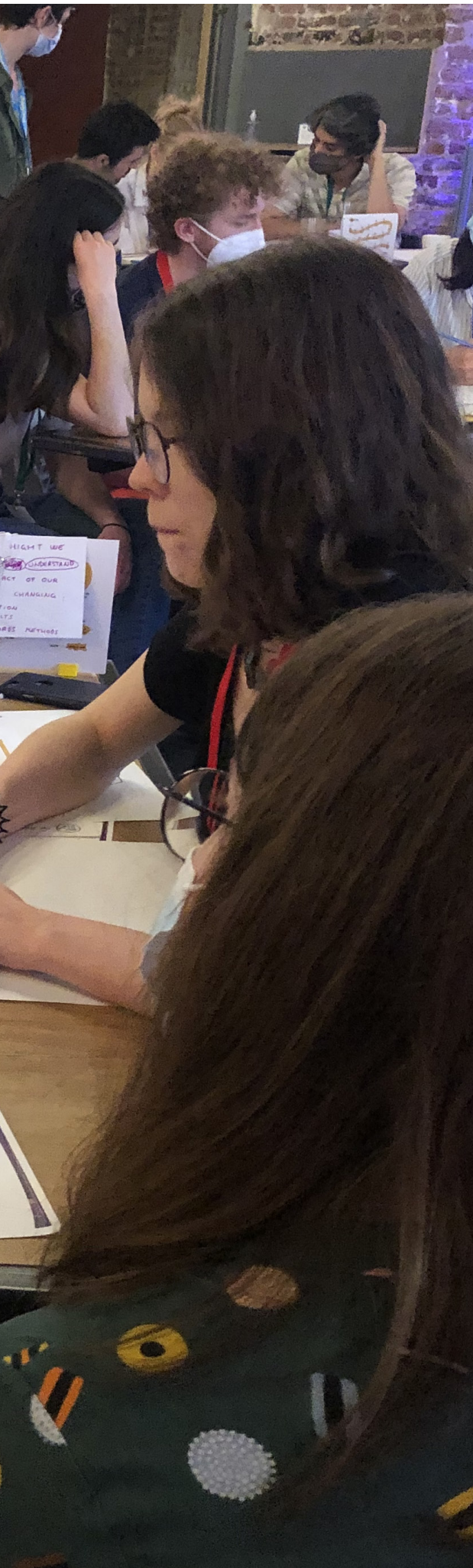
**The Consumers' Sustainable
Design Catalogue**



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Act4eco Design Jam, June 2021 - Brussels, Belgium
Photo: Strategic Design Scenarios



Why this catalogue?

Accelerating the adoption of energy-saving practices by households

European households accounted for 26.3% of total final energy consumption in 2019 in the EU (Eurostat), which represents one quarter of total energy consumption. So it is evident that this is a large sector that could have a significant bearing if all households take steps to become more energy efficient. Nevertheless, it is the sector that is one of the most difficult to implement changes in, as all the solutions depend very much on households, especially with regard to changing habits, daily practices and behaviour.

Households rely heavily on the services provided by energy. They consume energy to keep their homes comfortable and to operate appliances and all sorts of electrical devices. Whether it is watching TV and surfing the web, cooking and washing, lighting and heating. Households consume a lot of energy and it can even be considered as a basic need. But as time goes by and we become more and more accustomed to comfort, the line between essential and luxurious services provided by energy has gradually blurred. The notion of sufficiency is no longer taken into account, and households consume energy excessively and this without worrying or even thinking about it. Yet we know that energy is not infinite. Nor is it neutral for the planet. We know that we need to transform our production and consumption patterns. And of course, this must be done both globally and locally, at the level of society and the individual.

The good thing about the current situation is that there is an opportunity to support households to reduce their consumption, to change their daily practices and behaviours to become more responsible and energy sufficient.

But how? At the household level, this may mean changing some old, over-consuming appliances, insulating the home or changing the light bulbs, but it also means changing habits and behaviours. How can households be more reasonable consumers? How could they adapt their behaviours towards more responsible and sustainable uses of energy?

We addressed these questions within ECO2 (Energy Conscious Consumers), a research project funded by Horizon 2020. The aim of this project was to inspire and provide know-how to European citizens on how to adopt more conscious behaviour to improve household energy efficiency through Act4Eco.eu, an interactive e-learning platform.

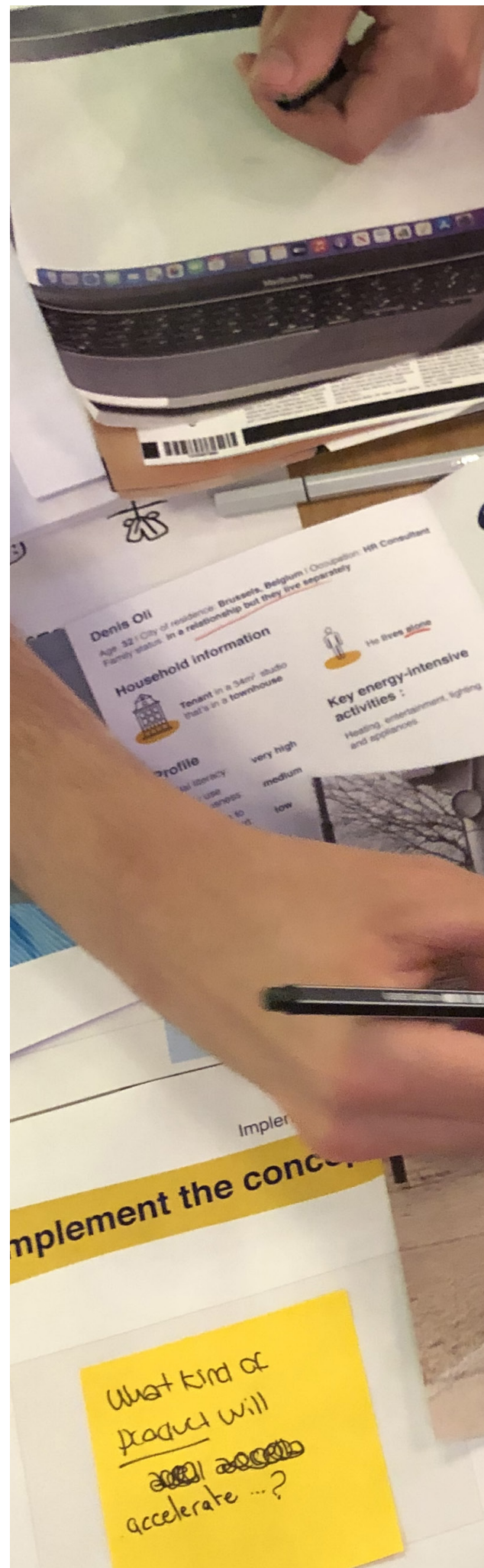
In the course of the project, we discovered some of the needs and barriers shared by platform users about how they struggle to implement energy efficiency measures.

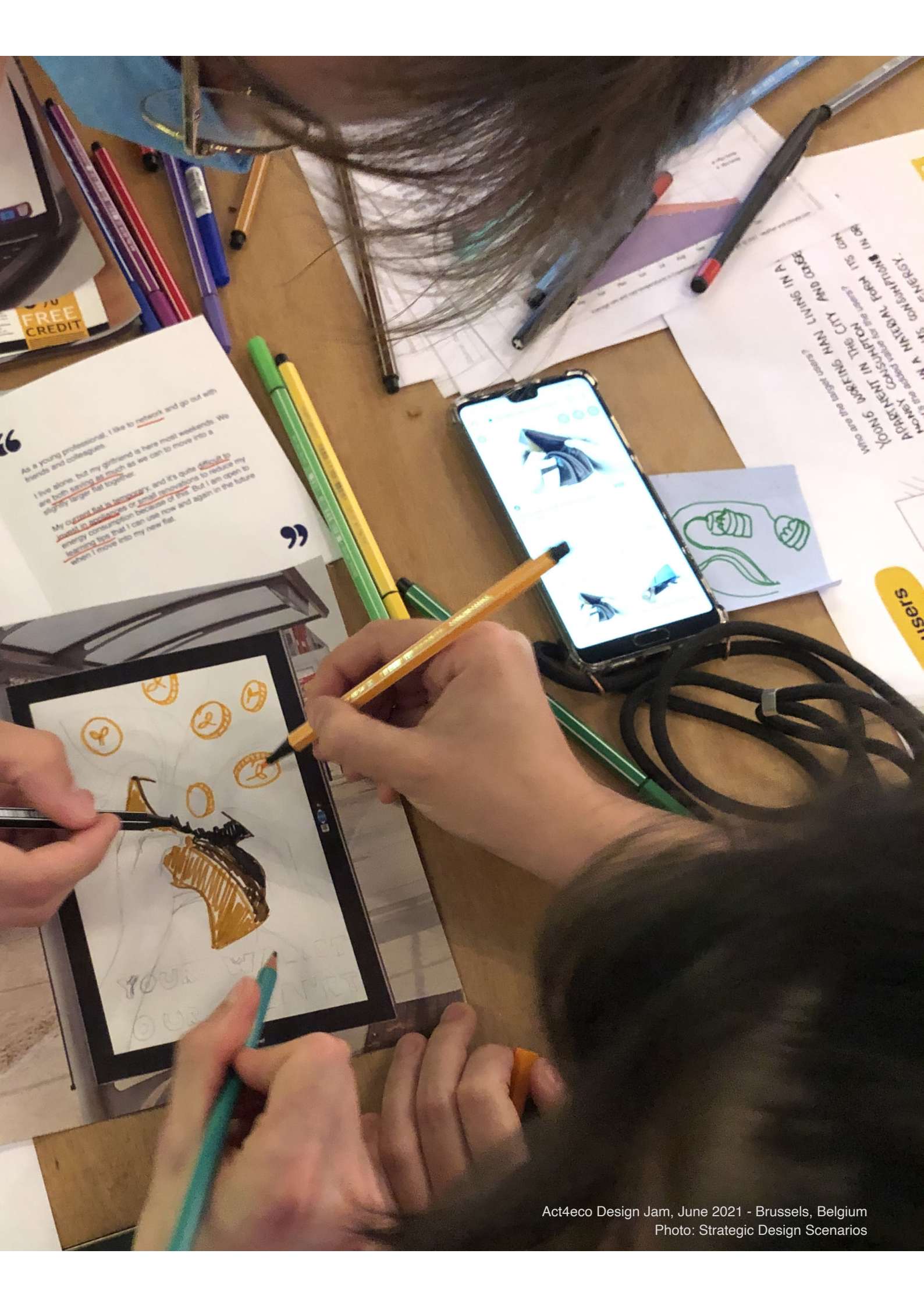
In early June 2021, a design jam was held in Brussels, Belgium, with 15 designers coming from all over Europe to look for opportunities to tackle these challenges.

In this catalogue, you will find the seven paths that emerged from the design jam that could be explored when designing solutions to support households in reducing their energy consumption. These concepts are presented to provide inspiration for tackling certain existing challenges and to also bridge gaps in missing objects, services and solutions that could help to accelerate the adoption of energy efficiency practices and solutions by households.

We hope that this catalogue will generate lively discussions on creative solutions that will make it easier for consumers to adopt responsible energy use.

Cheers,
Strategic Design Scenarios





“As a young professional, I like to retreat and go out with friends and colleagues. I live alone, but my girlfriend is here most weekends. We are both saving as much as we can to move into a slightly larger flat together. My current flat is temporary, and it's quite difficult to justify its expenses or small renovations to reduce my energy consumption because of this. But I am open to learning that I can use now and again in the future when I move into my new flat.”

Who are the major users?
YOUNG WORKING MAN LIVING IN A
APARTMENT IN THE CITY AND CARES
ABOUT SAVING ENERGY
FOR A FUTURE FLAT IN THE CITY
AND CARES ABOUT SAVING ENERGY

Users

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Conclusion

Harnessing the seven paths to explore solutions to guide households in reducing their energy consumption

Reducing energy consumption

Motivational factors that play a role in managing the gap between knowledge, intention and action

Decisions about energy consumption are usually taken in a rather routinised way, and often without much thought. Therefore, providing information and raising awareness of the consequences of consumption choices is not enough to change energy consumption patterns. The decisions are so integrated in the habits that consumers function in almost what we can call an automated mode.

Furthermore, initiatives such as Act4eco.eu, an interactive platform that provides its users with a comprehensive set of knowledge and achievable energy saving measures, tips and tricks that consumers can act on, demonstrate that this top-down approach of providing information to the consumer so that they can act is not enough.

In several qualitative interviews, users of the Act4eco.eu platform expressed barriers (financial, time, knowledge, digital skills, technology, etc.) and gaps in the market that prevent them from taking action in implementing the solutions proposed in the platform even if they're aware of the economic and environmental benefits. Thus, even if the motivation is there, such challenges hinder action.

So, when it comes to changing energy consumption habits, several factors are needed to convince consumers/citizens to

act, and these factors must all work in synergy.

A selection of these barriers, gaps, ideas and needs expressed by the users are presented as anonymous quotes throughout the pages of this catalogue.

Decisions about energy consumption are usually taken in a rather routinised way, and often without much thought.

In this catalogue, we'll focus on different design paths we can explore to remove barriers that prevent consumers to perform energy saving actions, enable consumers to become active consumers, make energy use comprehensible and make sure consumers have the possibility to easily make the right decisions to become energy efficient and so on.



Energy saving drivers

Economic motivators

Environmental motivators

Technological interest

Community-driven motivators

Comfort and efficiency motivators

It is not an easy task to find new ways for households to reduce their energy consumption by shifting their consumption patterns. This is mainly due to the many barriers that consumers encounter, be it technological (poorly designed appliances or missing devices), administrative (complex and time-consuming processes) or simply motivational (willingness to change behaviour).

This is even more significant for people uninterested in energy issues even though changes in energy consumption habits could be beneficial to their well-being and their wallet.

So, all these aspects and many others that have not been mentioned here should be taken into account when looking for solutions to design sustainable solutions that induce energy saving behaviour.



Energy saving barriers

Sludge

Social norm influence

Requiring high effort

Lack of financial resources

Lack of time

Lack of knowledge

Lack of willingness to lose convenience

Apathy towards efficiency solutions

Introduction

Exploring design opportunities to reduce energy use at home

In the beginning of June 2021, following the feedback of needs and gaps we gathered from the Act4Eco platform users, Strategic Design Scenarios, the Belgian partner of the ECO2 project and a design agency, organized the ACT4ECO Design Jam with the aim of coming up with innovative and sustainability-oriented solutions to reduce energy consumption in the home.

15 designers from all over Europe were invited to participate in this Design Jam. A design jam is a collaborative creative workshop that aims to generate ideas, develop concepts and even go further and prototype them in a collaborative environment during a very short period of time, usually one to two days.

The insights, ideas and design concepts that emerged from the Act4Eco Design Jam were then used to elaborate this catalogue.

The Design Jam focused on 5 main design challenges that are presented hereafter and which were in

Seven Paths to explore

1/ Making decisions

Provide guidance or the right resources to the consumer so that they can easily make the appropriate and informed decision.

2/ Changing habits

Consider ways to help users adapt or change their daily practices and habits to become responsible energy consumers.

3/ Easy control

Identify ways in which energy consumers can become more active and have the possibility to better manage their energy consumption.



4/ Acting responsibly

Ensure that consumers behave responsibly on an individual and collective level when it comes to energy consumption.

5/ No-care solutions

Develop solutions that do not require any effort on the part of the consumer to reduce energy consumption on a daily basis.

6/ Picturing energy

Give a more meaningful representation of energy consumption to households.

7/ Considering every use

Remind users that all energy consumption, however small, should be considered and used responsibly.

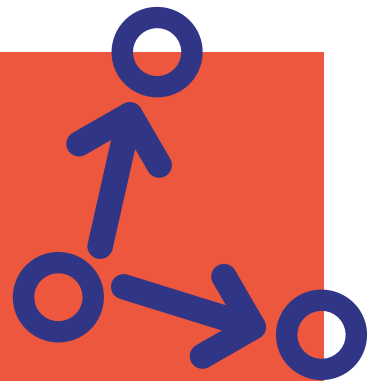
fact clusters of the 103 user quotes collected during the project.

- How can energy consumption be made more apparent?
- How can we create better awareness about energy use and its impact?
- How can we enable households to be in control of their energy consumption?
- How can we engage households to adopt new responsible energy consumption habits?
- How to ensure that reducing energy use requires as little effort as possible and excessive use requires more?

Just under two dozen design concepts emerged from this workshop, solutions that mainly address behavioral change. Among the concepts, most of them outlined some design guidelines for energy conscious design formulated as recommendations for industry and other stakeholders in the energy sector.

We organized these challenges in 7 grand themes described on the left.

1



Ma- king deci- sions

« I have no idea
how much my
appliances
consume when
they're used at
different times
and in diffe-
rent ways du-
ring the day! »

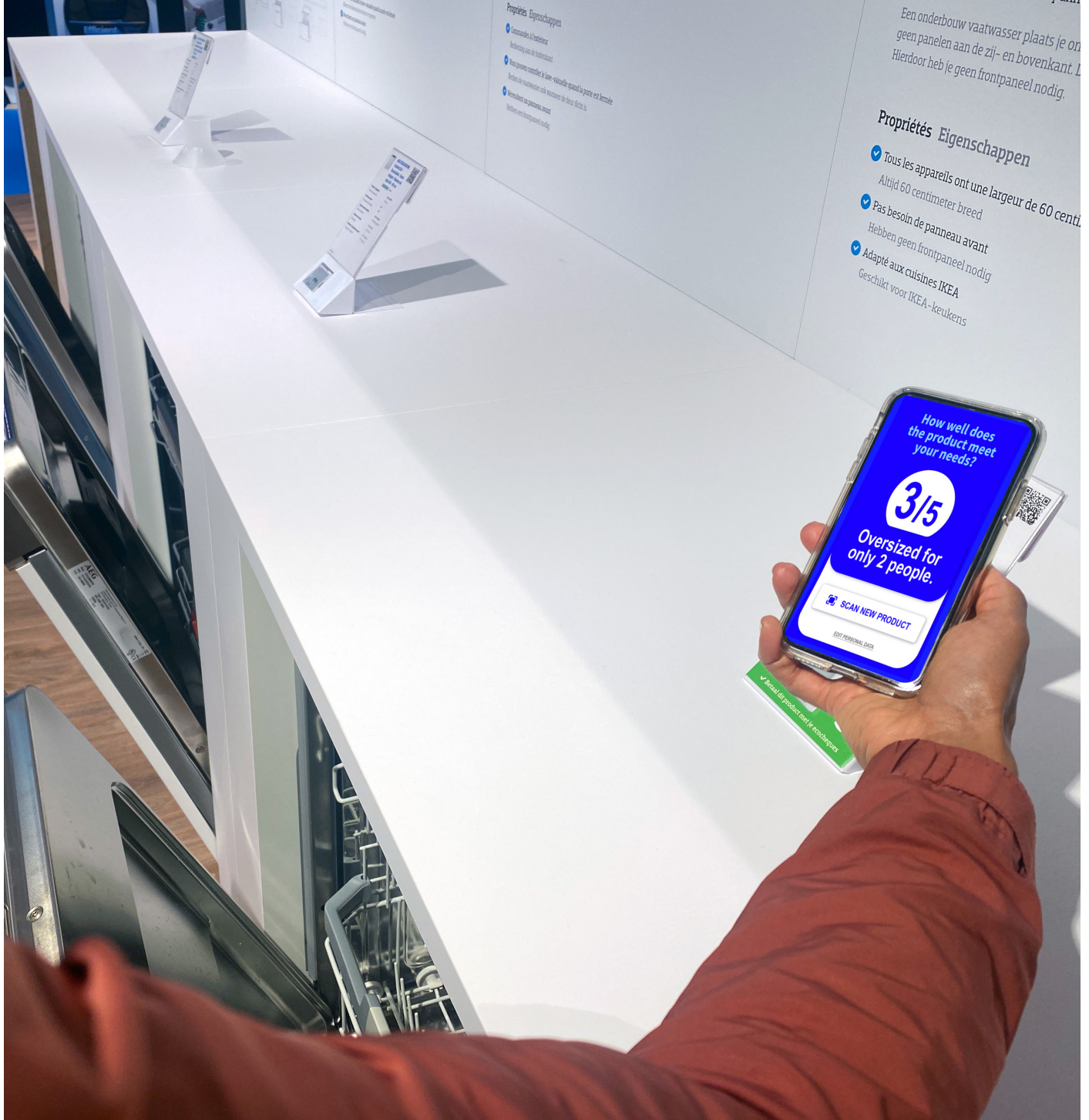
Anonymous

This quote was collected during workshops
conducted during the ECO2 research project.

« I'm not sure if the appliances I have at home are the right size. Is my oven too big? Am I consuming way more energy than I should? »

Anonymous

This quote was collected during workshops conducted during the ECO2 research project.



01 - Choose Right

What if users could verify the appliances that best fit their needs in terms of necessary usage?

Retail shops have a role to play in stimulating consumption and giving shoppers the opportunity to compare different appliances against a general standard. But they could instead provide more personalised information. An app could be used to scan products and, based on information such as the number of people living in the house, certain practices and needs, the app could suggest the most efficient appliance in terms of actual needs.



02 - Himprove

What if a virtual version of your home could help you simulate improvements or help track and monitor its energy efficiency status?

Himprove provides an overview of the energy performance, simulates improvements in a visual manner and provides tailored solutions for the home.

All incentives and renovation regulations are available when solutions are proposed.

It includes a playful aspect, such as building a virtual house, to encourage the user to want to engage in the simulation of various solutions and explore all possibilities.

Making decisions

Simplify the decision making process for consumers

A multitude of solutions, varying in form, cost and effort required, can be implemented to improve energy efficiency.

They are sometimes interdependent to achieve the desired result and an overview is needed to recognise the overall benefits of combining small and large actions.

Whether it is a decision about home improvement or what type of appliance to buy, the easier it is for consumers to make an informed decision, quickly and with less effort, the better. These are critical moments and situations that should be used to guide consumers towards the appropriate decision.

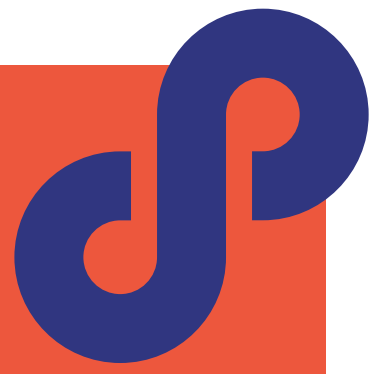
The pressure to analyse many complex factors before making a decision can lead consumers to a form of decision fatigue, or even to focus only on factors that make sense to them, such as price.

In many cases, such as applying for home renovation grants, we can notice unnecessarily complex processes that can be considered as a sludge. While we advocate nudging for good by making desirable behavior easier, a sludge does the opposite: It makes a process more difficult in order to arrive at an outcome that is not in the best interest of the consumer.

Therefore, the aim is to find solutions that communicate different factors in a comprehensive and user-centred way, at the right place and at the right time, so that the consumer can make the best energy saving decision taking into account all personal needs.

Both examples presented previously show that there is a need for services that provide personalised advice to homeowners so that they can plan, prioritise and implement home improvement interventions or buy the right appliance. And these factors should also incorporate consumer-specific elements such as number of people in the house, habits, etc. This will help the user to easily identify priority areas for action and also be supported in the decision-making process.

2



Chan- ging habits

«The lack of guidance on how to integrate smart energy saving devices into our habits makes it difficult to use them properly in everyday life.»

Anonymous

This quote was collected during workshops conducted during the ECO2 research project.

« I don't know how to motivate my family to make an effort to reduce their energy use, punishments and lectures don't help anymore! »

Anonymous

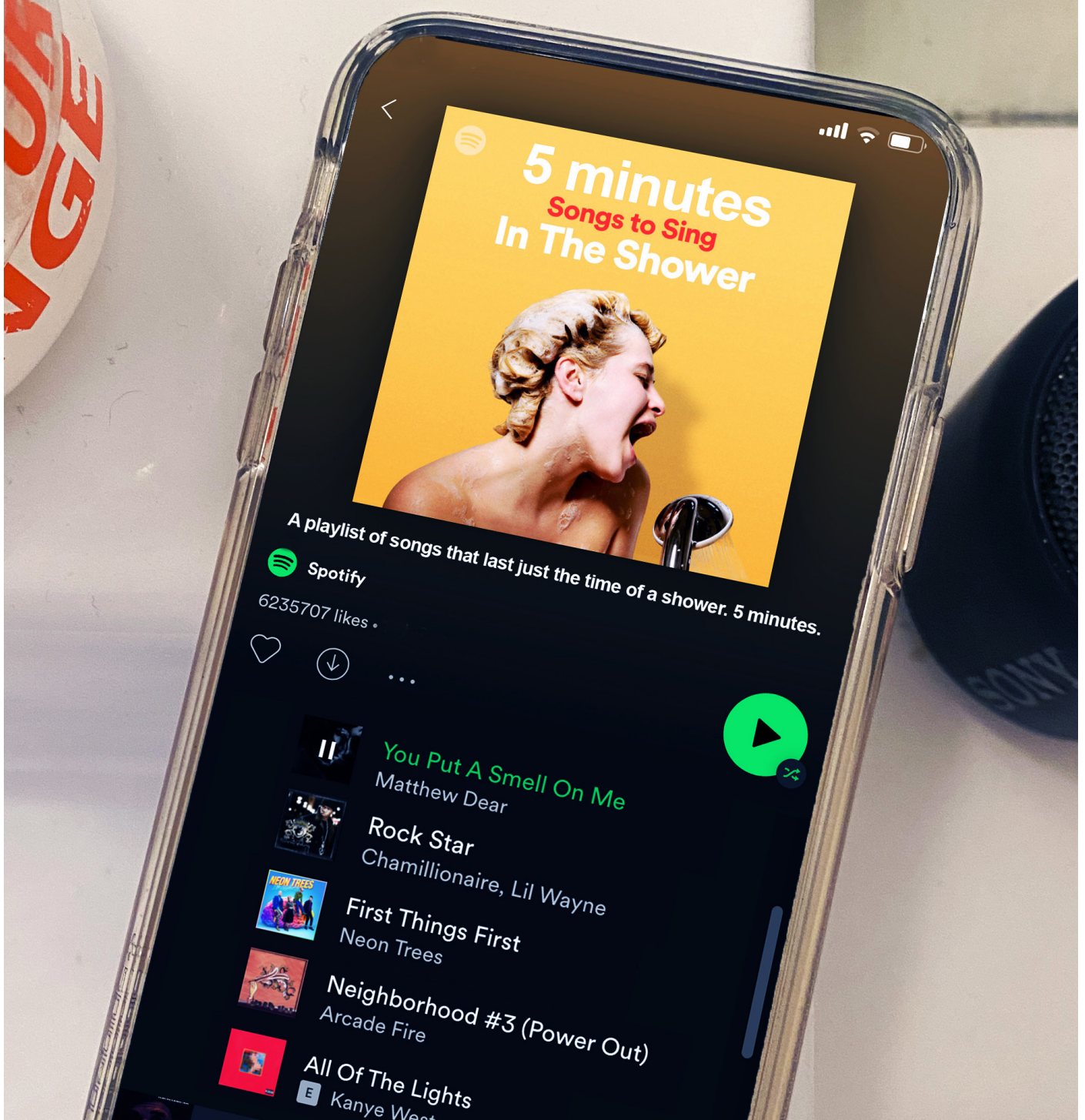
This quote was collected during workshops conducted during the ECO2 research project.



03 - Eco Adrenaline

What if consumers were challenged to implement energy saving actions in a playful way?

Aimed at a group of friends or family, Eco Adrenaline offers a fun way to change your behaviour. Through daily challenges, such as short cold showers, users can realise that they are able to step out of their comfort zone and recognise that they are capable of change. This could be an initial trigger or catalyst for a bigger change.



04 - Shower Playlist

What if we could measure energy consumption in an atypical and intuitive unit of measurement?

What is the right shower time? 5, 8, 15 minutes? This playlist has a collection of music that fits the recommended shower time: 5 minutes. You put the music on just before you get in the shower and when your time is up, the music stops, making it less fun to stay in the shower and also signalling that your time is up.

This intuitive unit of measurement changes the way we understand and depict our activities in terms of energy consumption.

Changing habits

Encourage positive reinforcement instead of guilt tripping

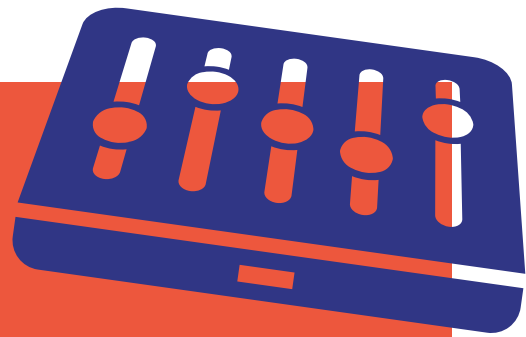
Whether we renovate our homes with the most efficient solutions or buy the most energy-efficient appliances, the constant determining factor that will really influence our energy consumption will be our habits and usage patterns.

Responsible behaviour towards energy consumption can make a significant difference in reducing energy consumption. It is therefore crucial to find engaging and sustainable ways to encourage consumers to alter their consumption habits.

However, changing habits requires stepping out of the comfort zone. This means questioning everyday routines and adopting new ones. This may lead to feelings of anxiety or discomfort, which may result in a loss of desire to adopt a new habit. It is therefore important to introduce playful, fun and engaging ways and solutions that could encourage consumers to try new habits.

And when it comes to engagement, games are undeniably at the forefront. And since energy is not a particularly sexy topic for the majority of the population, it could be beneficial to use game mechanics to share energy saving actions in an engaging and playful way.

3



Easy
cont-
rol

« I don't have
a basis for
knowing where
I stand in terms
of personal en-
ergy consump-
tion and
whether I am
considered effi-
cient or not. »

Anonymous

This quote was collected during workshops
conducted during the ECO2 research project.



05 - My Real Bill

What if energy billing did not have to be flat-rate for shared living situations?

Individual energy bills are usually the only tangible evidence of energy use. However, in shared housing, energy bills can be flat-rate and shared equally among the housemates. This can be a disservice to those who would like to make an effort to save energy and receive feedback or track their progress. My Real Bill allows tenants to see their individual energy consumption (using a disaggregation system) and the amount they have to pay in proportion to their energy consumption.

PREPAID ENERGY WALLET

29/04/27 - 19h23



2,47€
CREDIT LEFT



31 H
EST. ENERGY LEFT

YOU HAVE CREDIT LEFT FROM
LAST MONTH. HOW MUCH DO YOU
WANT TO RECHARGE FOR THIS MONTH?

30,00€

45,00€

50,00€



06 - Prepaid Energy Wallet

What if consumers could buy energy on a pay-as-you-go plan?

The Prepaid Energy Wallet can be a functional component to help regulate household electricity consumption.

In addition to avoiding excessive costs at the end of the month, the prepaid solution makes it easy to keep track of your consumption and your budget.



07 - Hot Shower Tokens

What if some energy-intensive services were provided with a regulatory system to avoid overuse?

We take far too long, super hot showers because we can. Unless you have a boiler with limited capacity, the hot water will never stop in most homes, despite it being the second biggest contributor to high energy bills. Hot Shower tokens are therefore introduced as a mechanism to restrict too easy access to this service. It adds a layer of effort to get access and helps in regulating the use of the service.

Easy Control

Enabling consumers to be in control and to actively manage their energy consumption

Alongside the suggestion that consumers should become prosumers in order to become active consumers, there should also be other solutions that give them the opportunity to move from being passive consumers to active consumers. This is crucial because, by being an active consumer, they are able to control their energy consumption and easily regulate their demand.

It is imperative to limit systems that tend to disempower energy consumers, such as flat-rate energy bills, the difficulty of easily regulating energy demand, etc.

Real-time feedback could help empower users to act with full knowledge of the consequences and easily visualise the results of their efforts.

And the potential to have a physical product in the home to inform and determine where energy is being consumed would also help to further this strategy.

4



Acting respo- nsibly

« When it comes to making energy use improvements I'm always full of goodwill at first, but then it just fades away with time. »

Anonymous

This quote was collected during workshops conducted during the ECO2 research project.

« Reducing my energy consumption would be motivated by the challenge, to see if I can do better than before or even than my friends or neighbours. »

Anonymous

This quote was collected during workshops conducted during the ECO2 research project.



08 - Super Homes

What if energy efficient buildings were easily identifiable so that neighbours could seek advice?

Newly renovated buildings or energy efficient homes could serve as a reference for the neighbourhood.

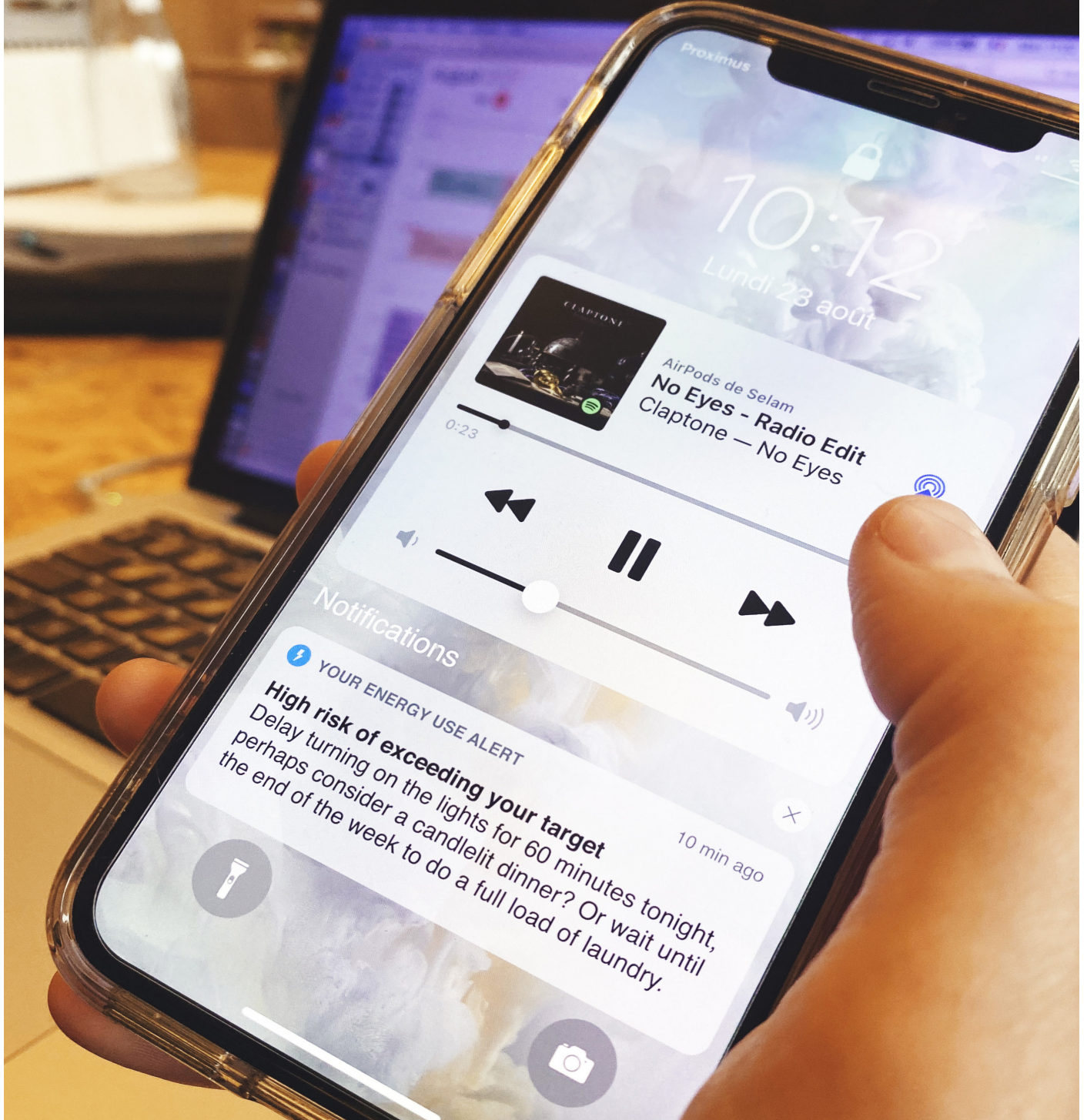
A discreet but noticeable green light could be introduced as an indicator to identify energy-efficient buildings. This could also be seen as a form of recognition and appreciation for those who make an effort to improve their energy efficiency.



09 - Community Hive

What if energy savings could be used to invest in community projects?

Energy savings at the individual level may be considered insignificant. However, when the savings of several households at the neighbourhood level are combined, they can help finance projects such as the installation of a beehive, which benefits the environment and the community as a whole and is a reward for collective effort.



10 - Energy Use Alert

What if consumers were given concrete actions to guide them in reducing their energy consumption when they need it?

Consumers are generally not opposed to reducing their energy consumption, but they do not engage in such actions due to certain motivational barriers which are, among many reasons, due to the lack of information on what to do. The Energy Use Alert is a reminder system that guides consumers to achieve their energy saving goal right when they need it.



11 - Power Charge

What if cities pushed consumers to take responsibility for their energy consumption in public spaces?

Energy consumption does not stop when we leave the house. To ensure that consumers are aware of this, cafes and similar public service places could start charging for the energy used by consumers. Not only does this make consumers more aware, but it also encourages them to take responsibility for their energy use.

Acting Responsibly

Ensure that consumers are able to be accountable and act responsibly, both individually and collectively.

To ensure that consumers act responsibly, they first need to know how to do so and they need to be given the right tools and conditions under which this can happen.

At a collective level, making consumers' efforts to reduce energy consumption visible, like Super Homes and Community Hives, is a way to give citizens a pathway to motivate them to adopt certain actions and in return benefit from concrete, tangible rewards or a social recognition system.

And at the individual level, advice and friendly reminder systems, with clear explanations of what to do, could contribute to helping people act responsibly.

Regarding advice provision, the first step should be to develop consumers' knowledge of the consequences of their behaviour, whether it is the direct consequences on their energy bill or comfort level, or the wider consequences on the environment and natural systems.

The second step of advice provision should then be to develop knowledge about how people can change their behaviour, with concrete actions they can take.

5



No-
care
solu-
tions

« I bought a new high-tech thermostat but I just can't manage to integrate it into my routine, so I only use the basic functionalities it offers. »

Anonymous

This quote was collected during workshops conducted during the ECO2 research project.



12 - E-Key

What if saving energy was totally effortless?

E-Key is a lock that is connected to certain household appliances using bluetooth/wifi technologies and motion sensors. As soon as someone leaves the house, the door is automatically locked and lights and some appliances will be completely cut off from power after one hour (in case some electrical devices still need recharging).



13 - Auto Dimming Light Switches

What if we built into our devices the ability to mitigate unnecessary energy consumption?

Automatically dimming light switches give consumers the option of gradually turning off the lights by dimming them if the motion sensors do not detect any movement for a certain period of time. This solution suggests getting rid of the ON/OFF mode and replacing it with AUTO/OFF.

This means that the default switch-on mode will be replaced by a system that mitigates unnecessary electricity use without any effort required from the consumer.



14 - EcoUser Award

What if appliances were designed to induce responsible energy use?

The EcoUser Award is an initiative that celebrates and rewards the design of appliances and electrical equipments that do not lead to higher energy consumption and that allow users to actually reduce their energy consumption.

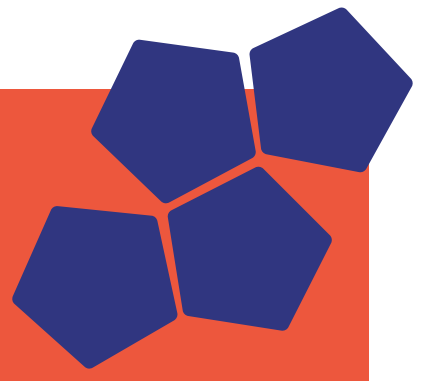
No-care Solutions

Make energy saving as effortless as possible

The effort dimension can be used to limit excessive energy use, but it can also be a factor in making energy saving as easy as possible for the user.

In this context, reducing effort means that the user does not have to expend any physical, mental or time-related effort. Energy saving solutions are either built into appliances or they are modifications to existing devices that do not require any change in adopting new habits.

6



Pictu-
ring
ener-
gy

« It's a shame that energy bills are just too complex and lack meaningful information on how to manage and reduce energy consumption. »

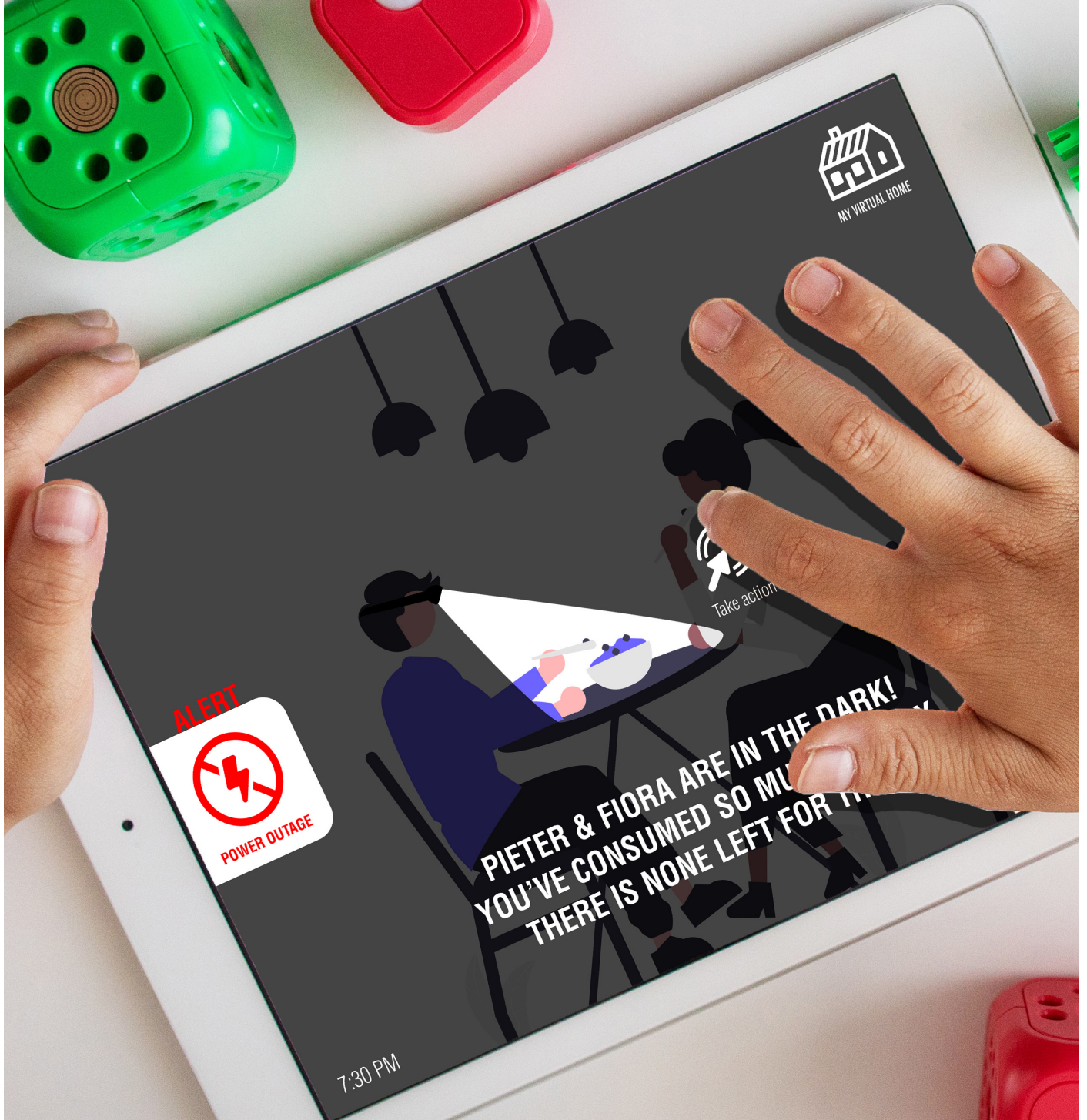
Anonymous

This quote was collected during workshops conducted during the ECO2 research project.

« I rarely take the time to reflect on my energy consumption because it's invisible. The only time I think about it is when the bill comes. »

Anonymous

This quote was collected during workshops conducted during the ECO2 research project.



15 - My Virtual Home

What if children played an active role in helping to reduce energy consumption at home?

My Virtual Home is an educational tool for children to learn how to save energy.

The energy needs of this virtual house are linked to the actual energy consumption of the family. This means that if the family consumes more than its target, this will have repercussions on the virtual house, such as power cuts or other types of restrictive measures. On the contrary, if the family's consumption decreases, the game can unlock different exciting features.



16 - Energy Service Bill

What if the cost of energy consumption was **communicated** in a way that **made sense** to consumers?

This bill communicates not only the price of overall energy consumption, but also the different costs of different services such as entertainment, cooking, lighting, hygiene or heating. The breakdown by specific use can help families to better visualise the areas where they can have a significant impact if they reduce their energy consumption.

Picturing Energy

Making energy usage understandable to all

Energy is intangible and invisible. For consumers, the only way to make sense of their consumption is through the energy bill. But unfortunately, the energy bill is usually too complex and only shows the cost to be paid. Yet it is a real window of opportunity to communicate much more than just the price and kWh consumed. For example, the energy used can be communicated in the form of the different activities that take place in the house, as shown in the Energy Service Bill example. This would allow households to better comprehend the cost and impact of their activities on energy consumption and have a clear idea of the priority areas they can make an effort on.

It is also an opportunity to include children in the monitoring of the house's consumption.

The potential for monetary gains from reduced consumption is relatively small. Therefore, energy saving initiatives may not be sufficiently compelling enough to trigger behavioural changes in adults, but intermediation through children can shift the balance of power, so that children take the lead in the household energy saving efforts. Games such as My Virtual Home can help introduce this strategy in the household.

Similarly, the energy savings achieved may not have convincing results for an adult, but may be of much greater interest to children. For example, saving €5 may be more

significant for a child who receives this money as pocket money than for an adult, who may find this amount insignificant.



Consi-
dering
every
use

« There is a lack of feedback or reminders, specific signage on appliances to remind us to take small actions to reduce energy consumption. »

Anonymous

This quote was collected during workshops conducted during the ECO2 research project.



17 - Extra Plug

What if energy supply was **restricted in order to encourage consumers to adopt a **sufficiency** approach?**

The extra plug is based on the concept of energy sufficiency.

Over the years, we have found ways to add extra items whenever we need them for comfort and convenience purposes. We only have to look around to see that there is often more than one socket in every room we are in. Yet restricting access to certain items, such as electrical plugs, can help regulate our demand for energy supply.

Considering Every Use

Restricting some otherwise easy-to-access energy supplies to encourage consumers to use energy for essential needs only

Among many strategies, solutions that could include different ways to prevent easy access are for example: pricing, rationing, information, changing standards and restrictions on supply.

Based on the energy sufficiency concept, solutions that restrict abundant energy supply could be implemented to better regulate demand.

Cutting off the power when energy consumption is high is not reasonable. On the other hand, requiring a little more effort on the part of the consumer when they need to use it for non-essential reasons is a path to explore.

Conclusion

Harnessing the seven paths to explore solutions to guide households in reducing their energy consumption.

There are a range of different drivers which may influence the way in which people choose to behave when it comes to energy saving, it usually depends on their underlying values, attitudes, motivations and other external factors.

At a household level, the property consumers live in and the people they live with have a significant influence on their energy use, and on their opportunities to change it. Note that not all energy saving behaviours are available to all. Someone on low income or living in rented accommodation, for example, may not be able to invest in energy efficient appliances or new technological solutions. Understanding the context of each particular household is therefore necessary to effectively tailor solutions, ensuring their relevance.

It is therefore necessary to have a closer look at these factors when exploring the different paths presented in this catalogue.

In conclusion, we would like to thank all the contributors of this catalogue and the designers who took part in the design jam to contribute in the production of the concepts presented as examples throughout the catalogue.

In addition, to all the elements presented please find some of the ideas that were discussed during workshops but not included in this catalogue that are worth mentioning:

- Knowledge is a prerequisite for action; for people to intentionally change behaviour, they must be made aware of their energy use and be informed about the consequences of this. Essentially, people need to understand why they should change their energy use, and how they can do so.
 - Energy consumption is a complex and multi-faceted process, but trying to make it explicit and understandable can be done by simplifying the subject matter without being too reductive.
 - Make device maintenance tasks easy to do and to remember
 - Find ways to make consumption level visible for different activities or each appliances in an intuitive way (including amount of water used).
-

The ECO2 Project and Act4Eco

ECO2 (Energy Conscious Consumers) is a Horizon2020 funded project. Its main objective is to increase the awareness of EU consumers regarding their energy consumption and ways to improve the energy efficiency of their homes. Since consumers play a key role in the transition towards more sustainable energy use, the project both engages and empowers them by enhancing their knowledge on how to consume energy more consciously in their everyday lives.

The main outcome of the ECO2 project is ACT4ECO, an interactive online platform available at www.act4eco.eu. It is aimed at motivating energy consumers to explore



The logo for ACT4ECO, featuring a yellow plug icon followed by the text 'ACT4ECO' in blue and yellow.

various solutions in terms of home improvements and implementation of energy-saving best practices.

ECO2 also aims at establishing a dialogue with policy-makers and innovators at national and EU level through policy seminars, to discuss energy efficiency measures available to households and their impact on consumer behaviour.

