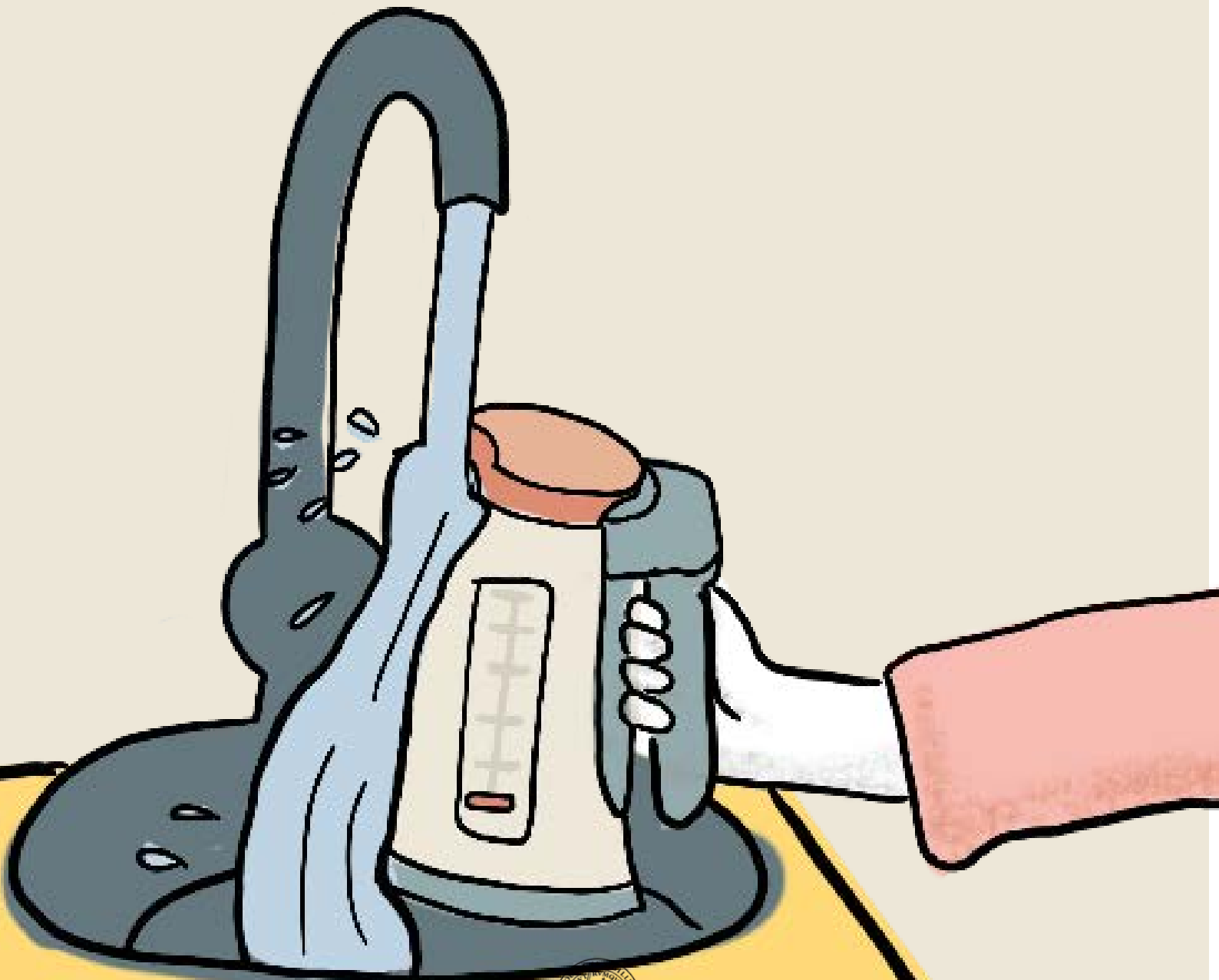


The Blue Project



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By Alexandra Fransson & Jacob Alm Andersson
2020

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Degree Project for Bachelor of Fine Arts in
Design
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Lund University, School of Industrial Design
Department of Design Sciences

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This project has been analysing theories and behavioral design approaches during a time where social distancing and other restrictions had been carried out by the Swedish government. Due to the COVID19 pandemic we were unable to include as many people and do hands-on testing of our ideas to the extent desired. Regardless of the inconvenience we found ways to validate our conclusions theoretically as well as with feedback from external people.

This project has mainly been carried out at the Faculty of Engineering, more specific; The department of Design at Lund University. We would like to thank our primary supervisor Jasjit Singh for valuable feedback during this project. We also would like to thank Anna Persson, Charlotte Sjödel and Claus-Christian Eckhardt together with Jasjit for their creativity and spirit in the execution of the course despite the difficult situation. Thanks to André Gunnarsson, Fredrika Hansson and Sofie Aschan Eriksson for their insights during a mid-project presentation and for pushing us forward and raising our spirit.

Lastly, we would like to thank every one of our colleagues and our friends for their support and encouragement throughout the project.

Abstract

The initiating impetus of this project was a frustration over the en-masse inaction experienced in relation to the climate crisis. Although people are aware of necessary actions few are able to act. This project attempts to understand people's inability to act whilst looking at ways to counter this apathy through behavioral change.

Through research on convenience, human behavior and inaction we ask: how can we apply friction to human-product interactions in order to nudge users into new patterns of thinking and question habitual interactions within a home setting, motivating users to save resources?

Through behavioural change research and user-discussions it was found that people need guidance and a sense of agency in order to change their behaviour, thereby our focus was redirected to the visualisation of resource use. In order to change, people must know what they are doing wrong and how to change.

The topic of visualization was divided into three paths of investigations: interaction with regulators, calling attention to mindless use, and prolonging the life of things.

These themes were investigated separately and developed to finally be applied to an everyday object: a water kettle.

A regulator that increases resistance as energy use is increased as well as a water controller that forces commitment of water volume in advance before filling the kettle intend to lower resource consumption by visualizing amount as well as implementing default settings.

With a device that measures and visualizes ongoing energy use in the physical realm through an anxious shaking we could call attention to resource use and appeal to the users emotion, creating a will to lower energy consumption.

By placing a date showing when a product reaches a level where the resources for the manufacturing process has been compensated, we hope to lengthen the time a user keeps their items. This can hopefully oppose current trends of greenwashing, making it easier for consumers to compare and make sustainable choices in the store.

The final result is a speculative concept of a water kettle consisting of both feasible and provocative aspects, allowing it to raise questions of user behavior and sustainability whilst providing clear alternatives forward. The final result is visualized through 3D modelling and rendering.

Time table

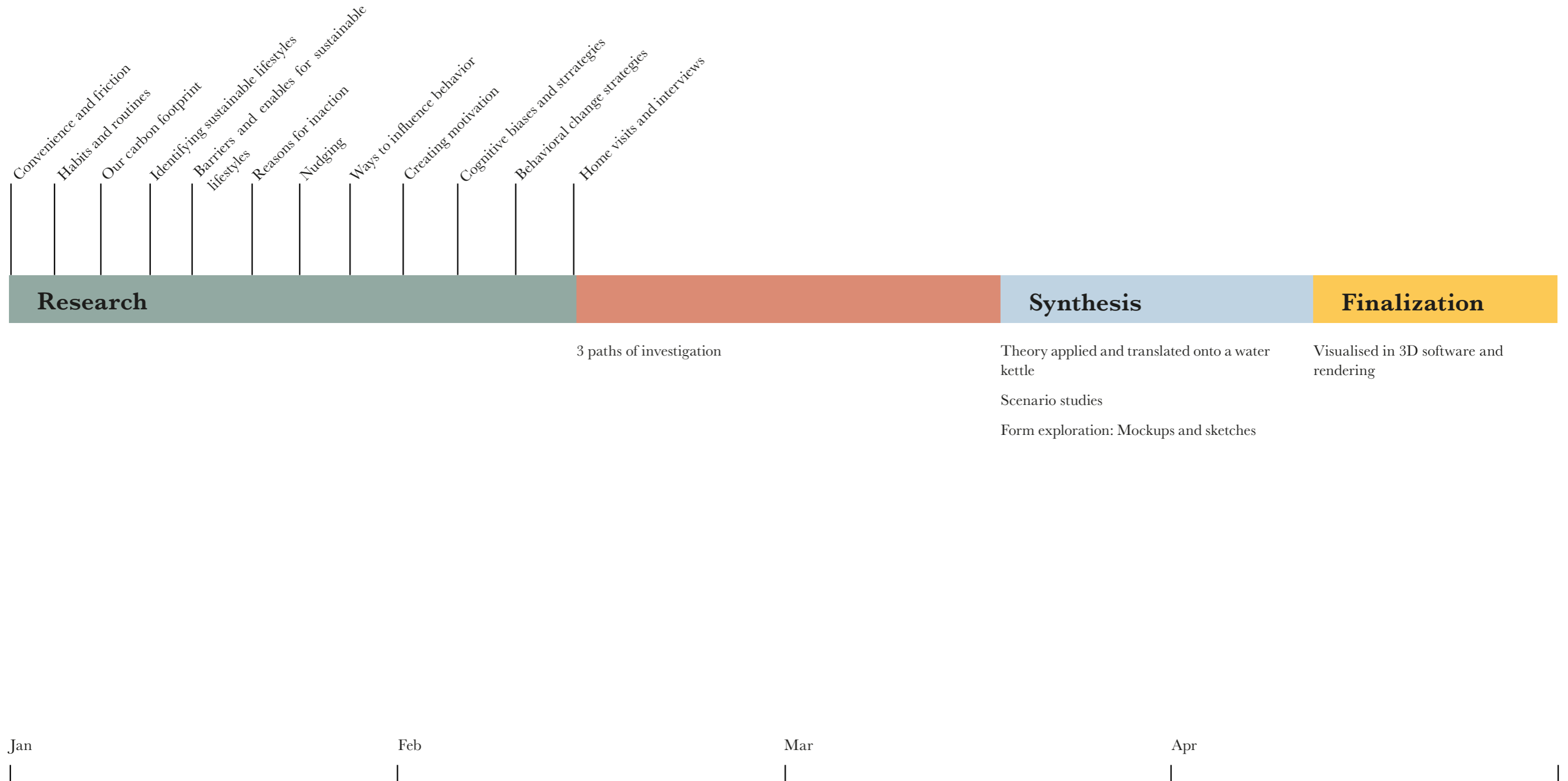
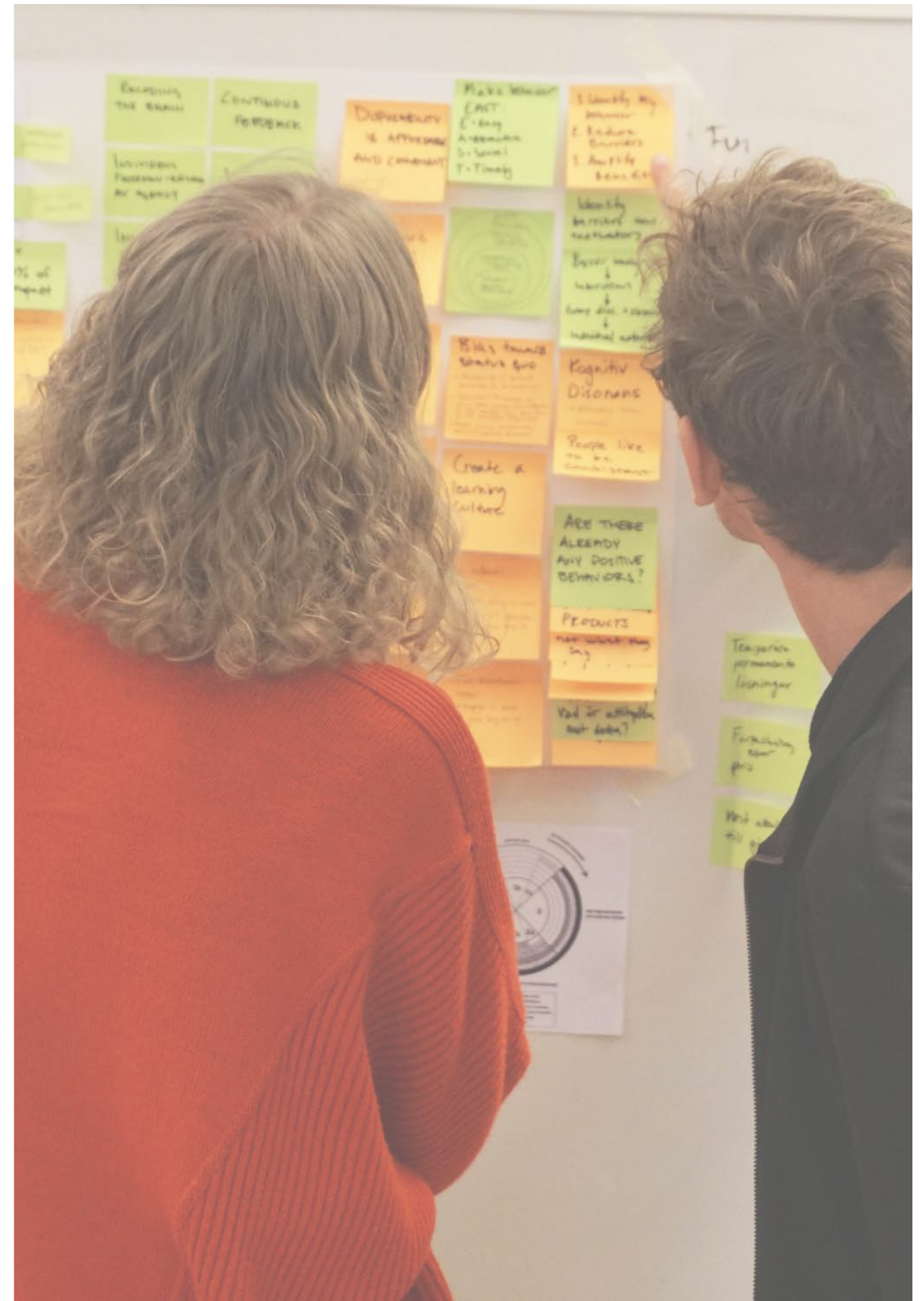


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INTRO

Definition of starting point, theme and brief followed by our idea and method of analysis.



Background

Saving the environment is on political and personal agendas all over the world and poses one of the biggest challenges for our generation. Environmental scientists are continuously telling us to take responsibility as consumers. We are told to stop driving cars, turn off our appliances and consume more mindfully. Yet people seem to keep on with business as usual without changing too much in their lifestyle, something we have made very easy to do through design.

Throughout this work we want to question convenience through design and investigate potential new ways of doing things.

According to several studies few consumers having positive attitudes toward eco-friendly products and services follow through with their wallets (Young et. al. 2009). Narrowing this “intention-action gap” is crucial for meeting the world’s sustainability goals. An estimation done by Unilever suggests that almost 70% of the household greenhouse gas footprint relates directly to which products consumers buy and whether they use and dispose of them in a sustainable way. (White, Hardisty and Habib, 2019)

“It’s not all about materials and production, it’s about behavior.”

- Casper Boks

Motivation

In a world where products and environments are created to smoothen our experiences, in order to reduce conflict and ensure convenience, there is a **NEED** to provoke and disrupt these systems to create awareness.

In society today we are recommended to save resources, turn off our appliances, repair our old things and stop buying new ones. Yet it seems like we only use more and buy more. How can we nudge people to break this trend through implementing physical cues into our product concepts?

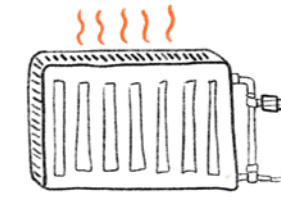
45-55% of total energy use is directly influenced by lifestyle choices*



**turn off
the lights**



save water



**turn down
the heat**



drive less



consume less



**reduce
food waste**

* Axon, S. 2016

Initial research

Starting the project and finding as well as navigating the wicked and complicated topic of convenience we had to first understand what convenience is and whether other people share our idea of this phenomenon being a problem. To our surprise there was a wide, wide sea of articles and research done on the topic.

Convenience

Convenience - The great liberator

Convenience is a product of the late 19th and early 20th century's ideal, when labor-saving devices for the home were created to level society and give the working classes more time to spend on leisure by saving time and eliminating drudgery. With leisure would come the possibility of putting time into hobbies, different learning experiences or other activities that might matter to us. Convenience promised to make the kind of "freedom of the self-cultivated" of the aristocrats available to the general population. (Wu, 2018)

Convenience and convenience products arose because it gave people a way of saving time and effort. But it also allowed people to gain better control over their timing of events. In the same way cars gave the driver the control to determine when to leave and arrive tumble driers liberated people from having to spend time doing the undesirable task of washing ones clothes. (Sheller and Urry, page 176, 2000).

What follows is a summary of what we've found followed by the formulation of our idea and some of the themes we've discussed, ultimately leading to our project focus.

Contemporary need for convenience

"In the developed nations of the 21st century, convenience — that is, more efficient and easier ways of doing personal tasks — has emerged as perhaps the most powerful force shaping our individual lives and our economies." (Wu, 2018)

In society today convenience is no longer primarily about saving time but about timing. "The valuing of speed and instant response is sometimes relevant but the more important issue is usually that of control." (Shove, page 171-172, 2003)

Instead of saving physical resources the contemporary need for convenience is that of saving mental ones. It has allowed us to divide our focus between dozens of tasks, speed through necessary errands, and outsource some of our most tedious activities (Willen, 2019). Some experts argue that our perceived sense of constantly being "short on time" is what drives us to seek out convenient solutions and shortcuts to daily and professional tasks. (Shove, page 172, 2003) "The value attached to convenience depends upon people's perceptions of being busy, hurried and harried, not upon the number of hours they spend at home, at work or in the shops." (Shove, page 173, 2003)

Convenience promises smooth and effortless efficiency. These attributes have today become more than just an aspirational idea but an expectation from the customer. As task after task becomes easier, an expectation is created on everything else to also become easy or get left behind.

In the New York Times article *The Tyranny of Convenience* Tim Wu argues that convenience has the ability to make other options unthinkable. He explains that laundering your clothes by hand seems irrational once you've bought your fist laundering machine even though this might be cheaper. Waiting for a television show to air can seem silly once you've started streaming television. (Wu, 2018)

Convenience is such a big part of our lives due to our new standard of working, where we've moved from scheduled work on an assembly line to more frequent work in an office where the time can be planned on an individual level. "To summarize, the contemporary valuing of convenience relates to an increasing intensity of small tasks and to a reliance on individualized modes of coordination." (Shove, 2003) (page 180)

Not to underestimate, Convenience also feels good. "Quickly accomplishing a task from a touch screen gives a little sugar rush of satisfaction as we scroll to the next item on our list." (Willen, 2019)

The trouble with convenience - A sense of disconnect

"Convenience and monopoly seems to be natural bedfellows." (Wu, 2018) Wu argues that convenience begets more convenience through a combination of the economics of scale and the power of habit. "The easier it is to use Amazon, the more powerful Amazon becomes — and thus the easier it becomes to use Amazon."

Comfort has become an attribute rather than an achievement (Shove, page 26, 2003), and so has convenience. The issues with the enormous

influence it has on our society and our expectations on experiences is its ability to disconnect us from others and from our environment.

Like social media, a car promises convenience, an irresistible sense of autonomy. "We've replaced the perceived inconvenience of shared transportation with millions of miles of asphalt that further separate us from each other and from a catastrophically warming climate." (Willen, 2019).

Convenience is all destination and no journey. Climbing a mountain is different from taking the tram to the top, even if you end up at the same place (Wu, 2018). Today's society seems to care mainly about outcomes and therefore convenience has become a crucial part of our experiences of products and the built environment around us.

What do we lose with this mindset and obsession with measurable outcomes? If we consider public transportation, where we can give up the illusion of control, letting our minds to wander or bumping into a stranger resulting in some small talk. Consider walking, where we move at a less convenient speed, where we can enjoy architectural details and city life that we would otherwise hurriedly pass. What do we actually gain on getting to our destination faster? Time? And if so, time for what? (Willen, 2019)

Talking about social media and our connected lifestyle, our relationships with neighbors, colleagues and friends have through technology become easy to keep efficient and low-maintenance. We can connect with hundreds of people but avoid uncomfortable situations. The nuances of human interactions has become a column of comments and likes.

Another aspect of how convenience is affecting the modern person is raised in "The Feminine Mystique" (1963) Betty Friedan where she wrote "Even with all the new labor-saving appliances, the modern American housewife probably spends more time on housework than her grandmother." When tasks becomes easier we can fill our "won" time with more "easy" tasks. We are planning our way through life, multitasking constantly, never really doing anything at all. (Shove, page 25, 2003)

Friction

Whilst convenience is a good tool for productivity, efficiency and optimization, it is not the best tool for human development, and it detaches us both from nature and the impacts of our actions. Convenience can enable us to inflict environmental catastrophes without knowing it. (Willen, 2019)

As Tim Wu argues in his article “The Tyranny of Convenience”, inconvenience needs to be embraced. It is within inconvenience that the human experience lies. It is where we grow as humans, for instance through the meaningful resistance of learning a hobby or testing the limits of our bodies through exercise. He states that inconvenience exposes us “to the risk of frustration and failure, but (...) can teach us something about the world and our place in it.” (Wu, 2018) Similarly Willen states that it is through resistance and friction our muscles and organs get their strength. (Willen, 2019)

Friction (as opposed to convenience) in design is what disrupts the user experience, and creates a barrier or pause in order to enable the user to fulfill its needs, and “without friction there is no space to examine our impulses”. (Sgarro 2019)

In the world we currently live in convenience has been used throughout industry to earn money on users, rather than to satisfy the users real needs. For example streaming accounts makes it easy for the user to continue watching without input, although this might not match with most users real, long term, needs. The convenience makes the user feel good momentarily but regretful of the action in the long run. By applying friction the user is empowered to “make intentional decisions as to how to spend their time and attention”. (Sgarro 2019) Applying friction is to design with intent, as designers cannot make choices for users but can create products that allows users to make decisions for themselves. (Sgarro 2019)

Friction is already an established and well-used concept within user experience and user interface design. In these areas friction can take the shape of

pop-up windows that slows down processes in order to prevent errors, to increase a sense of security and to make people more conscious of their choices.

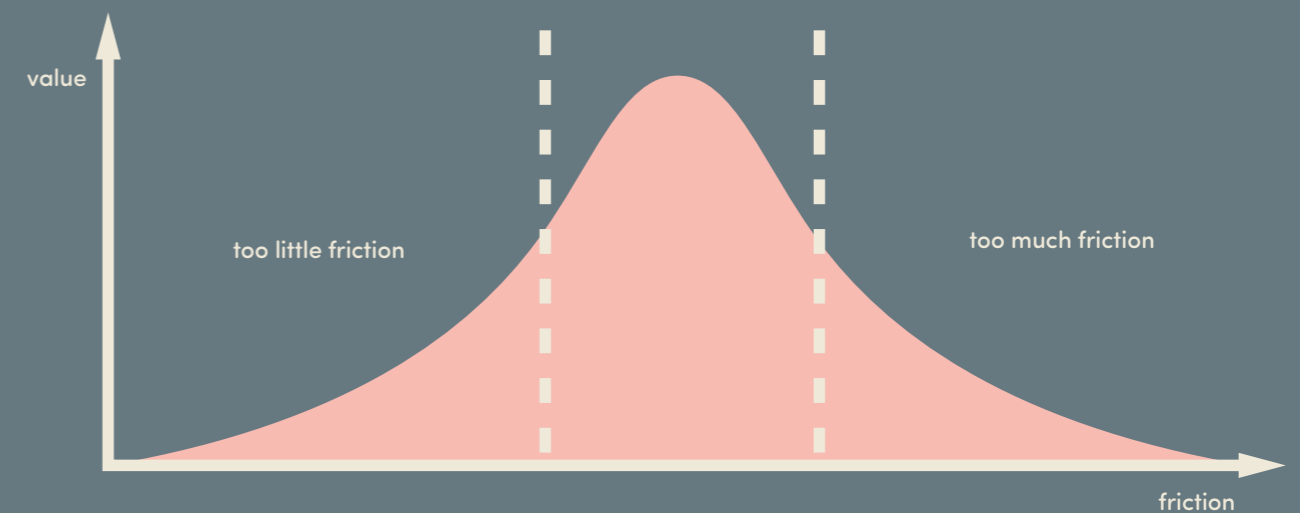
This can be through multi-step authentications and verifications, showing process bars when users are waiting, warning windows, and adding extra delays on important processes in order to create a sense of security. All of these measures hinder the smoothness of the user experience, meantime giving the user a sense of control, assuring that they do not accidentally performing an unwanted or undoable action. (Kollin 2018) What if the products around us had similar pop-up windows informing us of the possible impacts of our actions, asking for two step verification?

In 2012 a study was made comparing the value participants assigned to a box from IKEA, where half of the group got a prebuilt box whilst the other half had to first assemble it themselves. The study investigated the so-called IKEA-effect that shows an increase in perceived value of self-made products. (Norton, Mochon, Ariely, 2012)

The friction involved in building gave the product extra value and a stronger sense of ownership, however they also found how this extra value only was afforded if the participant was successful in completing the task.

This leads Weaver to the conclusion that “too much friction destroys value. But so does too little”. As shown in the graph to the right. By finding the right amount of friction for each problem we can create more value in both products and general human interactions with the world.

Friction is what makes our everyday interesting, it allows us to pause and reflect, it creates an opportunity for growth and development and allows for aware decisions. Friction increases value as it has the possibility to actively engage the user in products and allows it to achieve a greater understanding.



“Without friction there is no space to examine our impulses”

Investigated themes

Our work started with the investigation of convenience and friction as major themes. This was followed by discussions which can be summarized with the following subthemes. These topics have helped drive our discussion throughout the project.

Applying friction to ordinary objects.

In UX design there are clear examples of designing with friction in mind, pop-up windows asking if you are sure you want to continue is one example. How can this be applied to physical or analogue objects. And if so how will this affect our behavior as consumers and/or users. If there is a reminder of how this will affect the greater system or how it will be affecting the environment in the long run, can we help to nudge people into making more sustainable and healthier decisions? Build in: Reminder of responsibilities. Creating demand on companies.

Electricity.

Questioning need for electricity or being on the grid. The convenience of being on the grid and how this can be affected and/or changed. Can we create awareness around the system of electricity and how our electricity use is affecting society and our environment in order to create a less wasteful behavior around electricity and our electrical habits.

Convenience as a human right.

What are the human rights and what kinds of products are the most essential to human rights? If convenience products are seen as a human right, what conveniences are the most relevant?

Fictitious environment.

A continuous questioning of the constructed reality we live in. Why is everything supposed to be in a certain way or respond to certain standards? How can we start connecting back to the “real” environment?

Awareness through presence

Nudging behavior and multitasking. Is it possible for us as designers to slow down the use of certain

things or tasks to help interactions to happen between things and people, as well as inbetween people. Can we implement pauses in our usage of things or everyday pace to create space in time to stop and take part in conversations and environmental settings? Through this we might be able to create a new connection to each other and to create awareness of what’s around us.

Interdependence between people and products.

Products and people as a part of the same system. If we’re not there is the products’ function necessary? If we would have to actively tell our things that we are present and engaged would this teach us how to prioritise activities in our home and revalue our ‘resource consuming’ products and gadgets. A human can only manage a certain amount of relationships at once, what if this was true for relationship to products, tasks and/or activities as well? When limiting the number of simultaneous activities and tasks could we create a better presence and thought in the things we’re currently doing? Making sure that there is an active decision in the process of using something. About prioritization.

Discovering, developing, learning.

Used as a method the interaction should encourage and invite to curiosity, investigation and experimentation resulting in increased knowledge, understanding and creativity. This can be both a physical exploration as well as a mental interaction. Challenging the users norms and/or boundaries. Based on the philosophy of Arakawa and Madeline Gins.

Opposing detachment.

How can we create awareness that cannot be avoided in the moment. Demanding moral responsibility. Pushing the user out of it’s convenient self-built environment.

Keeping effect and removing convenience.

Analysing different objects and considering how they would work with built in friction, alternatively simply without convenience.



Who is it convenient for?

Considering how a products life will influence different sectors of society - Using system centered design as opposed to/or as a complement to human centered design. Weighing in factors in production and companies role in the life of a product, as well as the user aspects and the environmental implications of a product.

Creating system analysis.

Combating the loss of control and transparency. How can the consumer understand the implications, how can companies be transparent? How can the product work to make implications explicit. How can the user be in control?

Idea

In this project we want to question our mindless use (and waste) of resources within the home setting. We want to make the use more visual and by that battle the 'use-today-pay-later-mentality'.

We want to investigate different ways to enable people to be aware of their use. Hopefully getting people to prioritize their use differently. This project will present potential new systems that can be incorporated in homes in order to disrupt and enlighten us on our resource use.

Initial brief

How can we apply friction to human-product interactions in order to nudge users into new patterns of thinking and question habitual interactions with the world?



Re-brief

Design one or several product(s) based on the notion that it should nudge/motivate the user to save resources.

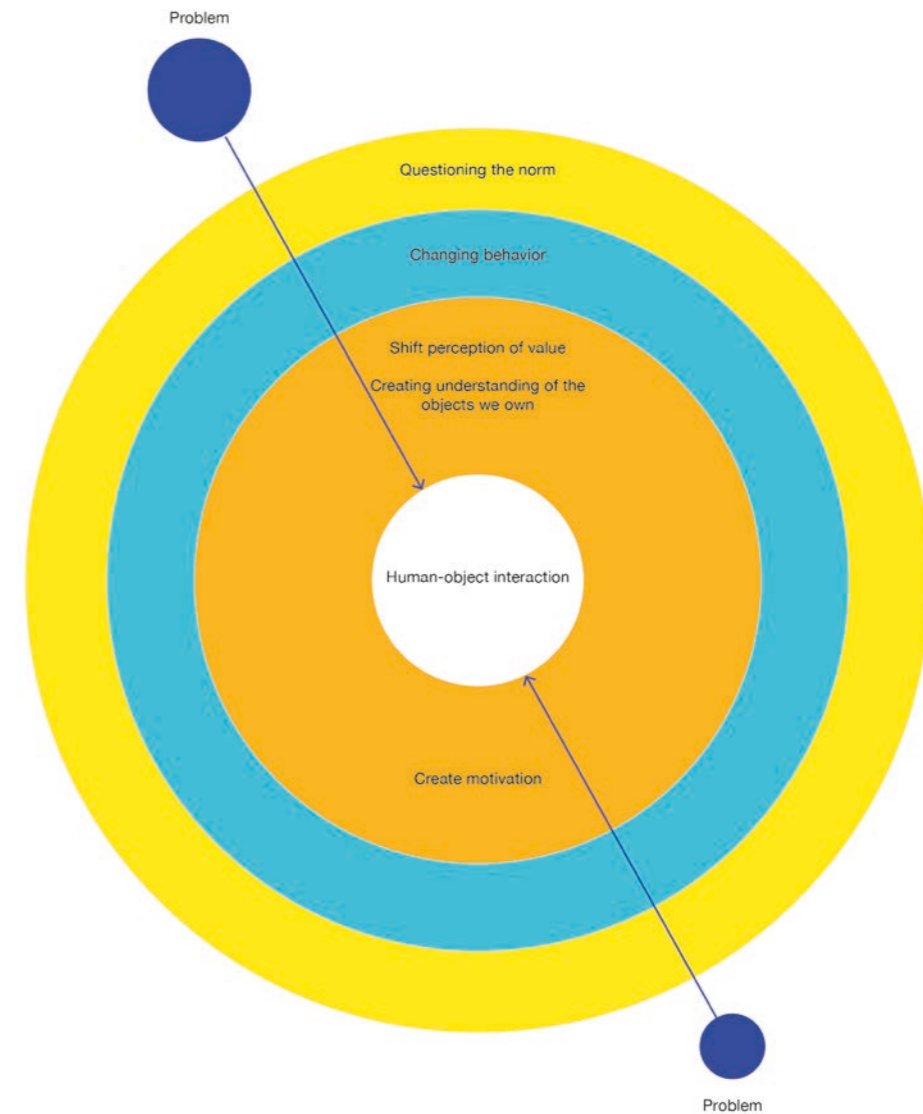
Method - Behavior

On the subject of sustainable design practice Casper Boks argues that “It’s not all about materials and production, it’s about behavior.” We need to design products that make it easy for the user to do things efficiently and mindfully as well as products that make it hard to create wasteful behaviors. When consumers learn how to live and behave in a sustainable way the rest will follow Casper Boks suggests. (Boks, 2011)

To find ways to motivate people to change we need to dig deep into behavioral change studies and use our skills as thinkers to explore alternative ways of doing things and push our ideas of convention and convenience.

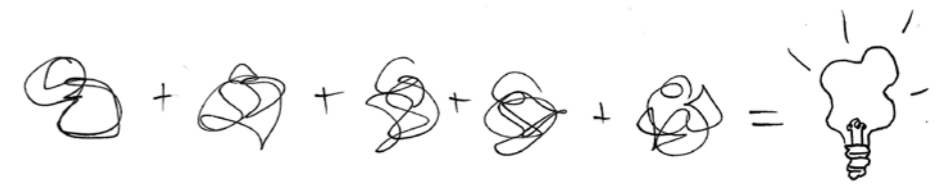
Our method is to use psychological tendencies in order to investigate the interaction between human and product and increase our understanding of how to create prerequisites to changing and renewing behavioral patterns and behavior in general. Through informing, motivating and enabling people to adapt to new behaviors and drive each other towards change we hope to create sustainable changes in behavior that can help shift society’s norm towards a more sustainable lifestyle.

This project intends to result in a tangible design proposal that helps users to understand their resource use better in order for them to hopefully change their habitual behavior to the better. Our project aims to serve as an example of how inconvenience and friction can be desirable and play a crucial part in motivating people into taking action for the environment.



CHAPTER 1

This chapter is divided into different smaller investigative sections. In an attempt to understand different aspects of the concept of convenience and our human experiences in interacting with products we tried to investigate a range of concepts and ideas in order to hopefully connect and contextualize them into a product proposal.





Habits and lifestyles

Habits and routines

Our research began with looking at habits in order to identify key behaviors and product interactions into which we wanted to direct our focus, searching for an area where our project could have a great impact. By first looking at how habits are formed followed by brainstorming on our own habits and the routines of everyday life, we hoped to find our concept.

Habits are defined as features of automatic behavior and are based in efficiency. The automatic aspect of habits and routines cause them to be carried out with a lack of awareness, and can be both unintentional and uncontrollable. The formation of habits is made through repetition and through the process of associative learning. The formation of a habit has three steps - context cue, behavioural repetition and rewards.

Habits can initially be triggered by a goal but over time this becomes less necessary and the habit becomes automatic. Some habits are referred to as keystone habits since they can influence other habits to be formed and thereby create a domino-effect.

Through the discussions we realised how our habits are deeply influenced by our lifestyles, which in turn is shaped by our values, attitudes and social situation. Thus we started to look into the effects of our lifestyle decisions.

Convenience - a lifestyle?

Our convenient lifestyle allows us to perform tasks without any major resistance. When our fridge gets empty (or the things in there get forgotten and old and thrown away) we can go to the supermarket and buy more, without putting in any extra effort. When we wash our hands we expect the water to keep running, without a thought of the system behind. When we get cold we raise the temperature on the radiator rather than putting on a warm sweater and we shop on impulse, because we can. The way we live in today's Sweden uses resources as if we had 4,2 globes to use. (Dagens Nyheter, 2016) As we all know it is not realistic to continue this way.



The lifestyle of the average swede requires 4,2 globes to maintain

Our carbon footprint

The carbon footprint of something can be described as “the best estimate that we can get to the full climate change impact of something” (Lee, 2011 p.5) and includes all the different greenhouse gases something emits. Although the emissions include different gases it is common to convert their impact into equivalent carbon dioxide in order to achieve a less confusing way to compare the impact of things. It is also important to distinguish between the direct and indirect emissions of a product, where the indirect emissions include things such as extraction and processing of raw products. The true carbon footprint includes both direct and indirect emissions and is necessary for a lifecycle assessment.

In the book *How Bad are Bananas?* Mike Berners Lee presents the idea that if carbon footprint was viewed similarly to the economy, we would be better at assessing and making environmentally sound decisions in our everyday life. We have learnt to be able to estimate how much things cost without having to look at the price tag, for instance we know that in general champagne will cost more than a cup of tea and less than a house (Lee, 2011, p.3). We also know that if we treat ourselves with something more expensive we need to cut out something equally expensive from our budget. We are not used to looking at CO₂ emissions this way, since it is not as tangible and does not affect us directly as money, but doing so would make us act in a different way.

The carbon footprint of actions in our everyday life can span between 10 grams to 10 tons. (Lee, 2011) Looking only at the impact of our households, a carbon factsheet from the United States show that residential electricity use in 2017 emitted 10% of the U.S. total carbon footprint. Water heating accounts for 14% of residential energy consumption and appliances and lighting typically amount to 25% of household energy costs. Energy consumed by devices in standby mode accounts for 5-10% of residential energy use, and together heating of unoccupied homes and rooms, inefficient appliances, thermostat oversetting and standby power loss account for at least 43% of the total energy use in the residential sector (Center for Sustainable Systems, 2019).

Identifying sustainable lifestyles

Sustainable lifestyles can be defined as conducting conscious or habitual practices that benefits the global or local environment. For many of us this means rethinking our ways of living, what we buy, how we socialize, how we build our identities and how we organize our everyday lives. (Axon, 2016) The focus on sustainable lifestyles is important as up to 45-55% of total energy use can be seen to be directly influenced by consumer choices. (Axon, 2016)

There is a need for sustainable lifestyles to become the norm in order to make an impact. In order for this to happen these kinds of lifestyles need to be “enabled and encouraged by the socio-technical systems and institutions that surround us.” (Axon, 2016)

The concept of a sustainable lifestyle is however more complicated than we think when making models of how to change behavior in order to become sustainable, and there is a need to look at all aspects that comprise life. In order to sustain sustainable lifestyles these need to balance work, home-life and personal wellbeing, and they have to be supported across short – medium- and long-term time frames. (Axon, 2016)

In 2015 the United Nations agreed on the 2030 agenda – a collection of 17 sustainable development goals that are to act as a “blueprint to achieve a better and more sustainable future for all” (UN, 2020).

In order to reach these the entire society needs to work together and re-define our standards of a “good life”. Some of the goals involving environmental sustainability are goal 11: sustainable cities and communities, goal 12: responsible consumption and production, and goal 13: climate action to reduce carbon dioxide.

Individuals have the possibility to have an impact on all of these areas. To promote sustainable cities and communities the individual can contribute by

reducing their travels by car and instead walk, bike, and travel by public transportation, and making changes to living arrangements.

Responsible consumption and production includes providing information in order to help consumers make sustainable choices, as well as minimizing both consumption and waste. Actions the consumer can take is to buy less, reuse and repair in order to increase the lifetime of objects. Recycling and sorting components when products no longer can be used, and taking care of dangerous waste, as well as eating in a sustainable manner.

Taking action to reduce carbon-dioxide-emissions in all planning and politics will attempt to increase awareness and prepare society for upcoming climate changes. As an individual this has a large range of possible actions, involving limiting harmful transportation, making your diet environmentally friendly, and preventing money from being invested in unsustainable organisations. It also means to be more careful of how you consume and not buying things you do not need, as well as making objects last longer, and making your voice heard politically in order to create pressure for change (Sveriges Konsumenter, 2017).

Barriers and Enablers to Sustainable Lifestyles

In the essay *Time Matters – carbon footprint of everyday activities in Austria*, a systematic approach is taken to the issue of carbon dioxide emissions, focusing on individuals as parts of families, the economy and society and not as lone actors. The article divides time into personal time, committed time (household activities), contracted time (employment and study), free time (social activities and leisure) and mobility time (enabling spatially different activities) (Schmetska et.al., 2019). When time squeezes occur

between these areas the possibility to spend time on other activities and consumption declines - as priorities are made focus on a sustainability is the first to be dropped, as more immediate, local and tangible issues are seen as more important. (Schmetska et.al., 2019), (Axon, 2016) Choices are instead made as a result of convenience. Thus it is important to identify these time squeezes and encourage sustainable practices that are based on what the individual can manage, and embed sustainability into one’s lifestyle with the help of practical solutions. (Axon, 2016)

In the article *Keeping the ball rolling - enablers and barriers to sustainable lifestyles* the writers consult focus groups and previous research on what the major barriers to sustaining a sustainable lifestyle are. One of the main issues presented in the article is the perceived lack of information and feedback on the environmental impact of ones actions. While people are aware of the environmental issues they are unaware of what actions to take and how to address the issue. Improving information and knowledge can increase both the quantity and quality of involvement, and would decrease time-related down-prioritization. The fact that sustainable actions often are conceptualized as an ongoing process, ones practices are always subject to change, and there is constantly more improvements that can be made, make individuals feel overwhelmed with the subject. (Axon, 2016)

The sheer number of actions related to a sustainable lifestyle is perceived as a great barrier, making people resort to apathy, ambivalence and active resistance towards changes in their everyday life. The inaction of others is considered a barrier as well, and the lack of collective action can cause people who already take action to consider reverting back into an unsustainable lifestyle. Many individuals expressed a feeling of powerlessness, as a result of the feeling of limited personal impact on these issues. (Axon, 2016)

Pressure and a fear of falling short when prioritizing

sustainability over the demands of mainstream consumer life is also an issue, and individuals often retort to treating themselves through consumption reverting the impact of their initial action.

Some individuals view sustainable lifestyles as boring, and feel a need to initiate excitement and interest around sustainable lifestyles. It is also common to view sustainability as a practice separated from the rest of their work and life, and perceive them as difficult to integrate.

In order to be successful in sustaining a sustainable lifestyle it is important to build upon behavioral and lifestyle changes steadily through time. By building on existing actions in the short term, maintaining momentum through engagement techniques followed by personalized feedback, less would revert to unsustainable practices.

Sustainable lifestyles are primarily practiced when individuals are free from pressure, feel that their action has an impact, know what actions to take and when they feel that they are part of collective action to address broad issues.

Actively and meaningfully engaging individuals is key to progressive change. Personal engagement is seen as key, and is triggered when individual affective responses concerning a specific topic are high. Individuals need to continuously be reminded of their individual reasons living sustainably. By receiving feedback individuals can see the impacts of their actions and receive positive assertion that can help motivate repetitions of these actions.

Tailored information, feedback mechanisms, community projects and breaking habitual behaviors are examples of interventions that have been successfully applied to change individual practices to encourage sustainable lifestyles. (Axon, 2016)

Many of the issues expressed and touched upon here will be further developed and explained in the research presented in the rest of this chapter.

Dragons of inaction

One of the main focuses of our project is the question of why we aren't acting as we should. We have known for several decades how we can take action against the climate crisis but yet we still take little action. Thusly we decided to look into what the reasons behind this inaction are. One psychologist which has done the same is Robert Gifford who has identified 33 reasons why we fail to act, or what he calls *The 33 dragons of inaction*. (Gifford, 2015) These are divided into 7 groups; limited cognition, ideologies, social comparison, sunk costs, discredence, perceived risk and limited behavior. Out of these we have found some to be more applicable to our process and these are presented below.

Limited cognition

Too long perspectives – “Ancient brain”

Our brain has a tendency to focus more on the here and now, failing to understand the gradual and distant impacts of climate change, thereby not being able to sense climate change as a prevalent danger, which makes us slow to act.

Perceived lack of impact

Since climate change is such a global and diffuse issue many feel that their personal behavior will have little or no impact, and thusly feel that it is not worth trying to make a difference.

Lack of time – time squeeze

Once people start to perceive their time in monetary terms people tend to act in less environmentally positive ways. This is because time becomes a self-interest that is difficult to put aside for the common good.

Not knowing what to do

One of the main problems people face, once they have come to terms with the fact that climate change is real, is to know how to take action. There is a lack of knowledge of what actions to take and what the relative climate benefits are of certain actions.

Low priority in context of everyday issues

The feeling that climate change is located in the future so there is no need to take action now, dealing with more imminent problems first and pushing the plans for action up until tomorrow.

Numbness – apathy

Message numbness is when you become numb to a message as an effect of how you see it too much, especially if the information is unvaried. The fact that we all have heard about climate change so many times and repeatedly are told what needs to be done to limit its impacts causes us to be less prone to act now when the concept is no longer new.

Uncertainty – abundance – inaction

This concept is also known as optimism bias. When we do not know the exact number or impact of something, we have a tendency to think it is for the better. Once figures become less precise or uncertain people are more inclined to act in self-interest, as we have the feeling that there probably are more fish in the sea than we think.



Social comparison

Following mainstream consumer life

The group mentality within us is strong, and we continuously adjust our behavior to fit into what is the “correct” behavior, even if we know it is harmful for the environment. The presence of role-models can have a great impact on how we chose to behave.

Social norms and networks

Norms can act both as a positive and a negative force in making people take action. A trend in the population can cause the individual to make certain decisions.

Perceived inequity

The perception of inequity is also a strong reason of inaction; where the individual feels that it has had to make sacrifices in order to be environmentally friendly whilst others enjoy the conveniences it itself is without. As inequality increases the cooperation towards a common good declines.

Perceived risk

Functional risk

Will new “green” technologies work the same way others have done before?

Physical risk

Some solutions can be perceived as more unsafe, such as riding a bike instead of a car.

Financial risk

Many “green” solutions require a higher initial cost with a long time before personal payback is afforded, for example solar panels.

Social risk

The fear of social judgment as a result of actions.

Psychological risk

The fear of prolonged social judgement can lead to a damaged self-esteem and confidence.

Temporal risk

The fear of wasting the time spent planning solutions without knowing if they will work.

Sunk cost

Financial investments

Once we have invested in something it is difficult to lose it for climate reasons. If we have stakes in areas that are environmentally unfriendly we tend to downplay the damages it has on the environment as we would lose too much by acknowledging it. It is easier to cope with the fear of loss by changing beliefs.

Habit

Habit involves the systematic mindless everyday performances that can have negative climate impacts. The repeated actions involved in habits is one of the reasons for habits major possibility for impact and permanent change. The act of changing ones habits can however be seen as a great obstacle.

Conflicting goals and aspirations

Sometimes personal goals such as affording a larger house and reducing climate change are seemingly impossible to combine, and once comparing the weight of the two goals the one with the greatest self-interest often wins.

Place attachment

When people feel an attachment to a place they are more prone to care for it. If there is a lack of place attachment we care less and do less in order to make it better.

Limited behavior

The rebound effect

The rebound effect means following a positive environmental behavior by a behavior that negates it. People feel they have compensated for a climate negative behavior with one that is climate positive.

Low cost-strategy

Many only change the behaviors that are easiest to implement, although these often have little environmental impact.

Conclusion

By looking at the reasons behind our inaction we can find the psychological and behavioral aspects that lie behind our decisions (or lack of) and use the same in order to nudge people into taking action.



Behavioral change studies



Nudging

As a part of our brief is about how we want to “nudge users into new patterns of thinking and question habitual interactions with the world”, we quickly delved into nudging and what the practice entangles.

Nudging is concept within behavioural economics that looks at the choice architecture of human decisions. A nudge is a deliberate change within the choice architecture, of which the individual is unaware, with the goal of engineering a particular outcome.

By using nudging as a tool we have the opportunity to subtly change the behaviours and mentalities around certain aspects for users. It gives us tools of how to approach our design, keeping in mind the factors that influence our behaviour as well as looking at the unconscious backgrounds for certain behaviour.

Classical examples of nudges include placing an image of a fly in a pissoir in order to make people aim at it creating a cleaner experience, as well as placing fruits in eye-height.

Nudges are not mandates, and do not restrict the freedom of choice, but rather looks into psychological phenomenon and human behaviour to influence what is perceived as the choice. This can be done in many different ways, such as boosting self-control or activating a desired behaviour or norm, be externally or self-imposed, be either a mindful or mindless decision from the user and be used to either discourage or encourage the user.

Mindful nudges causes the individual to become more cognitive and deliberate in its decision-making. In the concept of behavioural change it has been shown that if the individuals choices are active and mindful it can promote learning, in contrast to mindless choices where the individual doesn't reflect over choices made. It has also been shown how emphasising a behaviour as common within a group will have great effect on choices as well as how big life events has a great role in

nudging people into action. Examples of the latter two are how sending out bills with a text saying 95% pay their bill on time will cause the individual to be a part of the group, and how having a child may affect your concern for the environment.

By identifying barriers to certain desirable behaviours, followed by simplifying the steps to achieve it as well as highlighting positive aspects of the new behaviour it is possible to create behaviour change.

When approaching a problem through nudging the first steps are to audit the decision-making process of the end user and analyse both the context and task, as well as identifying key thought patterns and influences that may affect the decision outcome.

This can be done by mapping the concept, and asking the questions:

- What prevents the individual from following through on intention?
- What are the incentives and motivations and how much attention is directed towards the decision?
- What are the choices presented to the individual?
- How is information related to the decision gathered and presented?
- Does emotion influence the outcome of the decision?
- How does social influence, environmental and temporal factors affect the decision?

Nudging theory also identifies nine of the most robust behaviour influences:

Messenger:

We are heavily influenced by who communicates information to us.

Incentives:

Our responses to incentives are shaped by predictable mental shortcuts, such as strongly avoiding losses.

Norms:

We are strongly influenced by what others do and the expectations of our surroundings.

Defaults:

We go with the flow of pre-set options.

Salience:

Our attention is drawn to what is novel and seems most relevant to us.

Priming:

Our acts are often influenced by subconscious cues.

Affect:

Our emotional associations can powerfully shape our actions.

Commitments:

We seek to be consistent with our public promises and reciprocate acts.

Ego:

We act in ways that make us feel better about ourselves.

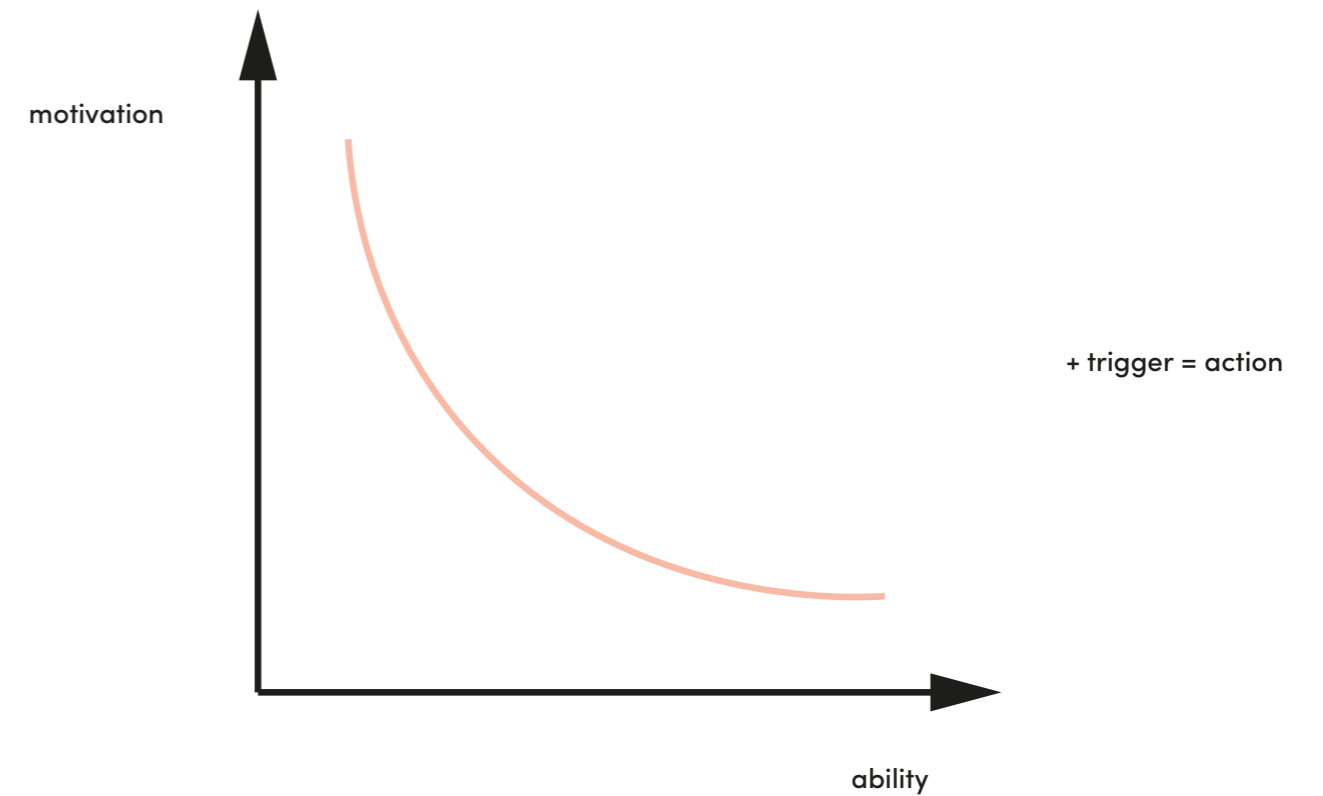
Ways to influence behavior

In order to handle the current environmental crisis we need to start questioning status quo and change our behavior, but the question is how?

There has been a lot of research done on the subject of changing behavior through design. Though our research we have found a lot of valuable tools and tricks in addressing this multifaceted and very complex area. What follows is a presentation of some of our key findings and some methods for analyzing this problem.

Motivation, Ability and Trigger

Motivation and ability together with an appropriate trigger are the three parts that enables behavior change to occur.



A user who is highly motivated will be more willing to do something that is difficult if they are given the right trigger. Similarly, a poorly motivated user will still participate in a task if the task is easy to do and with an appropriate trigger.

Creating Motivation

A common tactic for creating motivation today is to use fear to make better choices / not do the wrong thing. However, this has shown to occasionally have a boomerang effect and make us not do anything or make us unwilling to change (Sharot, 2014). Instead, when motivating people to change their behavior consider the following:

People responds to positive news and positive progress. Learning from bad news is something we learn through life, however it seems that this ability decreases after we reaches the age of 40. People responds more strongly to positive news because positive information makes us feel good. Progress monitoring and other ways of visualizing the user's progress will give the user a sense of control and they will be more likely to continue performing a behavior. It is important to highlight the progress not the decline. This can be done for example through different kinds of feedback loops and gamification of tasks.

People are more likely to respond to how they feel about a certain change than to numbers. What are the stigmas, attitudes and habits around certain products? Getting an idea of what attitudes lies behind a certain way of doing a task might give a better sense of why people are doing this in a specific way rather than looking at the effects of the task on things like e.g. personal economy or clinical proof

People like to have a reason for what they do and know how they'll benefit. You need to be clear about what they will gain on continuing with a certain behavior. Is it better health, money saved or something else?

Use social incentives. People want know what others are doing and we want to do better. One example of this is given by Tali Sharot in her TEDx Talk *How to motivate yourself to change your behavior* where she explains that in order to reach out to people with a history of not paying their taxes on time and enhance compliance the British government added a single sentence to their tax payment cards. The sentence said "9/10 people in Britain pay their taxes on time" resulting in

enhanced tax payment on time in that group with 15% (Sharot, 2014, 11:00).

Use immediate rewards now that will benefit you in the future. People respond more strongly to short term benefits and rewards than to long term ones. Actions that are rewarded now but will gain the user in the future can be one tactic to motivate people in the moment but help get results long term.

People need guidance. People seem to be more willing to act if they are presented with step-to-step guide on how to go forward. Rather than giving vague instructions, tell people exactly what to do when the time comes and don't be afraid to drive them toward specific actions. One example is a study made by Howard Leventhal where he studies the effects of vaccine information leaflet. The study showed that when there were follow-up information about where to get vaccinated provided, 25 % more people got vaccinated. The people who got no follow-up information convinced themselves they didn't need a vaccine and that they would get sick anyway, whereas the group which received a plan to take action had little reason to feel this way. If you don't present the user with specific instructions on how to solve the problem you might lose them.

People are more likely to engage in a behavior when they get positive feelings from doing so. Also known as the emotional appeal. By emphasizing relevant life values and long-term goals there is a greater chance of engaging the user in behavior change, and make them more prone to tolerate negative psychological reactions that are likely to occur during the behavior change process. If the immediate reaction is negative, a strong association with a future positive outcome may be enough for the user to pursue a new behavior. (Live Incite, 2020)

People need to be confident that their actions will have a meaningful impact. Also known as the rational appeal. Thus it is important to communicate what effect a specific products use will have.

Ability

Ability is simply how easy it is for a certain user to complete a task or perform a behavior. This ability varies depending on the user's physical or mental prerequisites. When creating a scenario to enable for a desired behavior the specific need of the use needs to be considered.

People are more likely to take action when minimal parameters are set. For example, by implying that a small action is a good start can make people more amenable to making a move. One way to nudge users into adopting a new behavior can benefit from lowering the threshold and to clearly identify a minimum in order to help people break through "action paralysis." (Ciotti, 2020)

Trigger

A trigger in a product can be anything from a blinking light letting you know it needs charging to a beeping sound calling for your attention. Many triggers are very general and not very informative in products today (Sharot, 2014). For a triggered to be effective it needs to be tailored to the user and the timing is crucial for the user to understand what they need to do. Therefore a small blinking light is seldom enough to spark a person to change their behavior.

Leverage the Domino Effect

One of the benefits of encouraging consumers to form desirable habits is that it can create positive spillover: People like to be consistent, so if they adopt one sustainable behavior, they are often apt to make other positive changes in the future.

Cognitive Biases

”A cognitive bias is a type of error in thinking that occurs when people are processing and interpreting information in the world around them.” (Cherry, 2020)

Through investigating cognitive biases we hope to find something that potentially could lead us closer to understand why people might not change their behavior even if they are willing to do so or finding ways to nudge them into doing things differently. What follows is a few cognitive biases that are interesting to this project and a short discussion on their potential in this work.

Sunk Cost Fallacy

A tendency to continue a behavior or endeavor as a result of previously invested resources (time, money or effort). This could be used as a way of increasing value of a product for the user. By investing time, money or effort in retrieving a product they’ll tend to value it higher than if they would achieve it without any personal or financial input. You give some to get some.

The IKEA Effect

This is a version of the sunk cost fallacy bias where people place a disproportionately high value on objects that they partially assembled themselves often regardless of the quality of the end product. By implementing attributes into the product that will require some sort of input for the user (time or effort) they might also start connecting to their objects and thereby value them higher. An attribute like this might also make people more willing to repair their things in order to keep them longer.

Default Effect

The tendency to favor the default option when given a choice between several. One example is a study showing that when green electricity was set as the default option in residential buildings, 94% of individuals stuck with it. (White, Hardisty and Habib, 2019) This is a cognitive bias used frequently in products today. Some are set to gain the person using the product and some are set to gain the company owning the product. A user rarely argues about a default setting so how can we use this to save resources and save the user some money along the way?

Pygmalion Effect

The phenomenon whereby others’ expectations of an individual affects the target person’s performance. There has been numerous studies done on this subject and they conclude that people perform in a way they believe society or a group expects them to perform. If you find a way to make the user believe they are ‘a person who acts for the environment’ you might be able to make him/her do just that.

Ben Franklin Effect

A person who has performed a favor for someone will value the relationship to this person more highly. By asking for a favor from your enemy you might be able to win him/her over and make them think better of you. People like to be consistent and by performing a favor for someone the brain interprets that ‘helping this person must mean that I care for them’. Could this simple act be translated into a human-product interaction? Could our objects ask us for a favor and make us think more highly of them?

The status quo Bias

The tendency to prefer things to stay relatively the same. Generally people do not want to change if they don’t believe they have to.

Unit Bias

A tendency to view the standard suggested amount of consumption (e.g., food serving size) to be appropriate (even if this is too much for this particular person). Today we have a perceived notion of how much we are meant to consume which drives us from not seeing how much stuff we actually buy. Being aware of this and using suggestions of appropriate use in our products we might be able to make people reconsider their resource use and their consumption.

Loss Aversion

The perceived disutility of loss of an object is psychologically more powerful than the pleasure of acquiring it. By implementing cues that lets the user know what they will lose rather than what they will gain could be a way of motivating them to do things differently. However, this also poses an obstacle, making people unwilling to give up the convenience in their current lifestyle.

Moral Credential Effect

Occurs when someone who does something good gives themselves permission to be less good in the future.

The Goldilocks Effect

If you are presenting your user with three options most people will go for the one in the middle.

Bandwagon Effect

The tendency to do (or believe) things because many other people do (or believe) the same. This relates to groupthink and herd behavior where we are constantly looking for appeal from others around us. We are very sensitive to what others think of us and therefore more motivated to change if members of our society or group are doing so too.

Confirmation Bias

This is favoring information that conforms to your existing beliefs and discounting evidence that does not conform. When people do not want to change they will stop listening. A big part of behavioral change is finding ways to design around this and tweaking the message to fit their beliefs.

Cognitive strategies

Beyond cognitive biases people also possess unconscious cognitive strategies that help individuals to harmonize and reconcile their seemingly incongruent behaviors, such as attention-shifting strategy and low-cost strategy. These strategies are examples of coping with an unsustainable lifestyle and are presented in the article *Environmental attitudes and behavior: Measurement*. (Bamberg, S., Rees, J., 2015)

Attention shifting

People tend to emphasize the importance of some activities while simultaneously playing down the importance of other activities

Low-cost strategy

Compliance to environmental morality and ecological insight in low-cost situations to harmonize environmental attitudes and behavior. People who experience cognitive dissonance because of indulging in environmentally harmful behaviors that are difficult or costly to change may engage in simple and painless pro-environmental behavior as a means to relieve the discomfort created by their harmful behaviors.

Contribution ethic

Neglecting a specific pro-environmental behavior is justified if one is already playing one's part in other ways.

Behaviour change strategy cards

All design influences peoples behavior and decisions, however, persuasive design does it in a more direct manner. By using this toolkit on how to create behavior change we got clear examples on how the concepts of our research can be more clearly applied in our design.

11 Emphasize losses to discourage a behavior.
People dislike experiencing losses, especially in the present. When an option or outcome is framed in terms of its associated losses it becomes less appealing - and people rarely stop to consider the associated gains.

12 Don't overwhelm the user.
When facing an overwhelming amount of information, people may shut down and stop paying attention. In the face of extremely scary information, people may engage in unhealthy self-soothing behaviors.

13 Combine small losses into one larger loss.
Losses that are experienced together, as one large loss, are less painful than smaller losses that are experienced separately.

14 Help the user make a commitment in advance.
People tend to make less rational choices when they're in "hot" states - like when they're hungry or emotional. Deciding in advance, in a "cold" state, makes preferable outcomes more likely.

15 Provide immediate and ongoing feedback.
When outcomes occur in the future it can be difficult to make the connection to the actions that originally caused them. More immediate feedback can help people better understand the consequences of their actions.

16 Call attention to the desired option.
People are more likely to select the option that they pay the most attention to. The longer a person looks at a visual representation of an option, the more likely they are to choose it.

17 Reduce uncertainty associated with the desired outcome.
People tend to avoid options that have ambiguous or uncertain outcomes, preferring instead options that are clear and certain.

18 Make the default option the desired outcome.
People are more likely to go with a default option when one is present, since it doesn't require any extra effort or action on their part.

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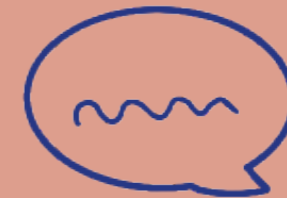
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The collage includes images of a 'RESERVED PARKING' sign, a recycling bin, a smartphone screen with a progress bar, a hand holding a card, and a plate of food.



Interviews and home visit





Home Visit

We visited Hugo who is an environmental science student living alone in an apartment in Lund. Hugo is 25 years old and has an interest in music from the 70-80's and likes to make the most of what he has got. His house is full of 'temporary permanent solutions', he says. He has a coffee machine that doesn't work but he doesn't know how to repair it or how he would go about discarding it in a sustainable manner. The coffee machine is used as a holder for the coffee filters and he still makes coffee in it every day. "I have it in my apartment so I might as well use it".

Hugo values a few things in his apartment very highly such as his kitchen table, his bar cabinet and the sofa chair. All of these things have a personal history with Hugo. The kitchen table which he has built from scratch himself he would drag out of a fire, he says. The sofa chair is something he found for a good price at a flea market and he uses it everyday. The bar cabinet was a heritage and a piece his grandmother once owned.



From talking to Hugo and from other interviews with colleagues it is clear that we feel attached to things that we have a personal history with or things that have been given to us by people we care about. Also things that we have built ourselves seem to be more highly valued.

When buying food Hugo tries to buy as little as possible packaged. However, he finds it hard to compare one packaging with another. He looks for the label FSC which stands for fair forestry. When comparing one plastic over another he feels less confident. The lack of information about how the packages are different from each other and the few un-packaged alternatives are the main issues, he says. His tactics when buying food or other products is to go with gut feeling and trying to avoid plastic. "It feels as if I have little control over what packages I can buy so I just go with the thing that feels the best in the moment or stick to brands I trust." Hugo recycles as much of the packaging to the best of his ability and reuses glass bottles.

Focus group interview

A group discussion on the topic of the relationship and attachment to things was carried out with 7 participants in ages between 25-30. The participants in the discussion all have a self-proclaimed concern for the environment and represent different professions, such as healthcare, engineering, law and architecture. Following are some of the reflections the discussion gave rise to.

On the question of mending things they already own different attitudes were represented, showing the impact of personality and interest as a great factor in motivation. One participant proclaimed “I don’t know how to mend things” and “if I have to drill a hole or use tools I am screwed”. The same participant explained how there are several objects “on hold” in his home waiting for reparation or an extra piece. The main reason for their mending being put off was explained to be time and the fact that these were not considered to be essential to use in the everyday life. Another participant however reported how he enjoyed mending things, and saw it as a challenge and fun experience, this as handicraft was described as a small hobby. The input made in order to mend objects also created a stronger relationship to the object.

Some users reported that the objects most difficult to create a relationship to were chords, and to some extent headphones, as they “count on that they will break eventually”. On the topic of headphones some however stated that they had a strong connection to the actual headphone but not to the chord, and would be sad if they broke.

The participants agreed that the things were replaced the most and viewed with less value were the things that are considered cheap and/or easy to replace.

Silence fell when asked what their most valuable item that could not be replaced was. Those who own and carry a strong relationship to music could eventually answer that it was their musical instruments, as they both had a sentimental value as well as could bring joy during use. Others found it

difficult to name one item they needed and couldn’t replace that didn’t have a sentimental value.

One participant mentioned how moving to a new apartment involved a getting to know process with the new appliances such as the stove and oven. This was described as a struggle that also built a stronger connection and the feeling that the oven was personal, with certain types of behaviours that gave it personality.

One item that the group collectively agreed on that they almost immediately built an emotional bond to was the car. Cars they had or had known were reported on as personalities of their own and the process of getting to know the car was cherished.

Conclusion homevisit and interviews

We value personal history

We value gifts

We value things we’ve made ourselves

We value things we use frequently

Our will to repair things is highly personal (If you are a person who likes making things you will probably be more prone to repair than if you’re a person not gaining any sort of satisfaction in the act of doing so)

We don’t know how to compare what product packaging is good and bad from a sustainability standpoint

We don’t know how to go about recycling most of our home appliances

JACOB OCH ALEX KOLLEKTIVBOENDE 2050

Brainstorm session

Ways to rethink: How can we save precious resources?

ESMV

VARNA

Professorn

125 år
föreläsnings
fullständigt
nationella
historiska

Ombyggnad

25 år

25 år

När vi inte
shopper

Läckhämmande
behållning 25 år

76%
av vatten
användningen

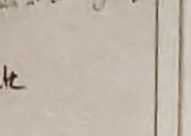
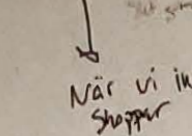
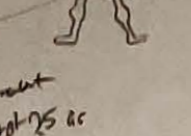
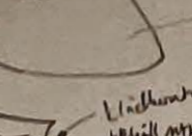
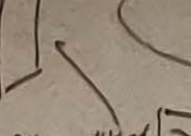
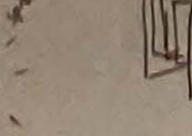
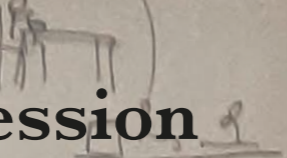
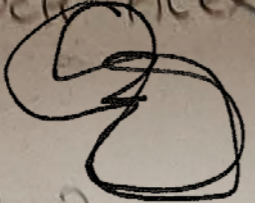
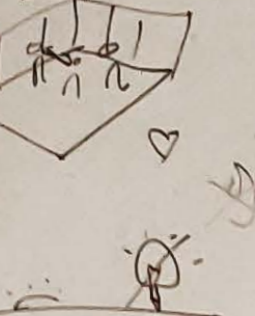
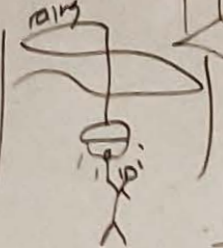
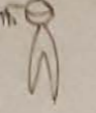
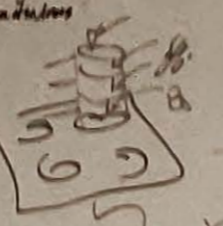
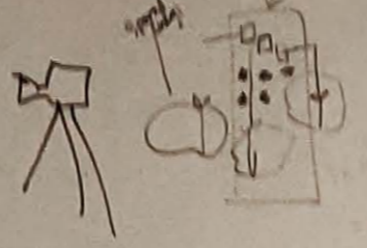
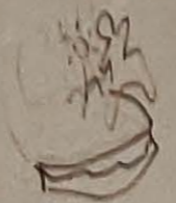
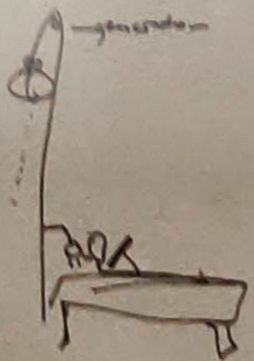
MÖRKT

personlig
lampor

Kvalitet
och look på
tyget är prio
1 (om läsa)

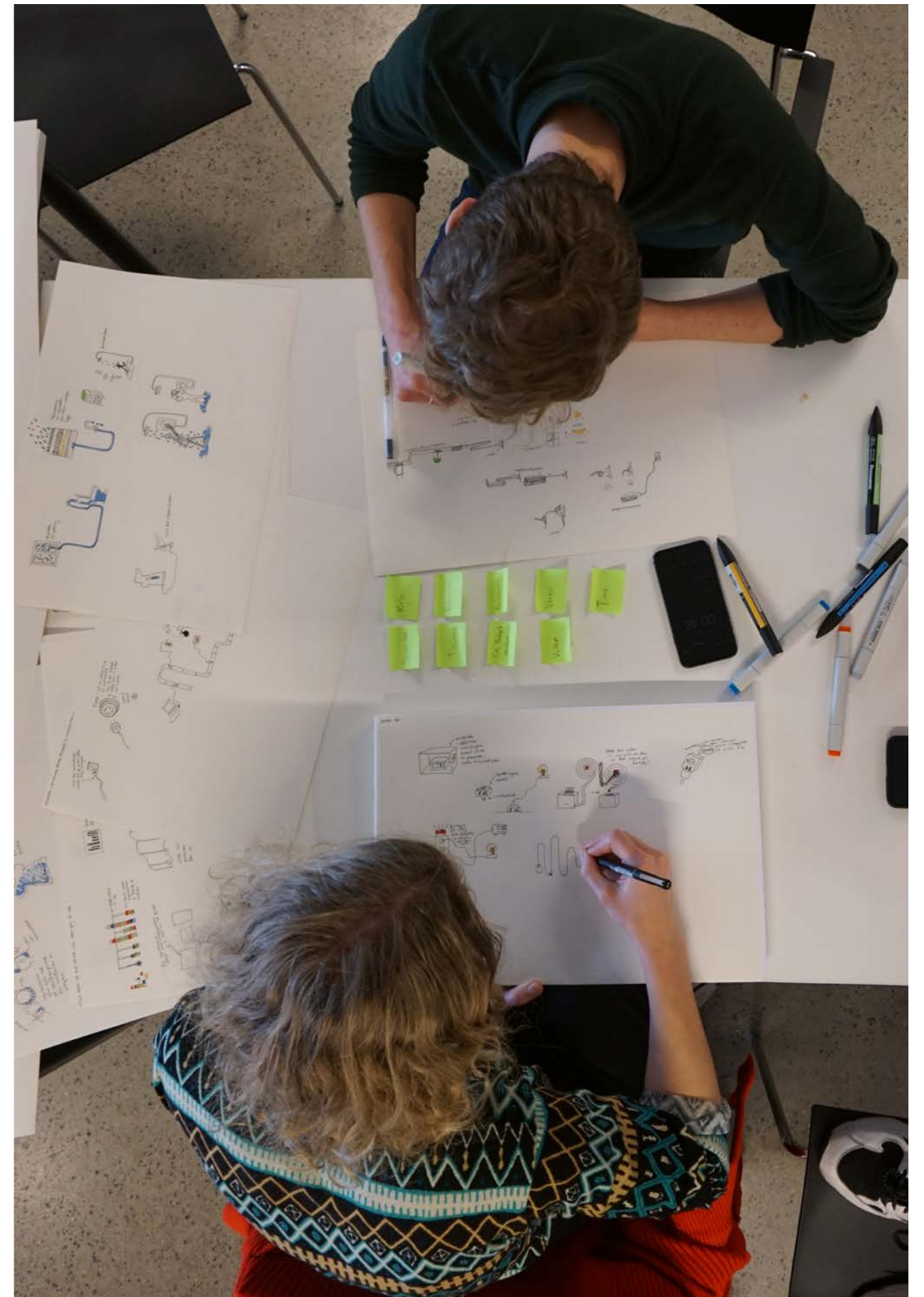
5 mån barn

→ Hög outfit



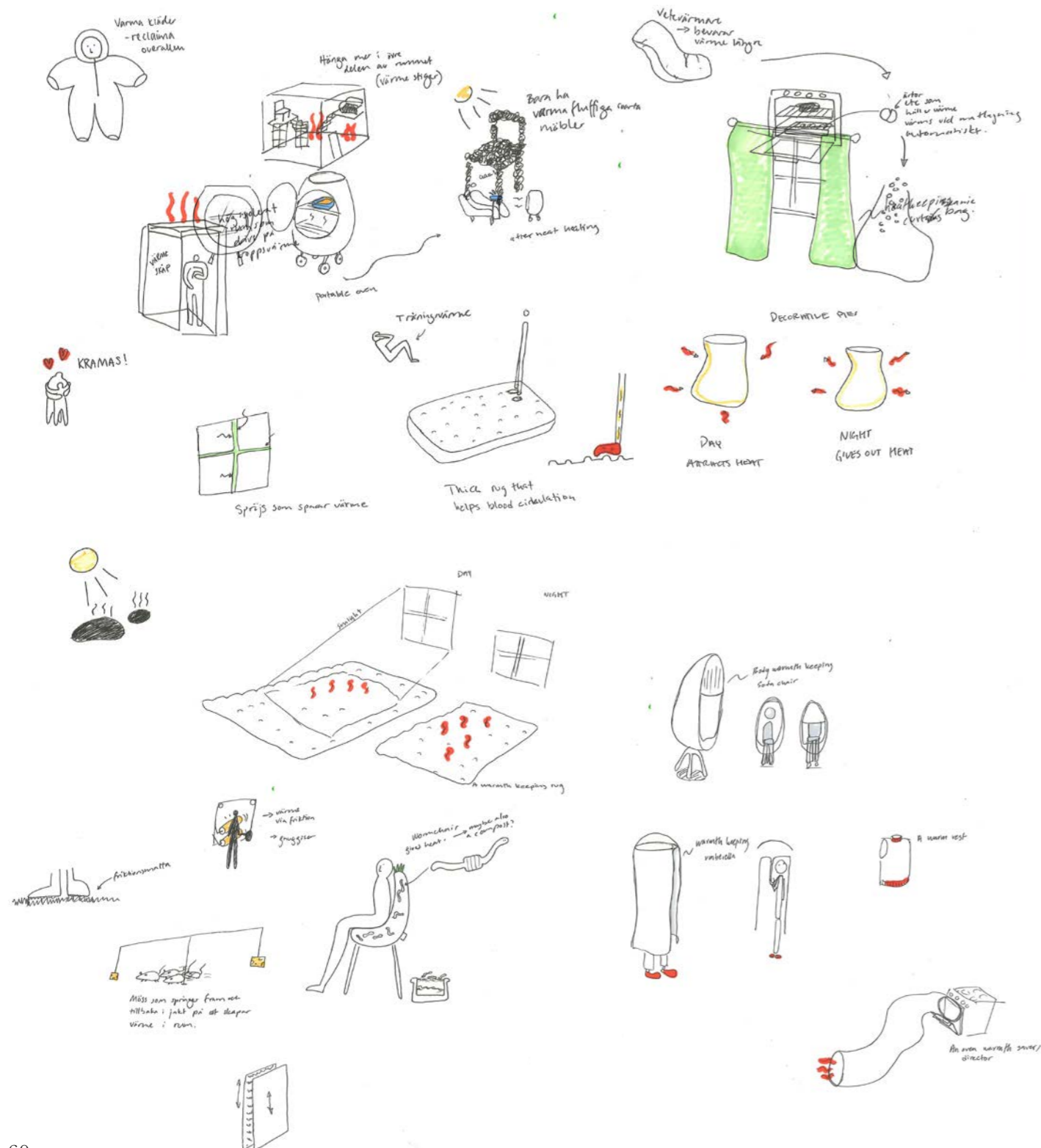
What if...

As an experiment we sat down to sketch ideas (high and low) on how to rethink our everyday life and how to find ways to save resources. The investigation was centered around a selection of topics such as water, energy, heating, cooling and how to clearly show CO2 use and impacts of actions, asking the question “what if...?”.



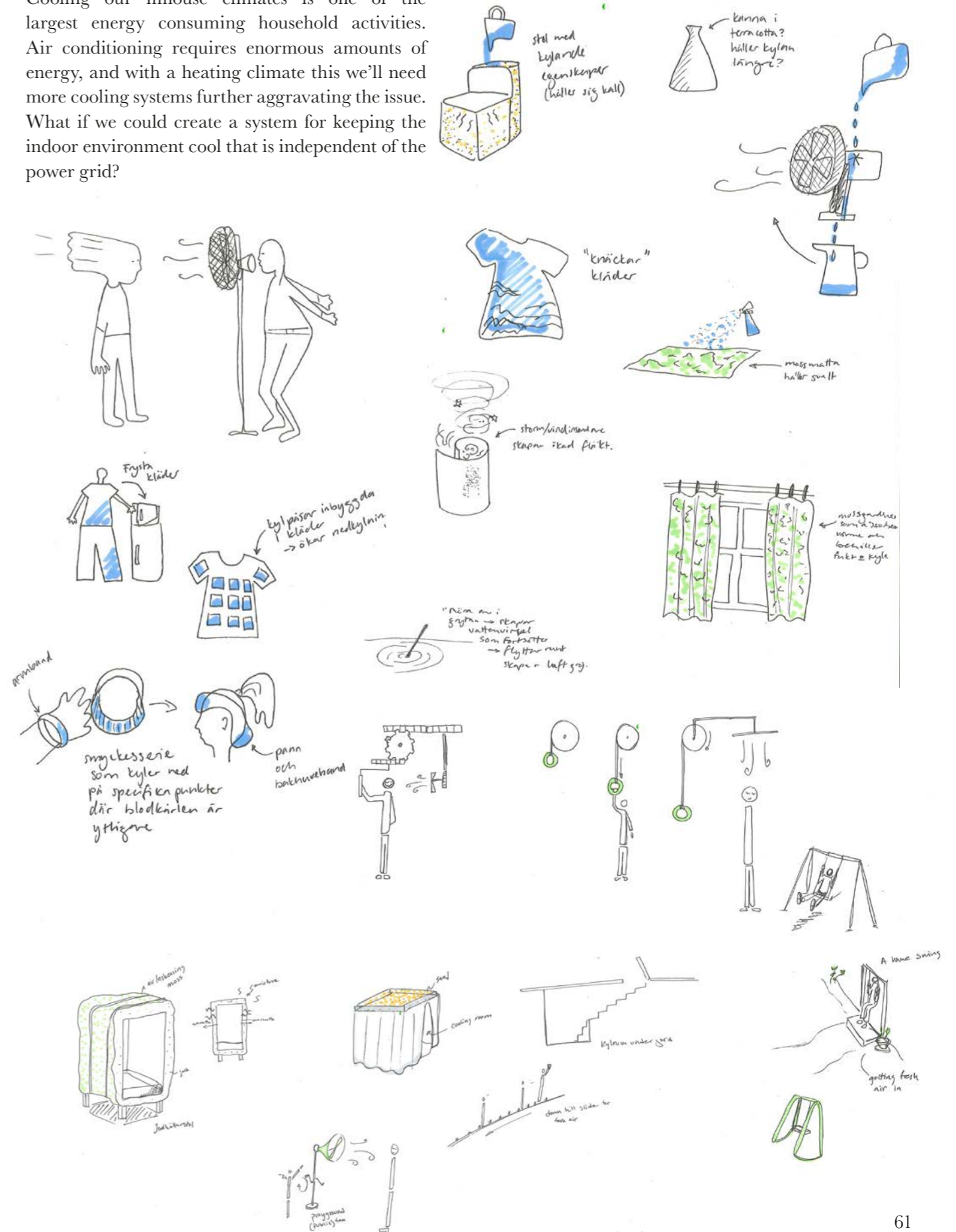
Heat

If we would lower the inside temperature we could save a large amount of the daily, monthly and yearly consumption of household energy. What if we could create a system for keeping and/or creating heat that is independent of the power grid?



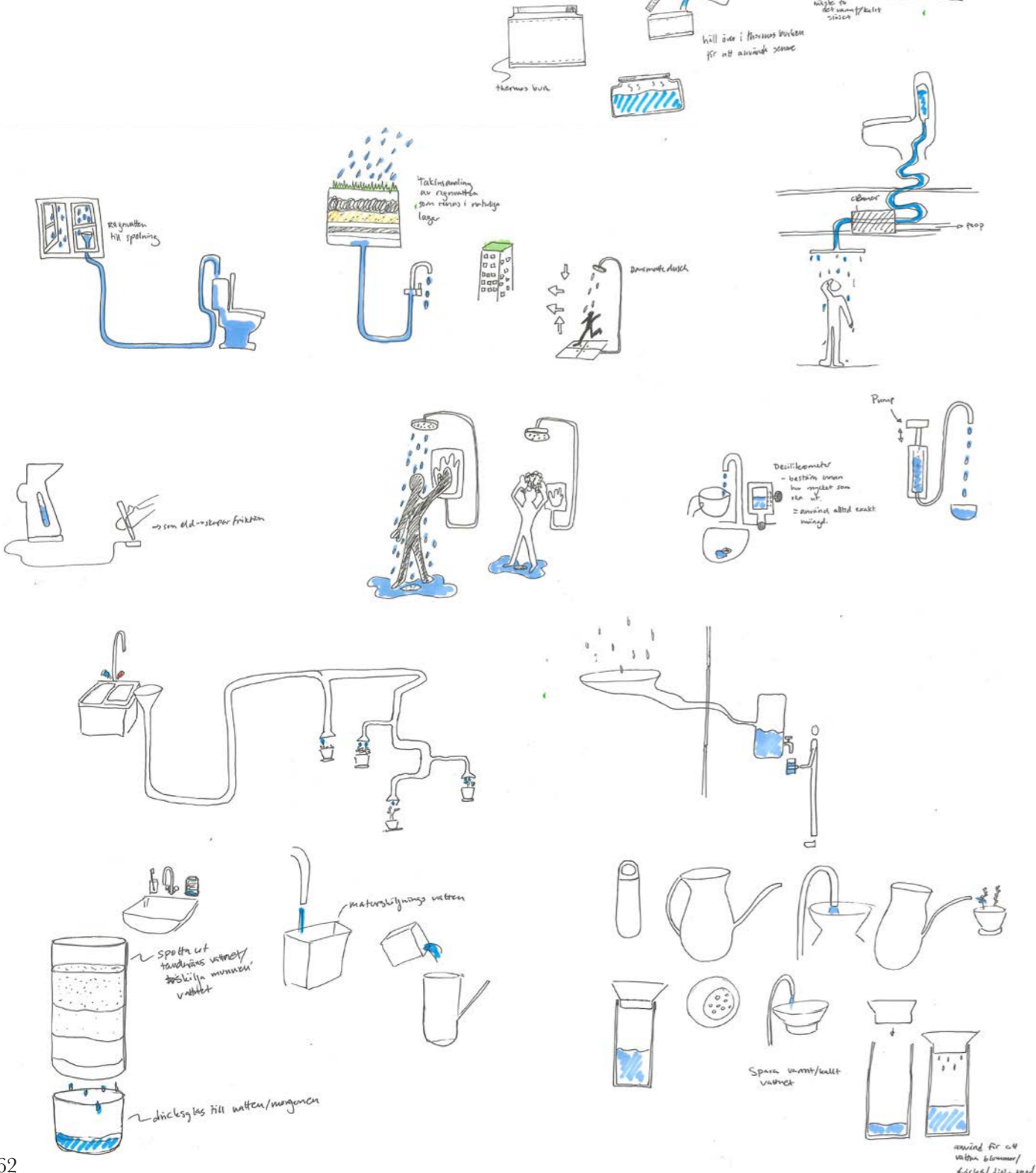
Cooling

Cooling our inhouse climates is one of the largest energy consuming household activities. Air conditioning requires enormous amounts of energy, and with a heating climate this we'll need more cooling systems further aggravating the issue. What if we could create a system for keeping the indoor environment cool that is independent of the power grid?



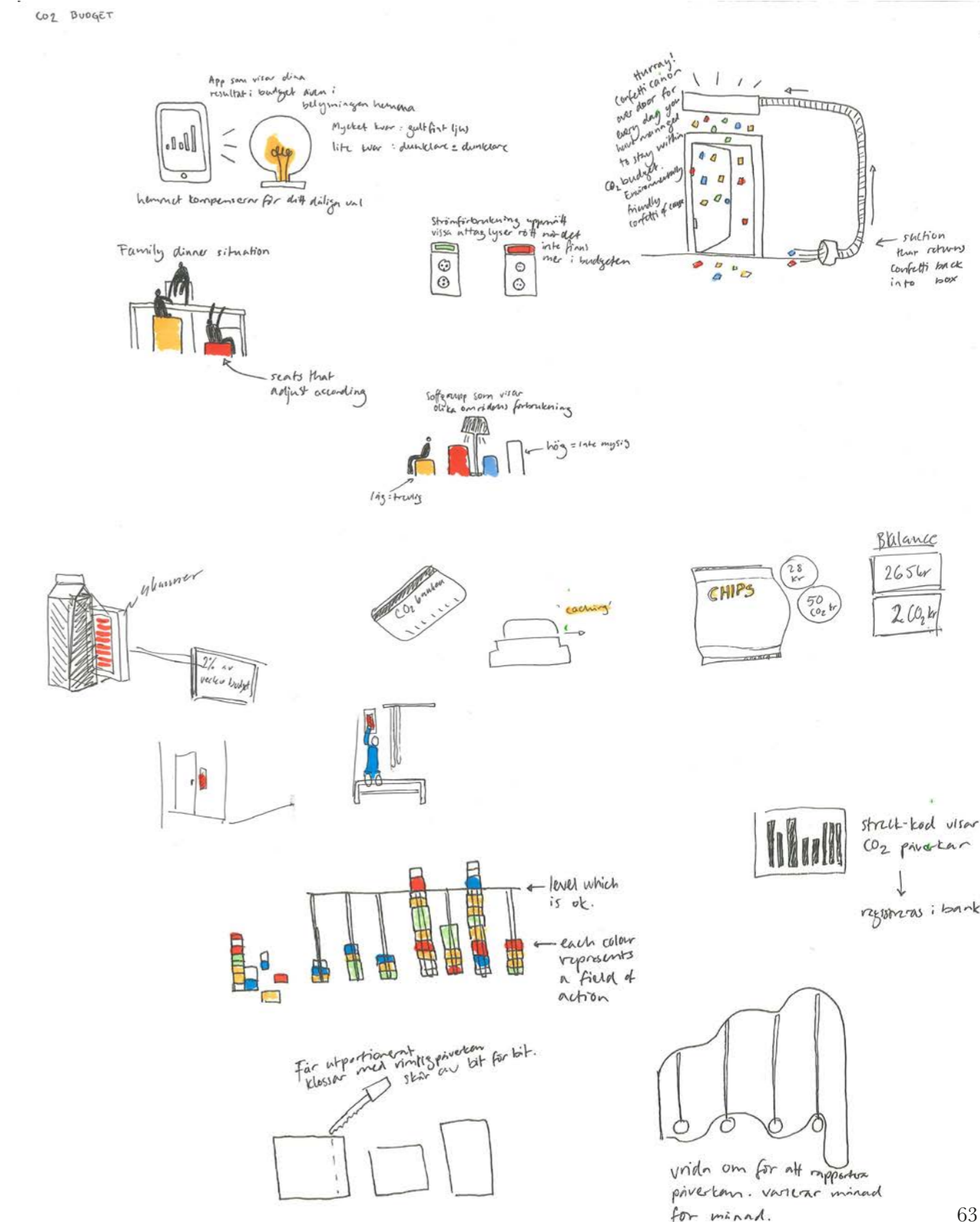
Water

Clean water is one of the conveniences we take the most for granted, and waste without reflection. But fresh water is not an endless resource and several communities have experienced drought as a result of climate change, even here in Sweden. What if we interacted with water in a different way?



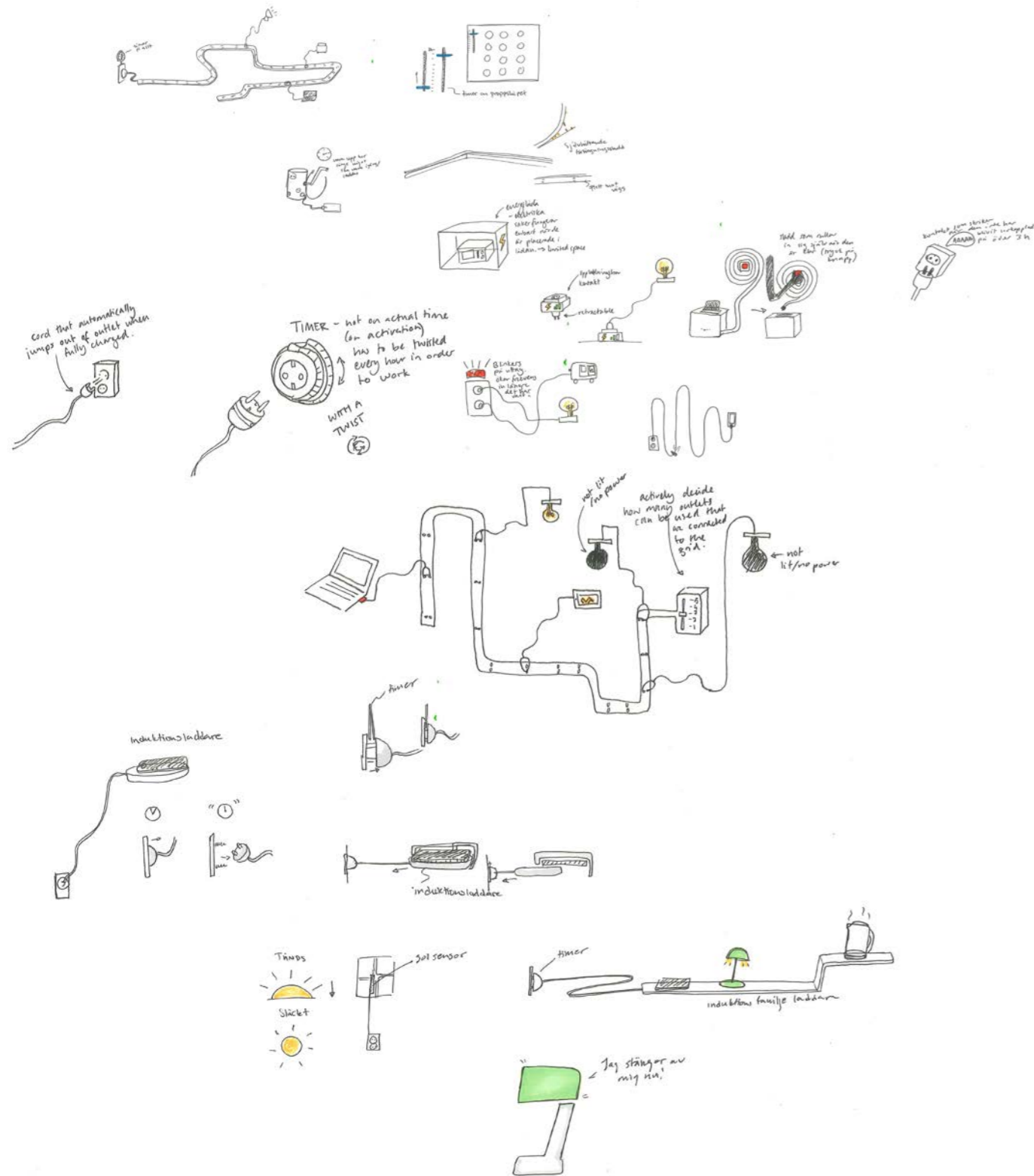
Visualising CO2

One of the major reasons behind our wasteful use of resources is unawareness. What if we could see the impact and carbon footprint of our actions clearly in everyday life?



Stand-by

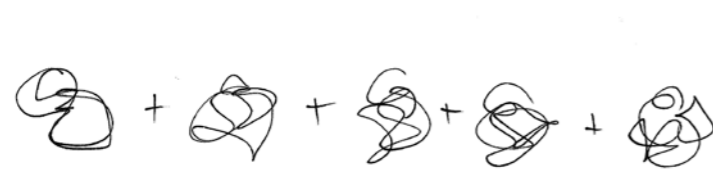
Energy consumed by devices in standby mode accounts for approximately 1% of the U.S. total energy consumption. (Center for sustainable systems, 2019) What if chords were treated in a different way?



Conclusion

This exercise was important for us to get some ideas out on paper and start looking at systems and scenarios with curious eyes. However, we realised that it was too early in the process for us to start looking at solutions and that we still had more aspects to discuss and needed to find a problem to apply our knowledge to in order to approach this project.

11 Thumb Rules



To summarize...

The conclusions reached through the research, interviews and brainstorms carried out in this chapter can be simply summarized into 11 categories on people and how different aspects influence their behavior.

- | | | | |
|---|--|----|---|
| 1 | People are more likely to act when minimum parameters are set. | 7 | People want to treat themselves. |
| 2 | People love being consistent. | 8 | People hate losing precious time or privileges. |
| 3 | People need to know what to do next. | 9 | People value a sense of agency. |
| 4 | People don't argue about a fair default setting. | 10 | People like new things. |
| 5 | People want to do better than their neighbor. | 11 | People responds to positive news. |
| 6 | People respond to their emotions. | | |

Conclusion - It's all about visualisation!

In order for users to change their behavior they need to know how to do it and why. A sense of ability and/or motivation is crucial when changing behavior and both of these build on information and feedback. Understandable feedback about ongoing and long term resource use is hard to find in home appliances today and there is a need for clear information in the sequence of use in order to make people know how to change. This project will therefore focus on investigating ways of visualisation to enable the user to experience, understand and assess information about their use of resources.



If our products could let us know how they are doing it would make it easier for us to understand how we need to change.



CHAPTER 2

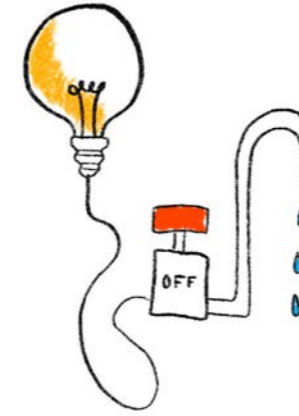
This chapter will look at three different approaches to the following question. How can we influence the user-object interaction in order to save resources with the help of a physical attribute?



Methods of analysis

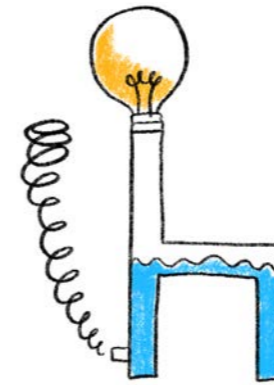
The conclusion reached in our research was how it was all about visualisation and creating feedback that could be easily understood. There were also a set of categories that we continuously were circling back to - such as the use and discard culture, how we cannot care about what we cannot see and the danger of mindless use. Thus we saw the potential to work within a set of three categories that each would have its own way of questioning the concept of convenience with the help of friction.

In the end of this phase we hope to apply our findings to a specific scenario or product in order to create a tangible and feasible concept.



Regulators

How can we make our choices more aware and visualise their consequences? We want to investigate ways of building in attributes that will require a conscious choice in the simple mindlessly executed actions such as an on/off switch.



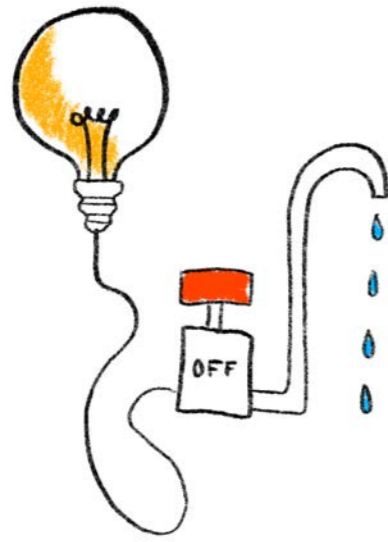
Call Attention

We want to make the use of invisible endless resources visible and tangible to the user.



Prolonging Life

How can we create attachment and a stronger relationship to our things in order to make us keep and care for them longer and go against the current throw-away culture?

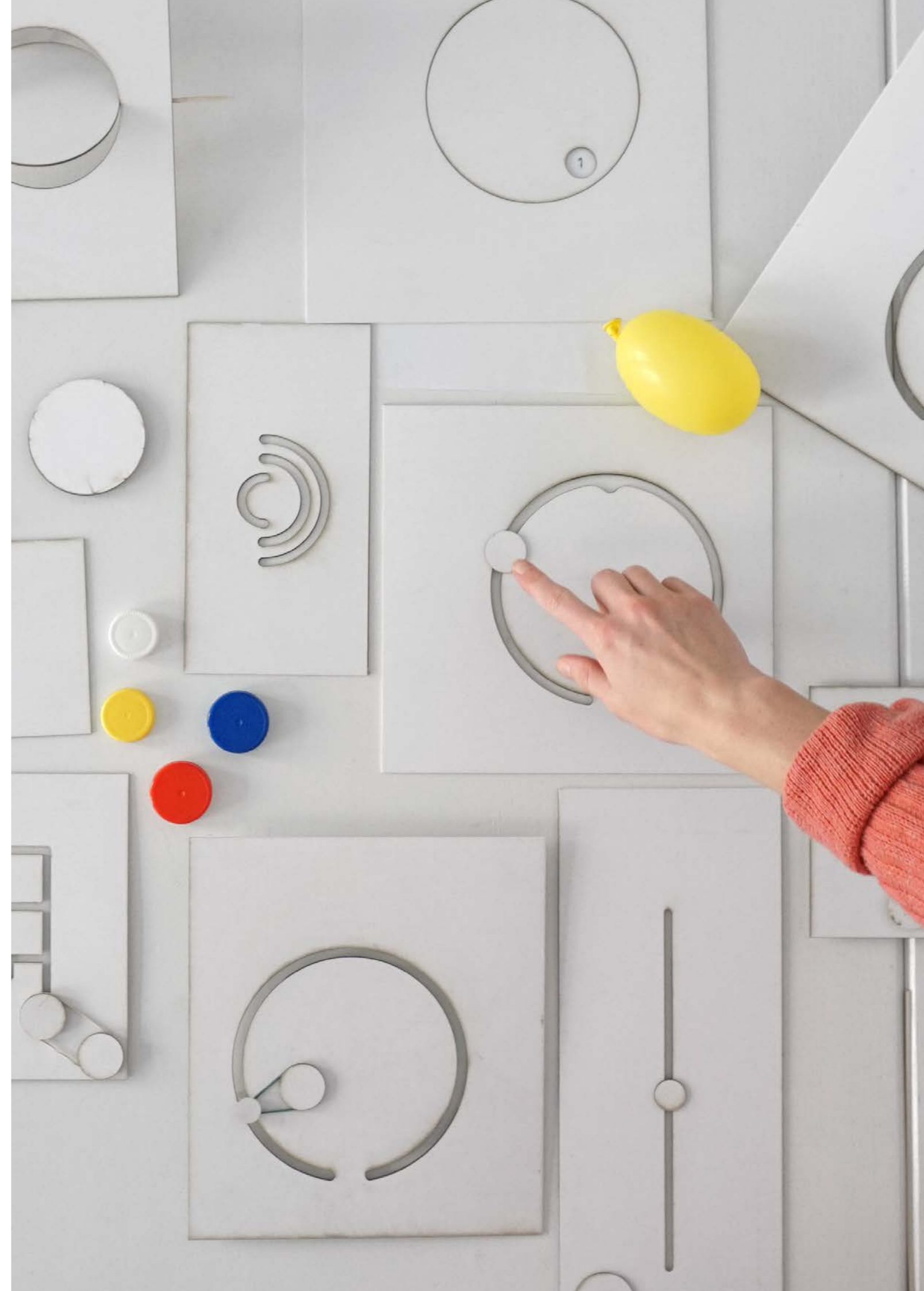


Regulators

How can we make our choices more aware and visualise their consequences? We want to investigate ways of building in attributes that will require a conscious choice in the simple mindlessly executed actions such as interacting with an on/off switch.

Creating awareness through friction

We want to investigate ways of creating a better understanding of the correlation between use and resource consumption in the act of use. In order to do this we'll try to find ways to build in feedback in the action of turning on/off and regulating. This could be done through incorporating physical resistance in order to visualise the interrelationship between time, money and environment. We want to investigate how we can make off the default setting and a desired option to nudge users to turn appliances off when not in use. Another strategy worth investigating is calling attention to the desired option and making the user aware of what type of use is desired and what is not. It is also important to not overwhelm the user and reduce uncertainty associated with the desired outcome, in this case lower the consumption of resources.



Switches in our surroundings

In order to know how to approach the issue of regulators and switches and determine what we see as issues in our daily interaction with them we decided to start by looking at the different kinds of regulators in our surroundings.

Forcing active decisions



Some switches force the user to make active decisions by placing barriers in front of the switch. These are generally connected to systems that can have serious implications if misused.

Informing effect/impact



Some regulators have an extra function informing the user of what kind of impact their chosen setting will have. In order to know on a scale from one to six how hot the radiator will become a coloured line shows the difference between the steps. The water kettle indicates energy consumption from low (green) to high (red).

Presence irrelevant



Some regulators act on their own once the initial action is carried out, causing the user to work independently. This however also allows for mindless use and waste of resources if not careful.

Presence needed



Some regulators require user presence, and do not work unless the user is there.

Turning itself off



Some regulators turn themselves off in order to save resources and prevent risks. This moves liability from the user to the object itself.

Amount chosen



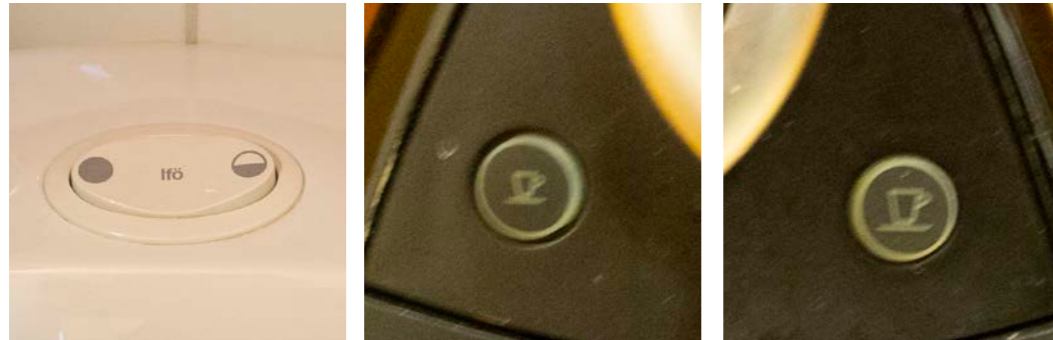
Some regulators are also dispensers, choosing a controlled amount and the user cannot choose on its own.

No freedom of choice



Some controllers act independently and do not allow users to choose individual settings on their own.

Choosing amount



Some regulators allow the user to choose amount and try to communicate this difference to the user, however, many create little understanding and users are rarely aware of their decisions.

Many choices and no choice



Some regulators present the user with a multitude of options. These have a tendency to result in information fatigue and users rarely have a direct understanding of the effect of their choices, more often than not retorting to the simple on and off button with default settings.

Showing it's on



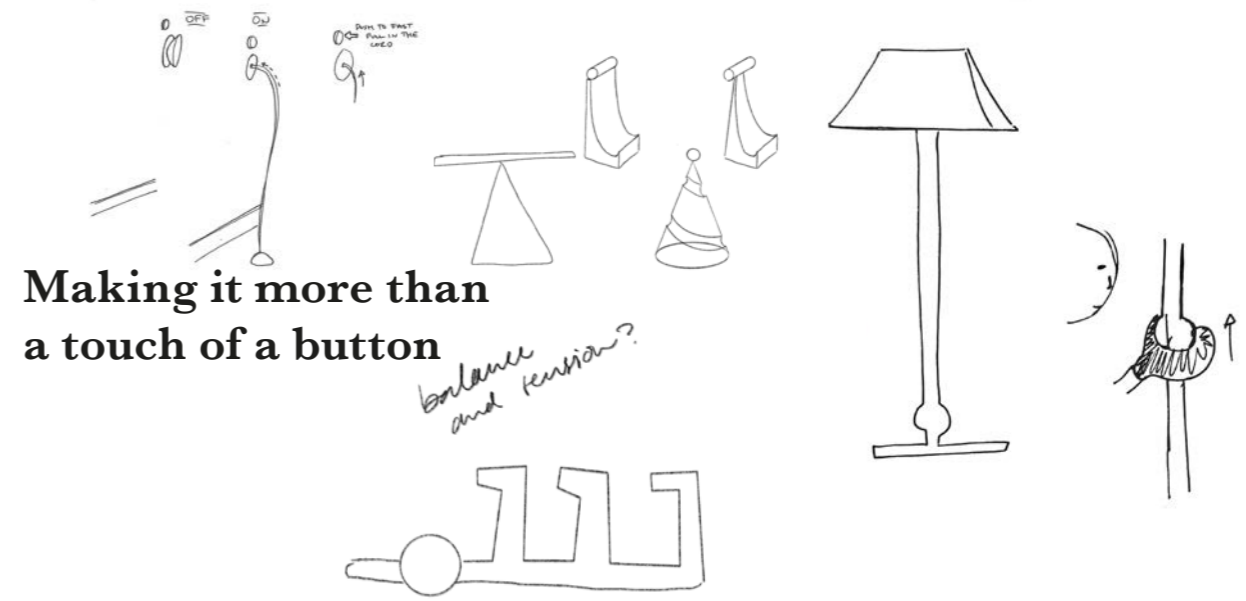
Some regulators indicate to the user that they have been activated and are able to give feedback before the functional feedback can be achieved.

Conclusion

Looking at the different regulators in our surroundings we saw how many intend to make the user aware of the choices it makes, both with amount, heat and controlling volume. However we also saw how easy it is for them to fail. The interaction with the regulator and/or switch is more than often mindless, and although we have the option to choose we rarely engage ourselves enough to make active decisions, falling into default patterns of use. Mindful and purposeful interactions were seen to be reserved for those with dire consequences. What if these limitations were put into everyday interaction to make us make every decision with assertion and purpose and with an awareness of the consequences.

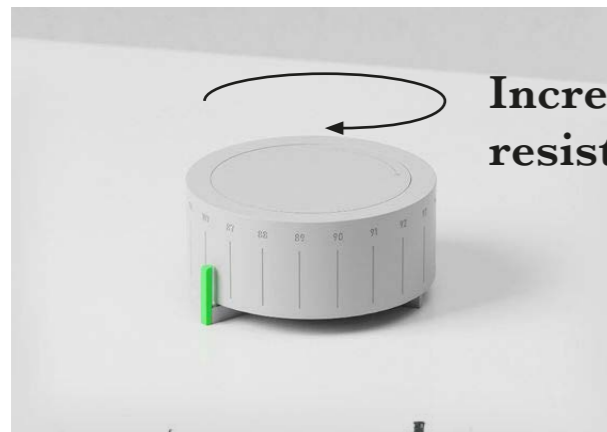
How can we visualise the correlation between use and resource consumption?

We analysed different ways of visualising desirable states and undesirable states through physical interactions and resistance, indications using color and having to extend the motion to more than a twist of a button as well as visualise different aspects of use (such as the amount of money that equals the amount of power used). Another thing we worked with was creating a two-step-control forcing the user to actively approve their choice, in hopes of extending the time for reconsiderations in the action.

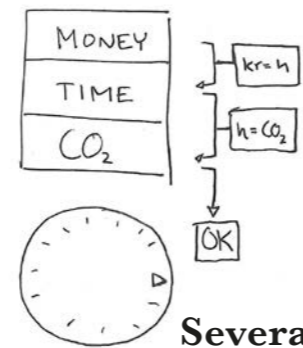
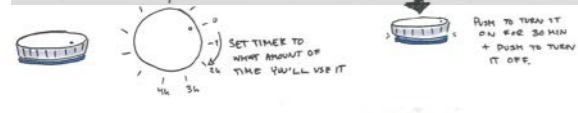


Making it more than a touch of a button

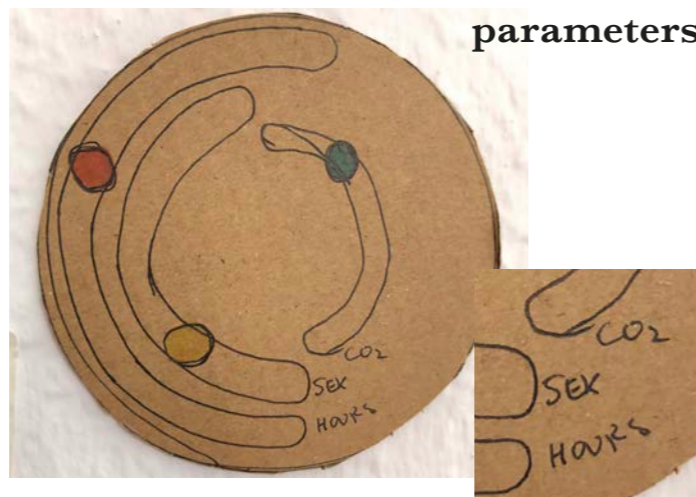
balance and tension?



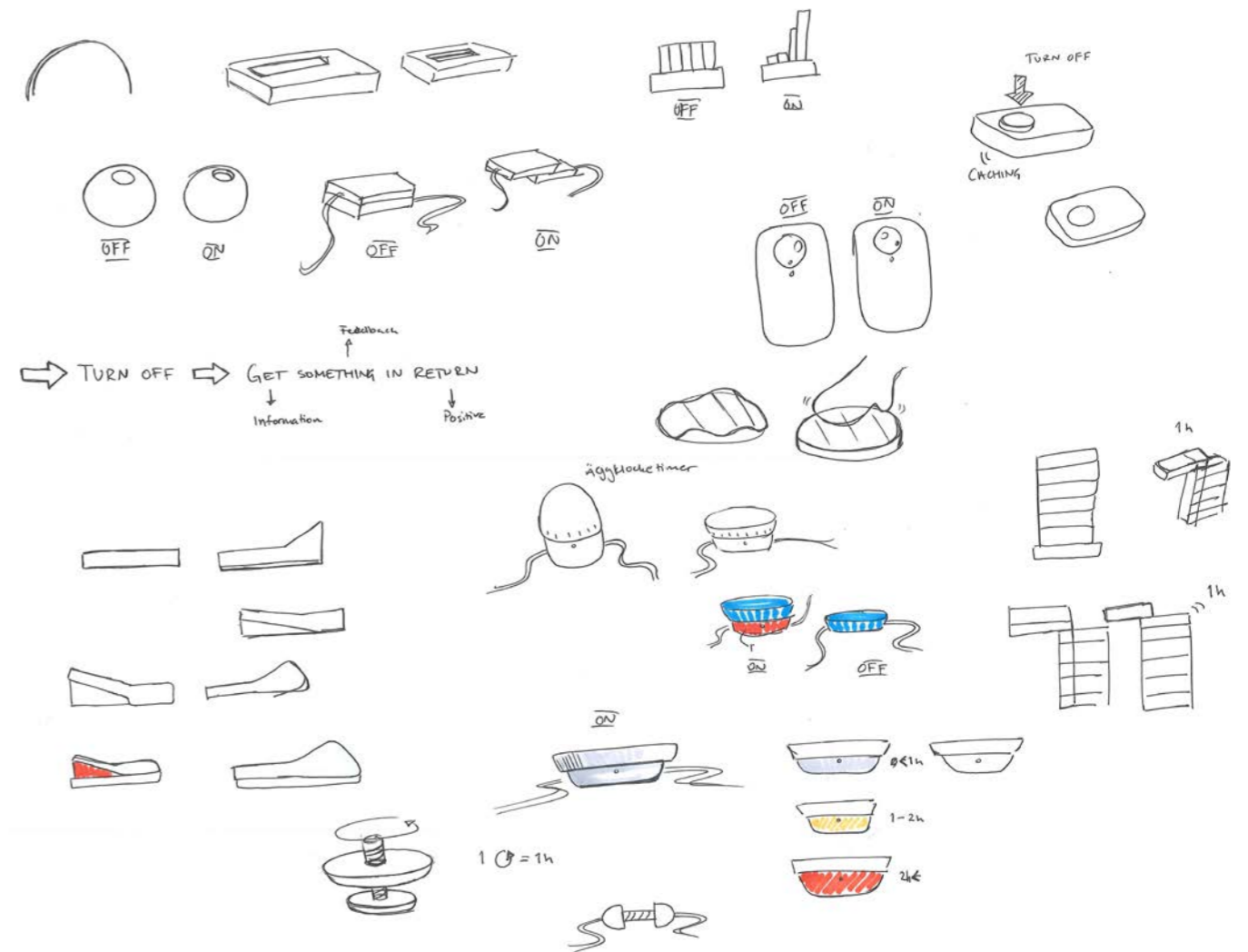
Increasing resistance



Several parameters



Indications and interactions



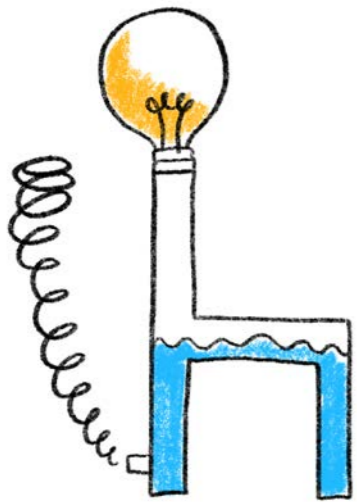


We continued on trying out our ideas through mockups. Working with physical mockups we investigated several different ways of interaction. We analysed the act of increasing/decreasing through working with linear and curved models. We also tried to incorporate resistance as the user would interact with the product and tried to evaluate what physically felt the most 'clear' and how we could create an understanding for the action.



Conclusion

Controlling regulators is about the choice between one state and another. One preferable (off) and one non-preferable (on) in our case. In order to communicate this to the user we want to work with physical resistance in the act of turning something up (increasing/decreasing) and/or turning something on. By incorporating a physical resistance in the action we hope to create feedback telling the user when they are increasing their use and when they are using resources excessively. Connecting back to our research this could help the user get tailored feedback to the current scenario making them aware when their use is increasing and feeling the 'tension' they are creating. Also this action could benefit from a 'two-step' control slowing the action down giving the user room to reconsider and approve their choice.



Call attention

We want to make the use of invisible endless resources visible and tangible to the user.

Physical feedback on resource use

How can we create knowledge about the ongoing use of resources? We have little to no understanding of the amount of resources that are consumed during the use of a product. By calling attention to the use of resources we do not reflect over in our everyday life, for instance electricity, water use and heating and cooling of a space, we hope to create a greater awareness in the user.

Our research has shown people need feedback in order to act and know whether their behavior is environmentally sound or not. Another great motivator for action is how affect can inspire and drive action. One of the main inhibitors for action is the “ancient brain” that cannot register the significance of issues far away such as global warming and instead focusing on more imminent personal problems. By creating a more immediate and tangible threat/feedback we hope to inspire to a change in behavior and an increased relevance of energy consumption in homes.

In UX design the concept of pop-up windows shows when actions with a negative impact are taken and ask the user to verify. This could become a physical pop-up that calls attention to use. We’ve also discussed incorporating a social incentive making people be able to follow others’ use in relation to their own.

We do not want this to result in a display but work with physical cues to hopefully find different and more effective ways of communicating this information in a more tangible way to the user.

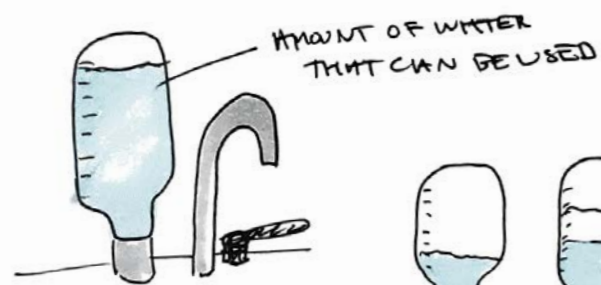


The rational approach

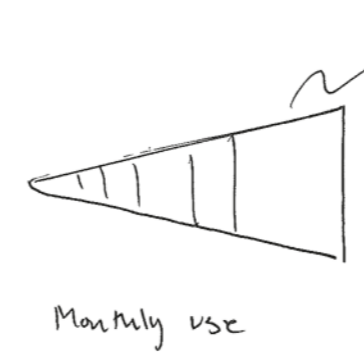
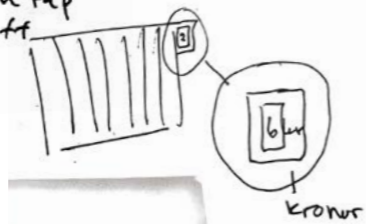


An example of how an alumni (Håwi, 2019) has visualised and saved the amount of water wasted when running the tap to achieve the right temperature.

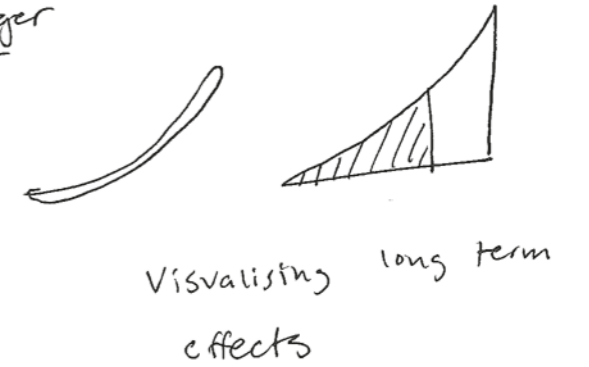
$1+1+1+1+\dots = \text{mycket}$.



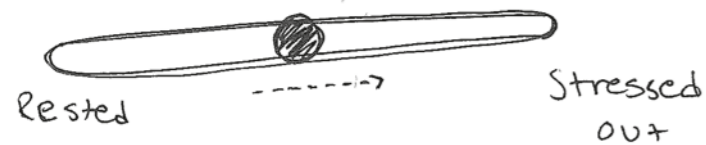
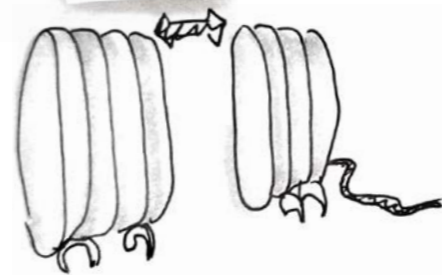
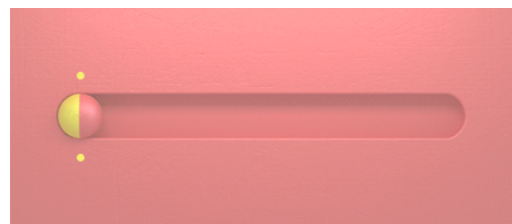
visual reminders of use.



Becomes larger and wider

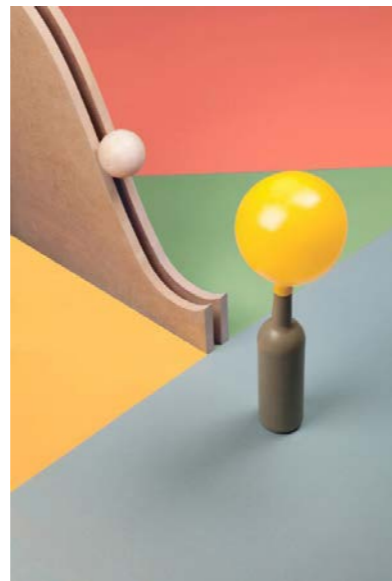


Visualising long term effects

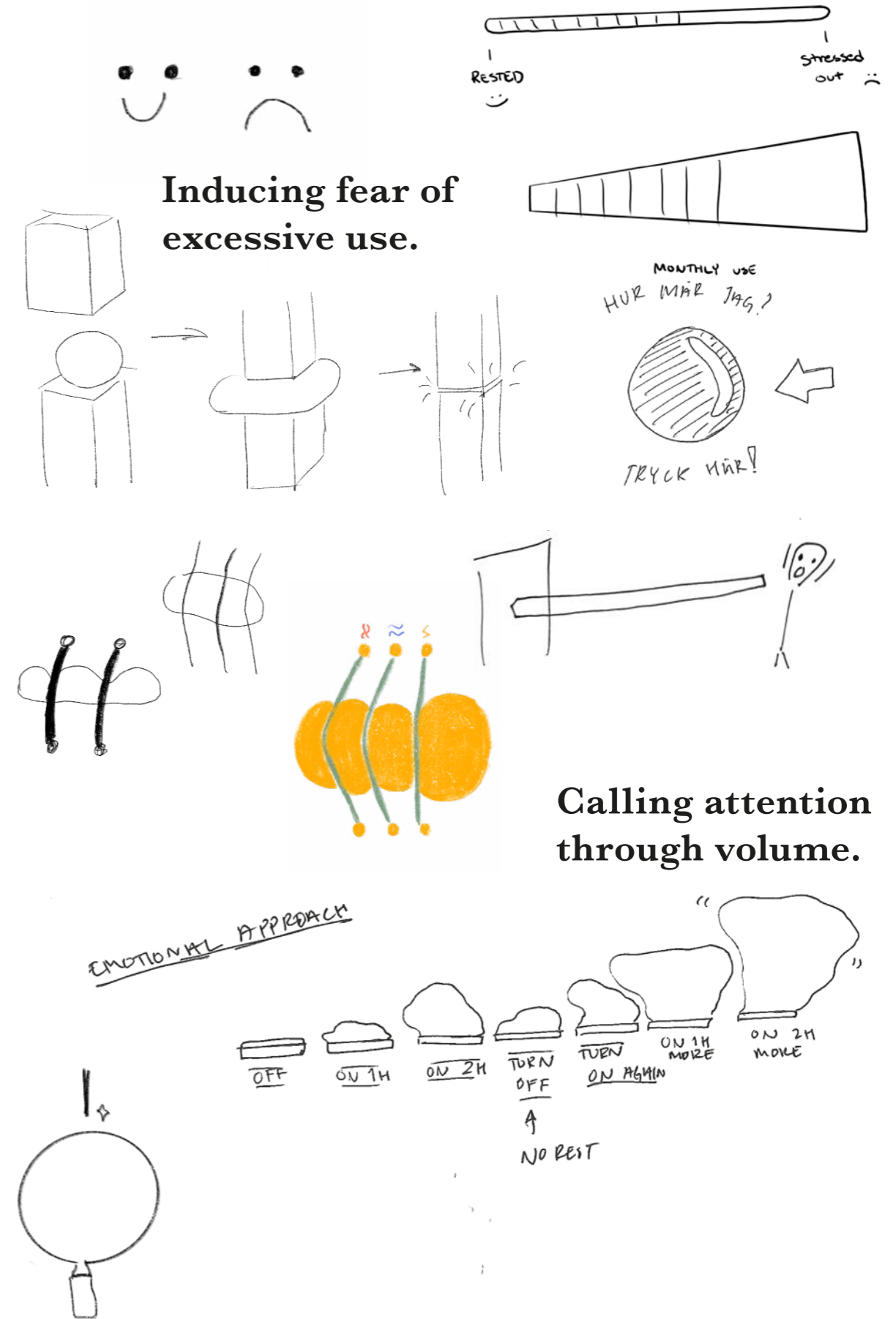


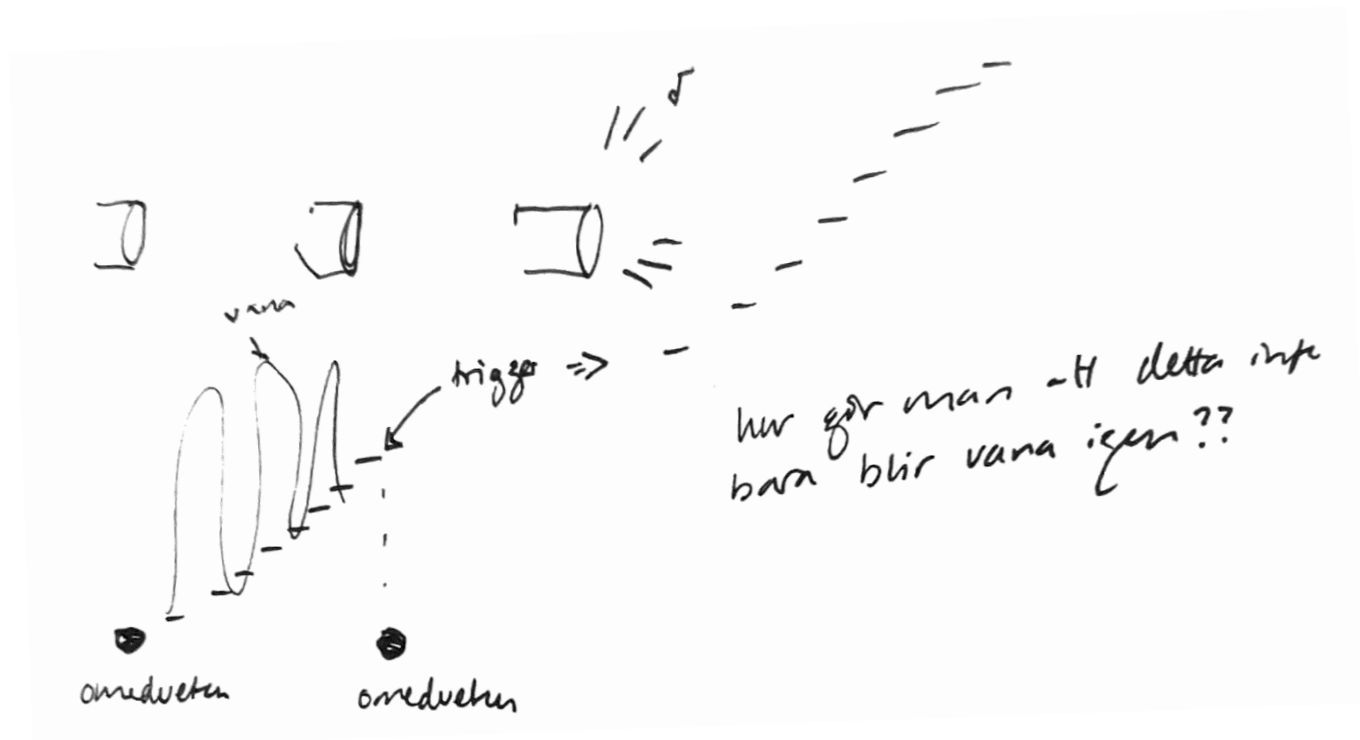
The perception of time - we should try to visualise what kind of effects use today will give in the long run. It might be that a single interaction does not have that large of a carbon footprint, but the combination of all minor uses can have a great impact, and thus the total impact should be clear and communicated to the user.

The emotional approach



Concept moodboard: how can we create a sense of imminent danger and evoke an emotional response and willingness to act as a response to unsustainable use?





How can we assure that the user does not become desensitised to the new addition after a while? We have already learned that humans are able to adapt to new conditions and an initial moment of engagement is soon followed by indifference as momentum is hard to maintain. The addition must continue to find new ways to involve the user, if it so is to increase to new levels of strength or changing the way it behaves to cause an element of surprise.

Conclusion

The realisations from these investigations are that the product should visualise the real consequences of our actions giving physical/three dimensional proof, thus not being digital on a screen. The product should give feedback on the waste of resources and present use in a perspective of time. It should also help the user shift values and priorities in order to change behavior.



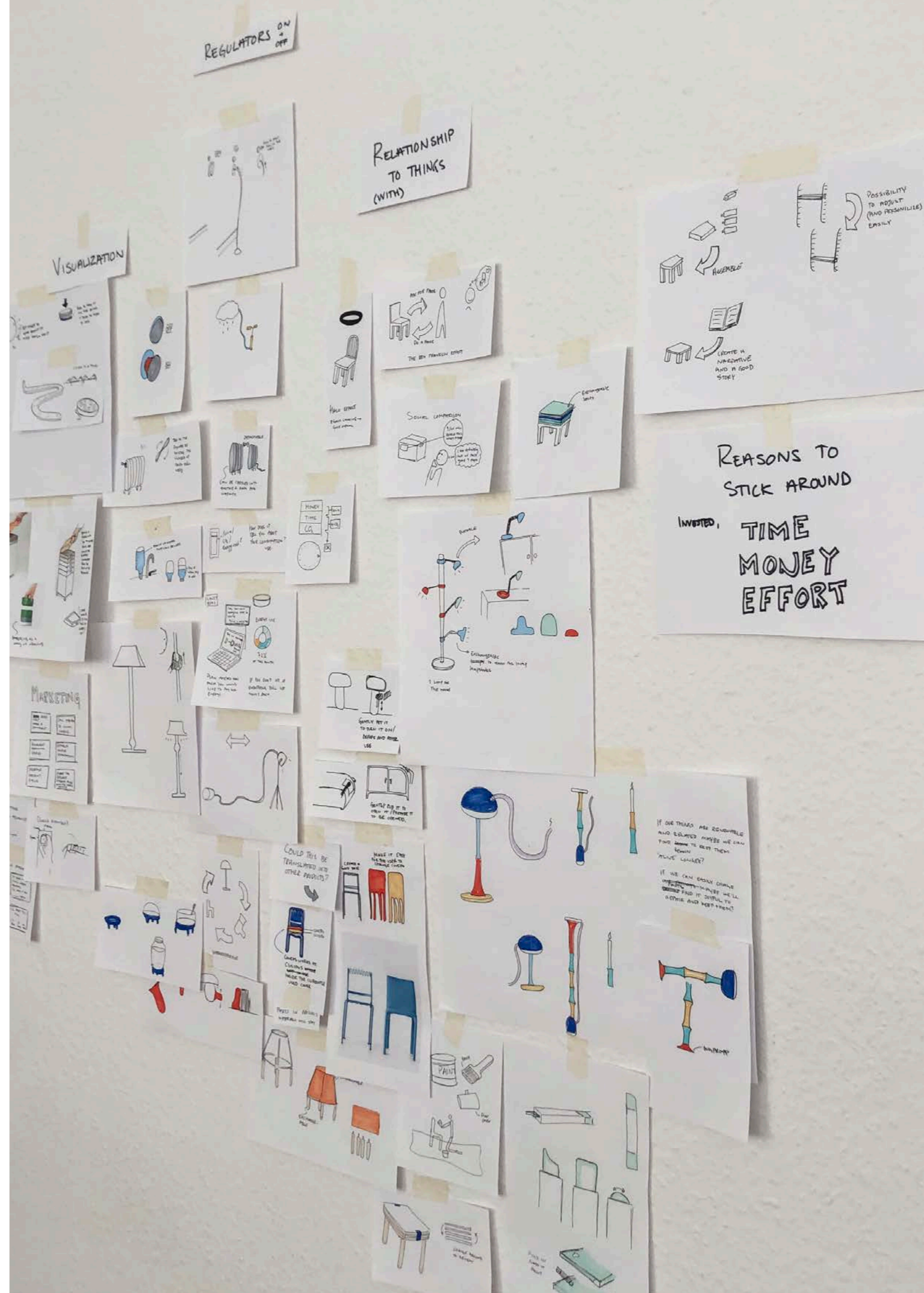


Prolong life

How can we create attachment and a stronger relationship to our things in order to make us keep and care for them longer and go against the current throw-away culture?

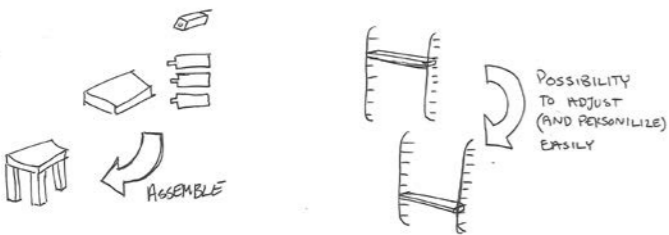
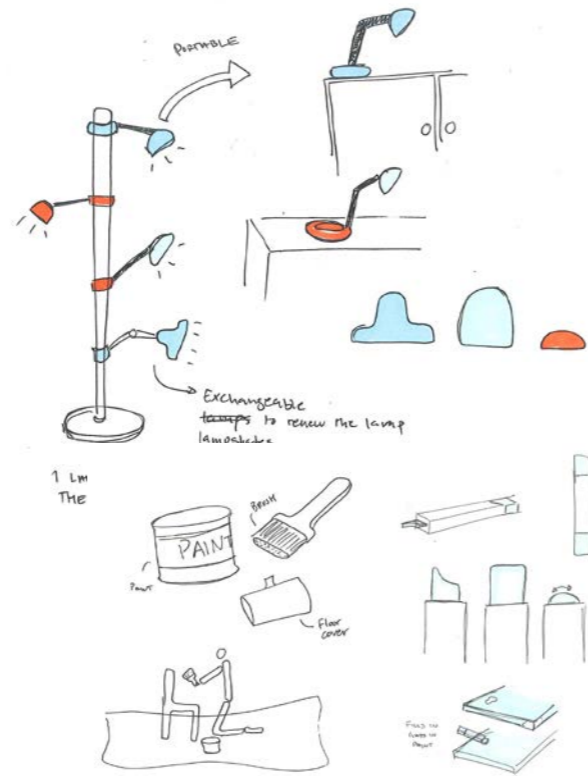
Investigating our relationship to things

We want to investigate how we can create a stronger bond to our objects in order to hopefully nudge users to be respectful and repair their things, prolonging their lives. We are going to investigate how to use both emotional and rational appeal theory to analyze this. The problem could lie in a humanistic aspect where we want to look at how we can create a relationship towards our things like we do to another person. Common guidelines for maintaining a good relationship include a clear dialogue (feedback), the sense of history and past (cognitive dissonance and the IKEA-effect), filling emotional needs (things we need to use often) and more. What if we could apply the relationship principles to interactions with our objects? We also want to discuss ways of using cognitive dissonance theories and creating a sense of history in order to increase the value of the object.

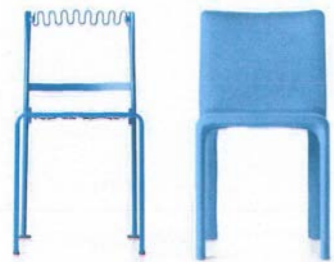
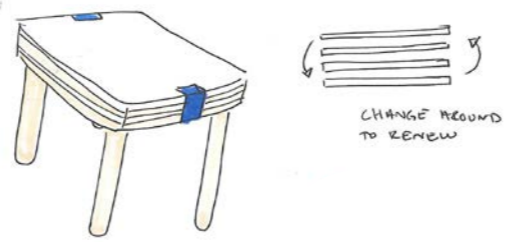
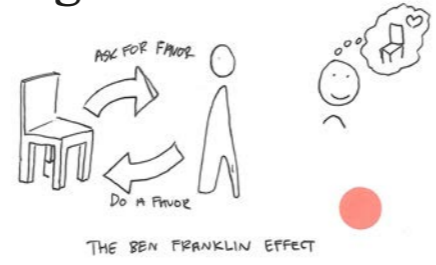


Ways of altering

As we've learnt from the research section of this project, people like novelty and value things they can alter easily and/or assemble themselves (the IKEA effect). People do not always know how they can repair their things, something that can be solved by letting them participate in the assembly of an object, and they usually think their things out because it is not 'aesthetically' fitting anymore. From this we tried to develop concepts for how the user could take apart and assemble their things giving them more control over changing the exterior of a product, like a snake changing skin.



Changing appearance to prolong use.

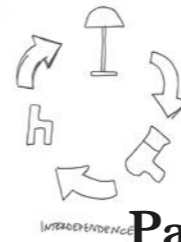


Creating attachment

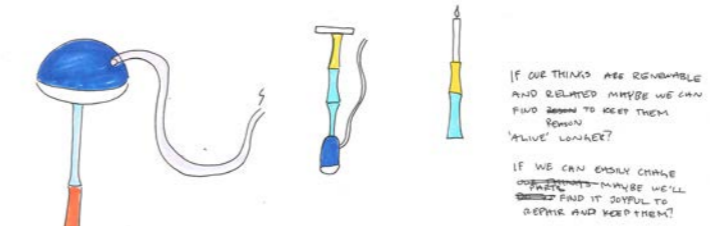
We also took what he knew about people needing an emotional attachment to their things in order for them to value them and tried to find ways of how we could fabricate this attachment. One way was to create an interrelationship between products by letting them share parts giving the user an incentive to keep it longer, and thereby also value it higher. We looked at tender actions and how this could make you more emotionally connected and how we could take a more rational approach and show the user how long they need to keep the product in order for it to become "climate neutral".



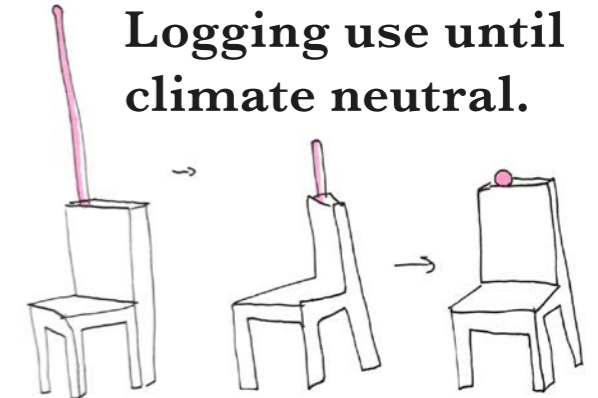
Physical interactions creating a bond.



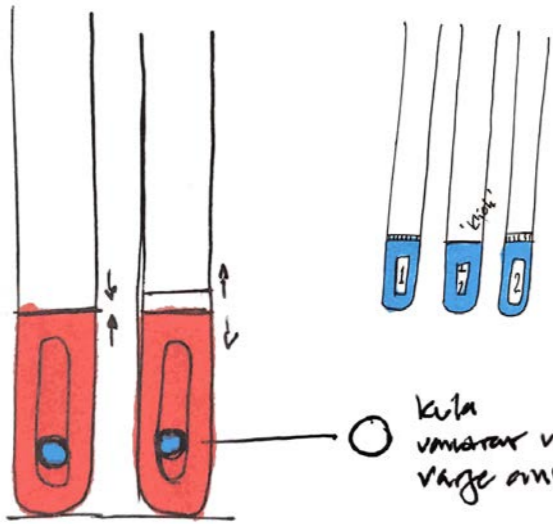
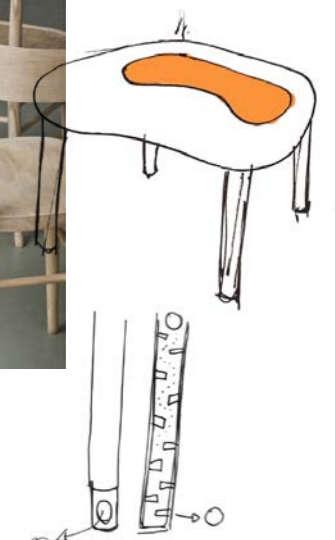
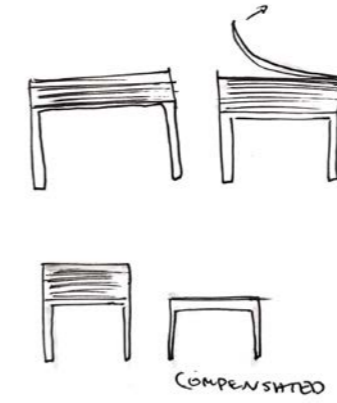
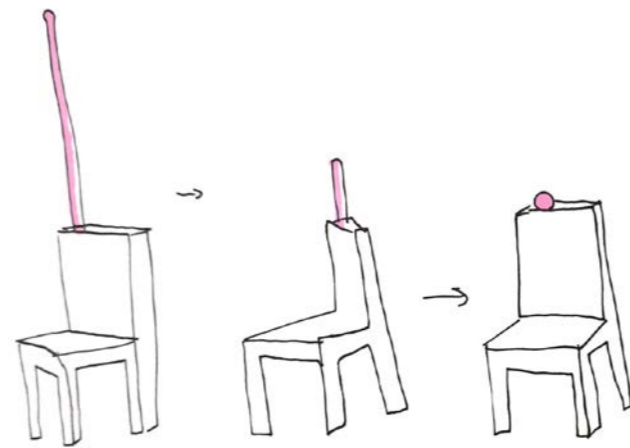
Parts independent and multifunctional.



Logging use until climate neutral.

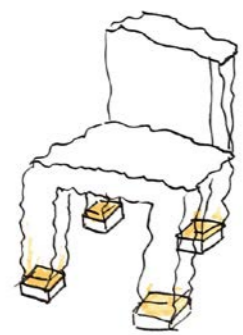


We found the concept of climate neutrality as the most impactful and frankly the most relevant way to nudge users to keep their things longer. By visualising a products life, we would hopefully be able to nudge them into taking better care of their products and create a greater attachment. Also, by visualizing how long you have kept the product you might not be as prone to just throw it out (because of the shared history).

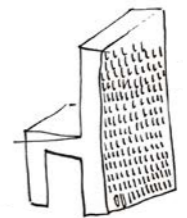
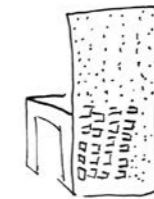
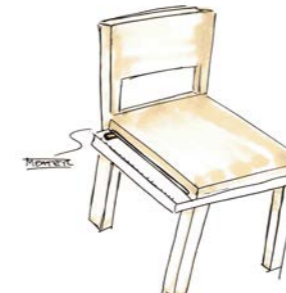
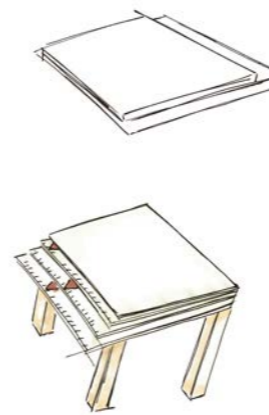
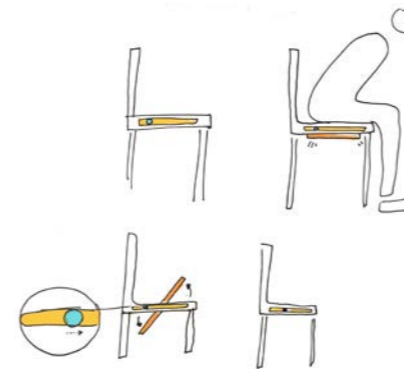


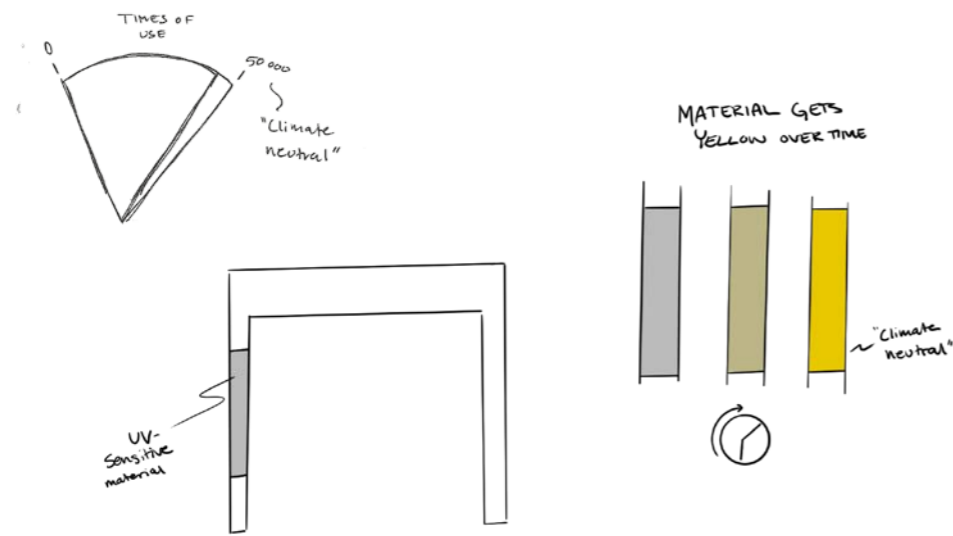
Kula
vänder vid
våge användning

Different ways of visualising countdown until climate neutrality.

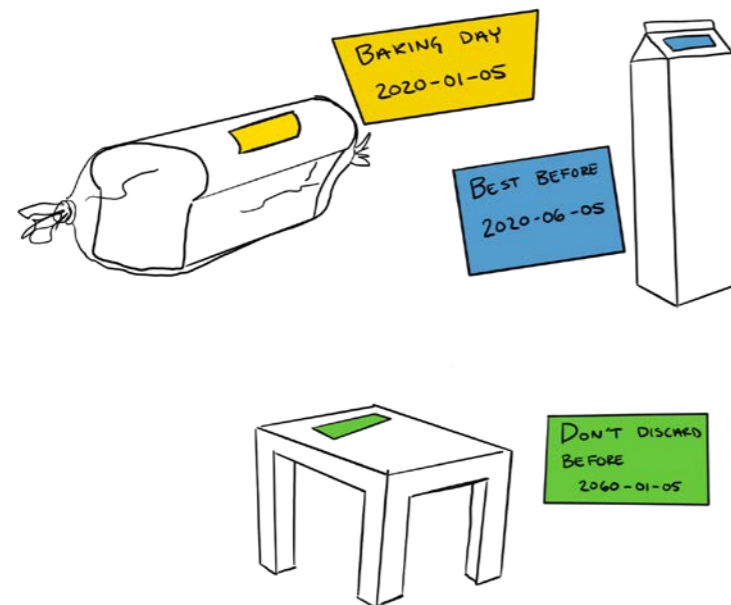


som ligger





After a few discussions we realised how a simple marking could be just as impactful as a physical attribute.



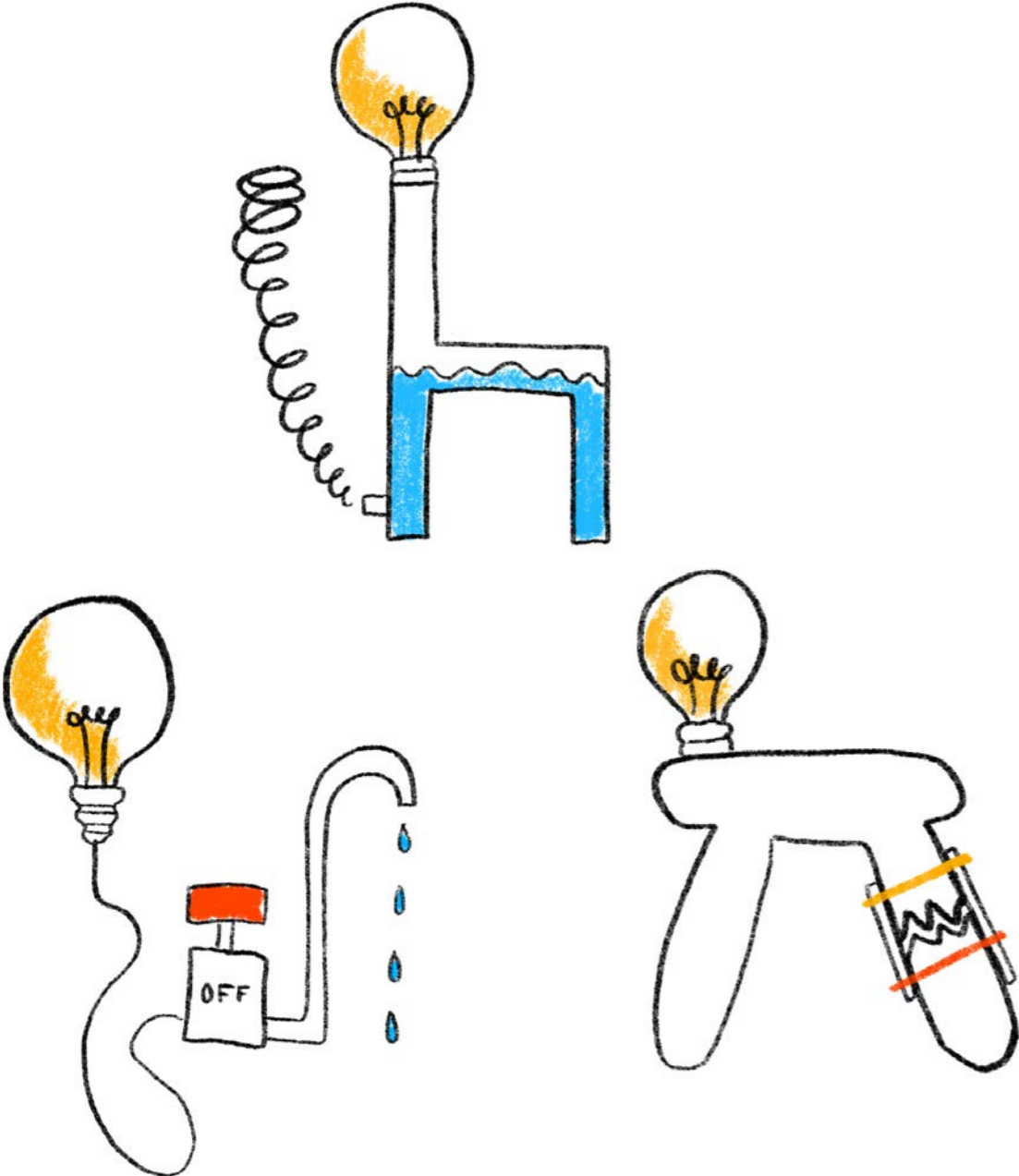
Conclusion

By creating a language for how a product can communicate when it becomes climate neutral we hoped to help the user to understand how long a product will have to be used in order for it to compensate for the resources spent during its manufacturing. If the user knows that he/she will have to keep a product for x amount of years this could hopefully drive them to try to keep it longer (as they have made a commitment in advance), but also by showing that there is history between the two of them hopefully making room for second thoughts. By letting the product visualize when the product has “made up” for the resources used during the manufacturing and also show the “over-time” there would potentially be a way for the user to motivate to keep or discard a product. A way to make them actively take that decision. We are aware that there is no such thing as climate neutral but a product will reach a time when it is defensibly okay to throw it away, and this is what we refer to as the time it has reached “climate neutrality”.

Chapter conclusion

Users need to be able to get direct feedback on the environmental implications of their behavior, they need to see and feel how much energy is being used and feel an urge to change their behavior. By making the consequences of actions physical in a way that you can feel the consequence in your interaction we can increase peoples awareness and nudge them to become more active in their decisions. Through creating a physical reminder that gives a sense of threat and compassion for the product we can make people reflect more over their mindless use. By placing a date on when a product becomes climate neutral from production people will feel an urge to keep their products longer since they have made a commitment and will know the true impact of their consumption.

All the concepts considered in this chapter are representations of ideas based on our findings through research and could continue to consist individually on a merely conceptual level. Nevertheless, we found that our project could gain in both feasibility and applicability by applying the concepts to a product that we interact with often in our everyday lives. The following chapter involves the application of the concepts to a waterkettle.



CHAPTER 3

How we applied our concepts to an actual product - the water kettle.



Why a water kettle?

We have chosen to work with the water kettle since it is a so-called “active” product, where the product requires further input and activation during use. This means that the climate impact of the kettle is not restricted to production and end of life but a major contributor to the carbon footprint is the user phase. For the water kettle the use stage contributes 80% to the environmental impacts. (Gallego Schmid et. al., 2018)

The water kettle has also been a recurring example that we have stumbled upon during our research. One popular example is how there is a need for workers at the national electricity company in the U.K. to watch TV during work hours. The reason for this is that at the moment when a popular tv show ends, they have to rush to buy extra energy from France because everybody in the U.K. turns on their kettle at the same time. (Acaroglu, L. 2013) The main problems with the water kettle is how users continuously overfill it when boiling water, on average 50% more than needed. The extra energy required caused by overfilling kettles in one day in the U.K. is enough energy to light all the streetlights in England for a night. (Acaroglu, L. 2013) Boiling the exact amount of water needed would reduce the environmental impacts of a water kettle by 33% and by using water temperature control this can be lowered further with 2%-5%. Increasing the current average durability of water kettles would reduce environmental impacts with less than 5%. (Gallego Schmid et. al., 2018)

By boiling more water than you need for a single cup of tea the initial carbon footprint goes from 23g to at least 45g (Berners Lee, 2011) and although this might sound as a little change in the environmental impact, when looking at the amount of times the water kettle is used everyday in an average household, and then over a year of use, the impact becomes even greater. This small unnecessary action will amount to large amounts of extra carbon emissions. Taking this and then considering that there are between 117 to 200 million kettles being used in the European Union each year, (Gallego Schmid et. al., 2018) the at first seemingly small impact becomes huge.

For us, the water kettle is a perfect example of a product that is used rather mindlessly and represents an action which the user does not register as having an environmental impact. The water kettle is included in many daily habits in the home environment and has one clear task - heating water - that can be applied in many different situations. The application of our concepts on a water kettle also serves as a good platform in order to exemplify how these concepts can be further applied onto similar products as well.

80%

**of the water kettles carbon footprint
comes from the use stage**

System demands

Volume (water container). Heating device. Energy input (cord). Handle. Spout.



Task demands

- Heat water (for coffee, cooking, tea and so on).
- Pour in water
- Pour out water - precision
- Keep heat
- Turn off when done
- Don't boil if kettle is empty of water

User demands

- Presence.
- Awareness.
- Choosing the amount.
- Choosing a low temperature setting.
- Turn on.

Function Analysis

			Comment
Heat	Water	MF	
Visualise	Resource use	N	
Pour	Water	N	
Pour	Accurately	N	
Require	User presence	N	
Inform	When climate neutral	N	Should be done through a clear marking on the product and its package
Show	Resource use	N	
Turn off	When done	N	
Include	Consequence for mindless use	D	When used wrongly or extensively the user should be prompted with information about this
Include	Resistance / warning	D	
Be controlled	Through two steps	D	
Nudge	To lower resource use	D	By making a easy and fair default setting
Nudge	User to make a commitment	D	
Call	Attention to ongoing resource use	D	Informing the user about the user's resource use. Connect to the user emotionally.

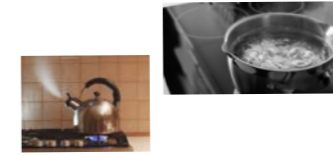
MF = Main function
 N = Necessary
 D = Desired

Benchmarking

A benchmarking of water kettles on the market today was carried out, looking into the level of tech and possibility to regulate the different settings included into the kettles. This gave us an insight into the current water kettle market and how our design could fill a gap that is yet to be represented.



"Low tech" - lack of user control



Requires a separate stove



No indication of volume / difficulty to discern the volume when filling kettle one setting - on and off



More clear indications of volume, still only one setting

Same as before, now with flashy lights to indicate use.



Indications of temperature easy for the user to read



Allows the user to choose temperature of water



Indicates choices made through displays and lights

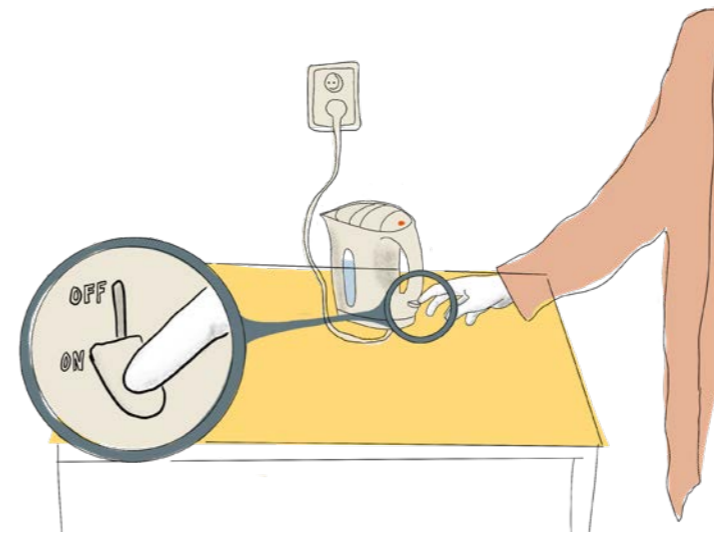
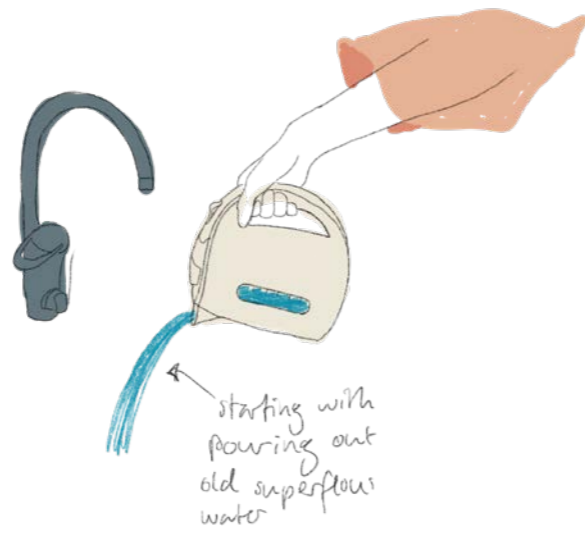


Allows remote control with the help of an app, controlling setting timers and temperatures

"Hi-tech" - high user control

Current Scenario

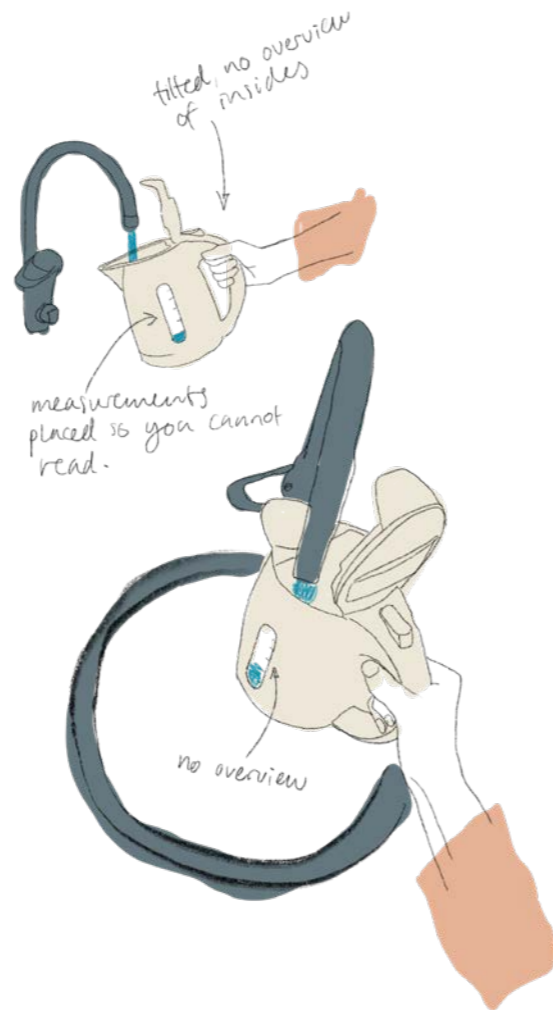
- the process of boiling water



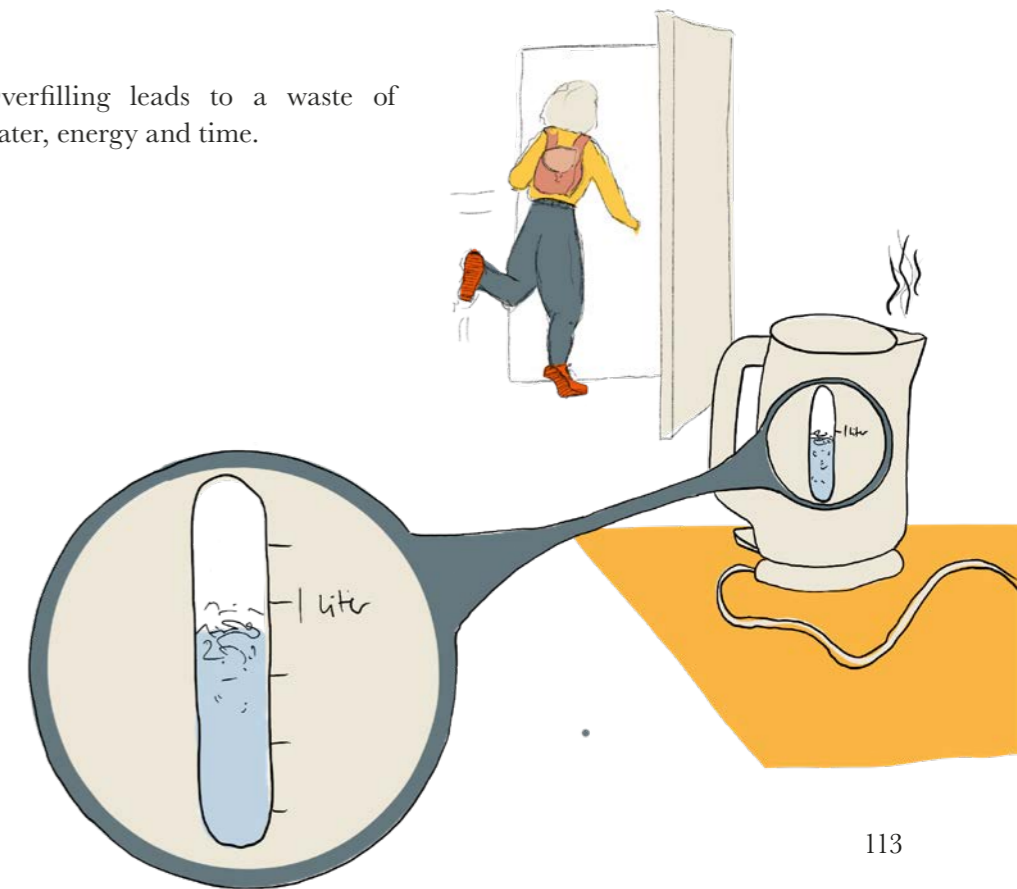
The most sold kettles only have one temperature setting (100 degrees). In a stressed situation this can be problematic.



Overfilling leads to a waste of water, energy and time.



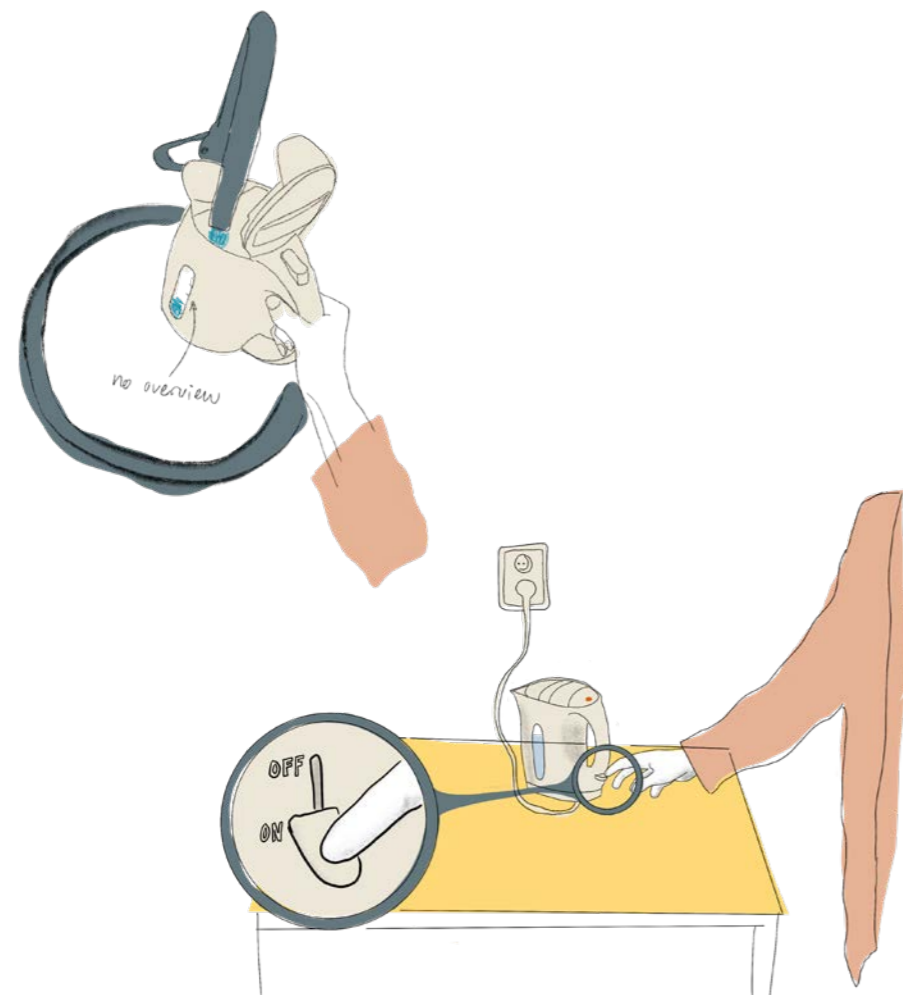
Currently filling the kettle with water requires little to no presence from the user, and if not looking at the markings the kettle is overfilled more often than not, especially in a stressed situation.



Regulators on a water kettle

From the previous investigations of the regulators we could distill a few major aspects that we see as requirements for the regulators.

- Focus and presence is needed from the user
- A clear understanding of the correlation between use and resource consumption
- Default settings are the most environmentally friendly - off as a default setting
- Resistance should be felt when used wrongly and/or extensive use
- Two step control



A water kettle is in need of three regulators - on/off, water volume and heating temperature. We have decided to work with water volume as a separate control and heating and on off as a combined solution, in order to increase awareness in the users decision of heat, and make the user choice active.

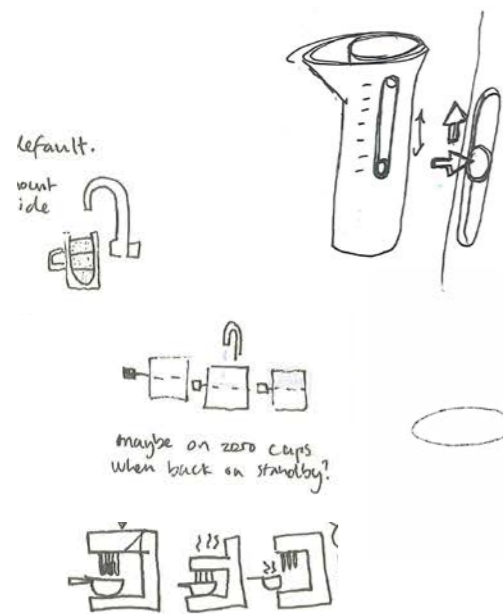
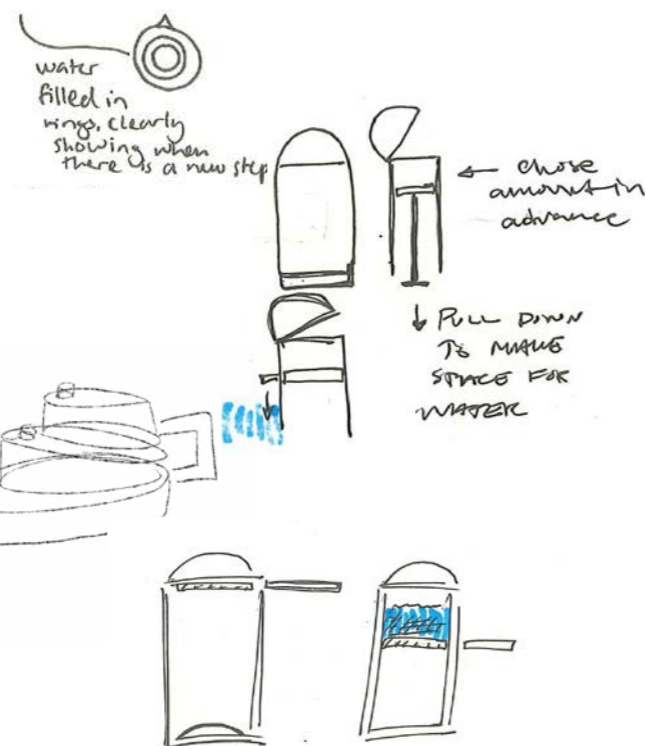
Controlling water volume

How can we create conditions where only a specific chosen water volume will be boiled?

The minimum amount of water to be boiled was decided on as 2,5dl as this represents one cup or glass of water, sufficient for a cup of tea. By making one cup the default setting the tendency to overflow will be limited. Although options involving outsourcing volume settings to the tap or having a heater that could be used on different vessels were discussed we quite quickly found that our solution would lie in changing the volume capacity of the kettle. By changing the capacity of the kettle in accordance to the selected volume settings it would be impossible to overflow it and the user will become clearly aware on when to stop filling.

How can we create a vessel that can change volume and expand/minimize in accordance to the users needs?

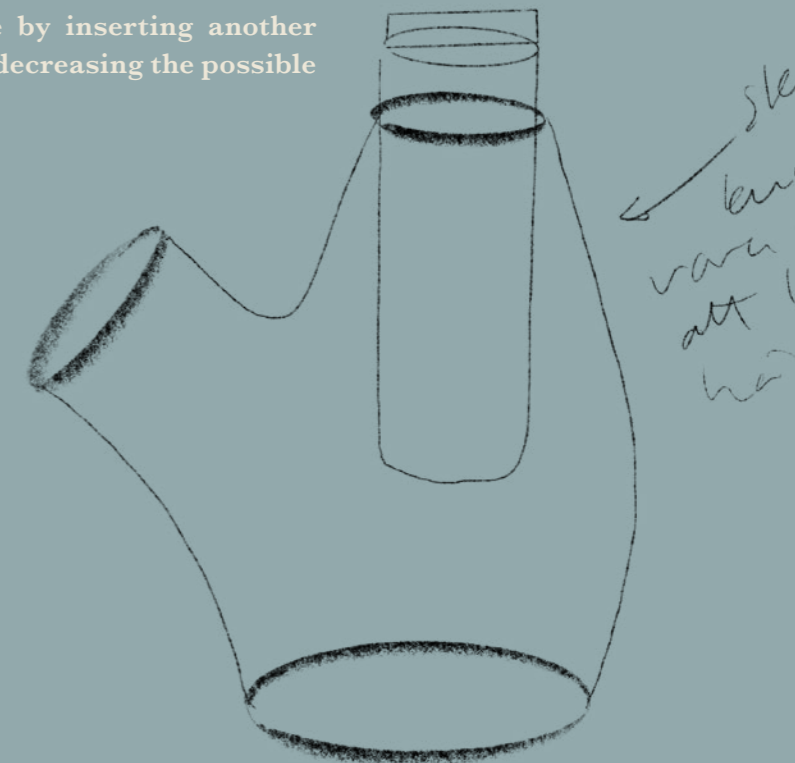
Our initial inspiration for changing the inner volume of the kettle was drawn from the classic french coffee-press.



The man in the tub



Our own eureka moment was found with the realisation of how we did not have to technically find a way to expand the insides of the vessel itself, but could in similarity to Archimedes himself, decrease the amount of water in the kettle by inserting another body in the water and decreasing the possible volume.



Sketches on how to regulate water volume by lowering a second volume into it.



Definition of function

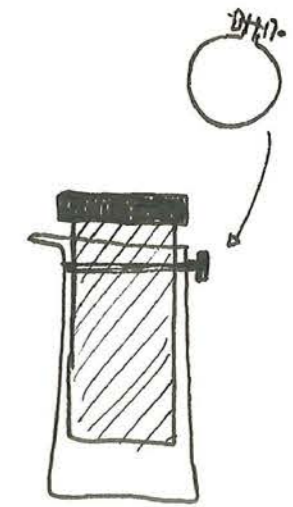
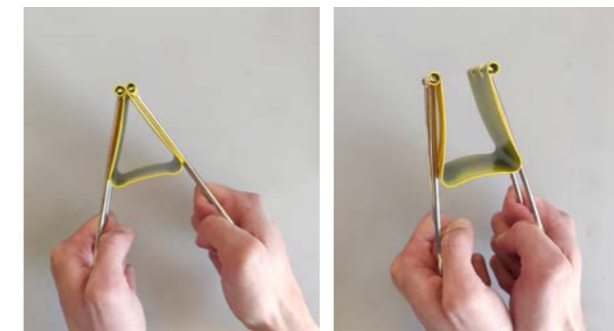
Body



The concept chosen was to have a vessel that has a cylindrical shape and a cylindrical body that can slide within this shape, with a cut out through which the kettle can be filled and from which the water can be poured. The shape will be kept fairly simple in order to ease cleaning.

Locking mechanism

The solution for fastening and moving this body is based on a simple tightening mechanism. The cylindrical body will be held in place in an unactivated state and when a button is pushed the gripping arms will release allowing the body to be moved in a two step interaction requiring focus from the user



Volume measurement

The amount will be shown by lines that have indents indicating how much water the setting is on. The indications will be both in dl and cups in order to get a quick understanding of how much water is required. This acts as a replacement for the classic measure on the side.

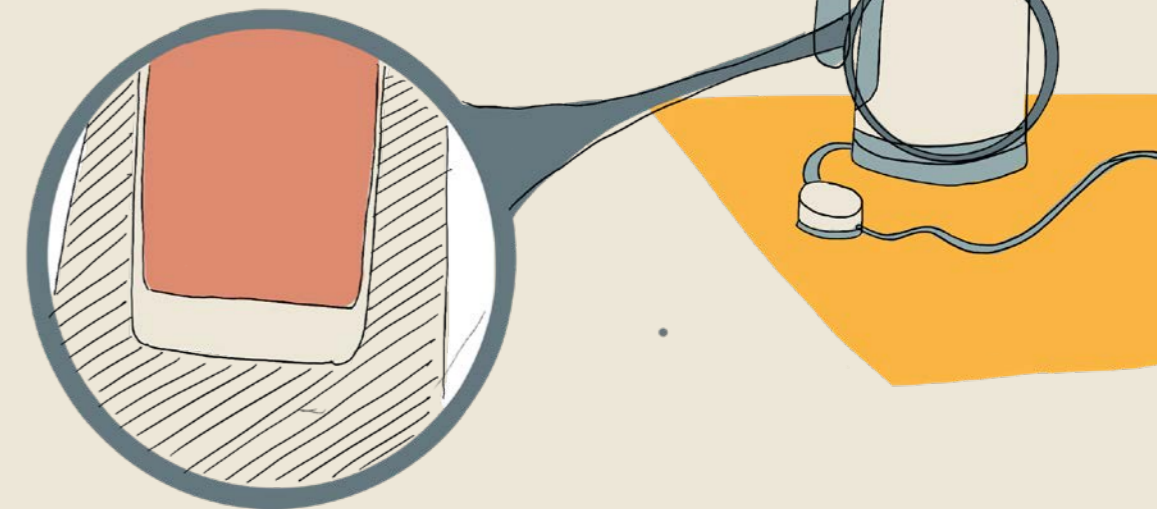
New scenario



The new scenario allows the user to make an active choice on how much water should be allowed into the container. Where the default setting is 1 cup.



Since the volume is decided in advance, the kettle will stop filling at a certain level, provoking a pause and awareness in the user behavior. Since the kettle is not overfilled there will no longer be any leftover waste water. This also helps the container to stay clean for a longer time frame.



Controlling temperature and switching on and off

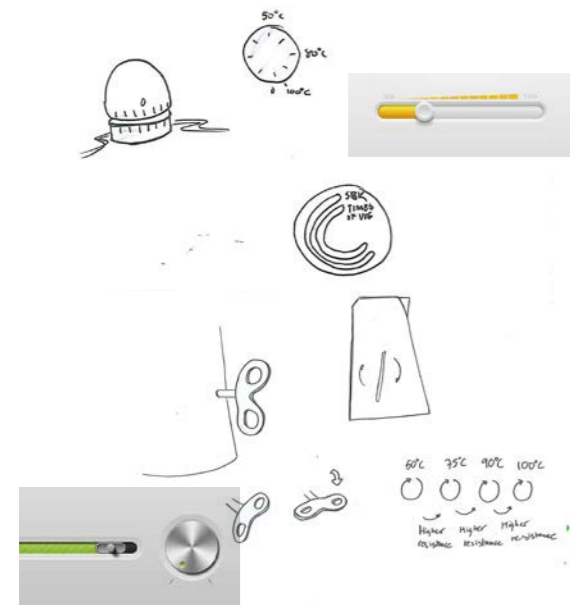
When heating water in a water kettle we do not always want it at a hard boil (100 degrees celsius). When making tea different lower temperatures are required, as well as the optimum temperature for making coffee.

Heating water at a lower temperature will also require less energy, and require less time.

How can we make a low temperature the preferred setting? How can we ensure that the user has to make a deliberate decision when choosing a higher temperature and how can we build physical resistance towards more energy intensive activities into the regulator?

This particular investigation was heavily informed by the findings in the earlier stage. Focus was primarily placed on increasing tension as the switch was moved further away from the default setting and a need for precision in order for the dial not to slide back into its original state.

Increased resistance



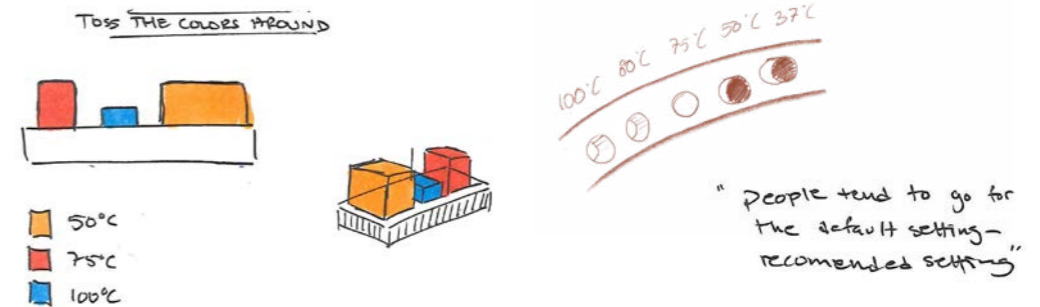
Focus and precision



Correlation of use and money - curve

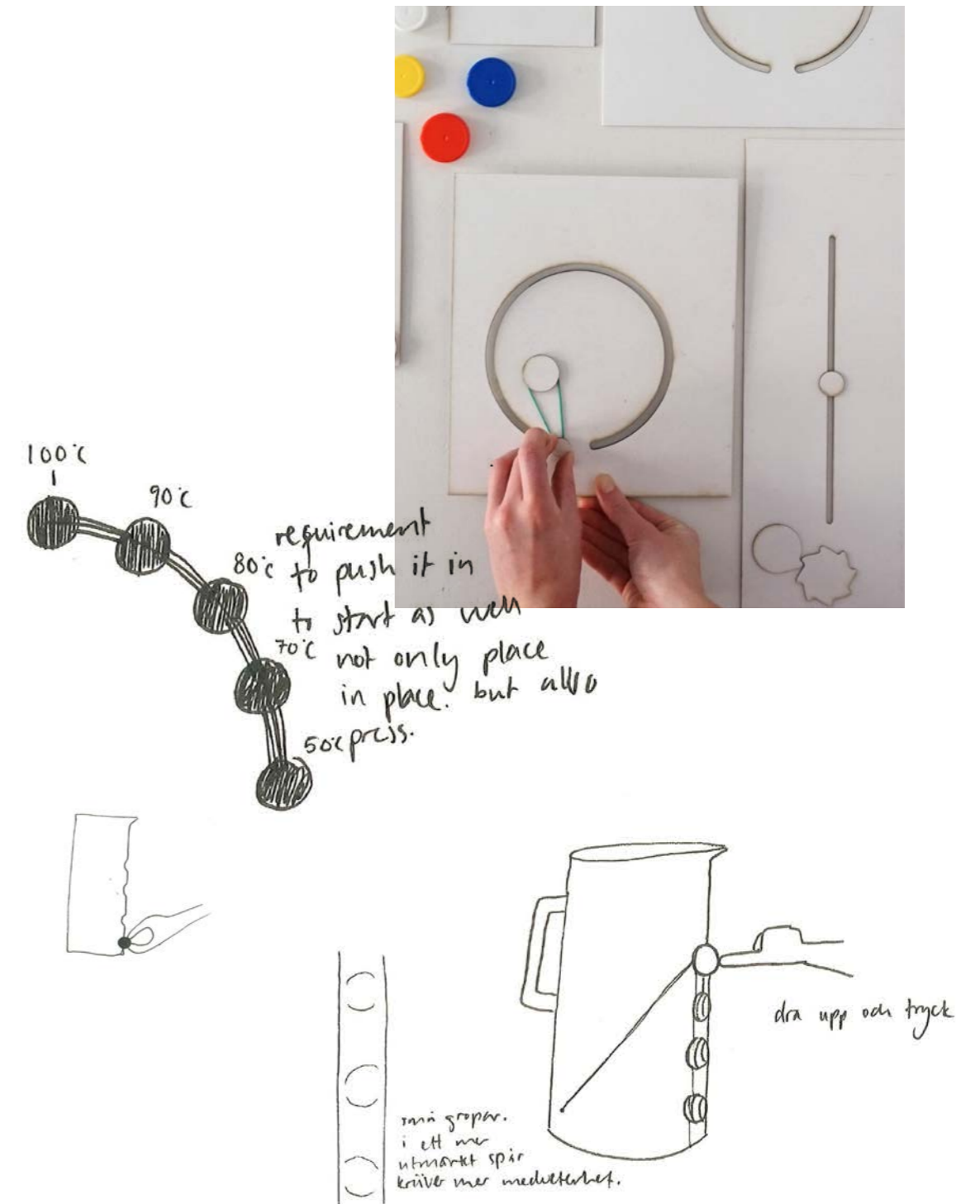


Making it hard to reach



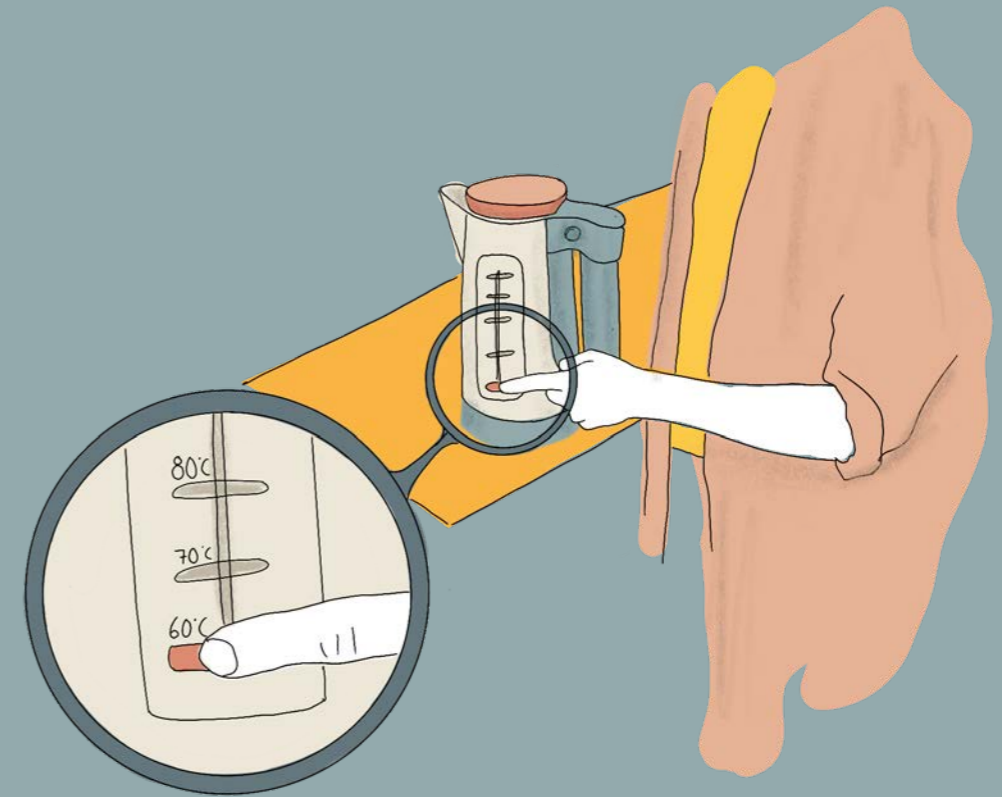
Definition of function

The conclusion we reached was a combination of precision and resistance. The controlling of temperature is carried out by moving a knob along a slide with increasing resistance corresponding to increasing temperature setting. If the knob is released it will slide back to its default setting (the lowest temperature). In order to choose a temperature the knob has to be slid to the right position and then pushed into a slot with precision. When the knob is placed in a slot the kettle will start heating the water. Once the water has reached its goal temperature it will pop out of the slot and return to its initial state.



New scenario

Default setting: A comfortable 60 degrees celsius



Calling attention to the impact of use

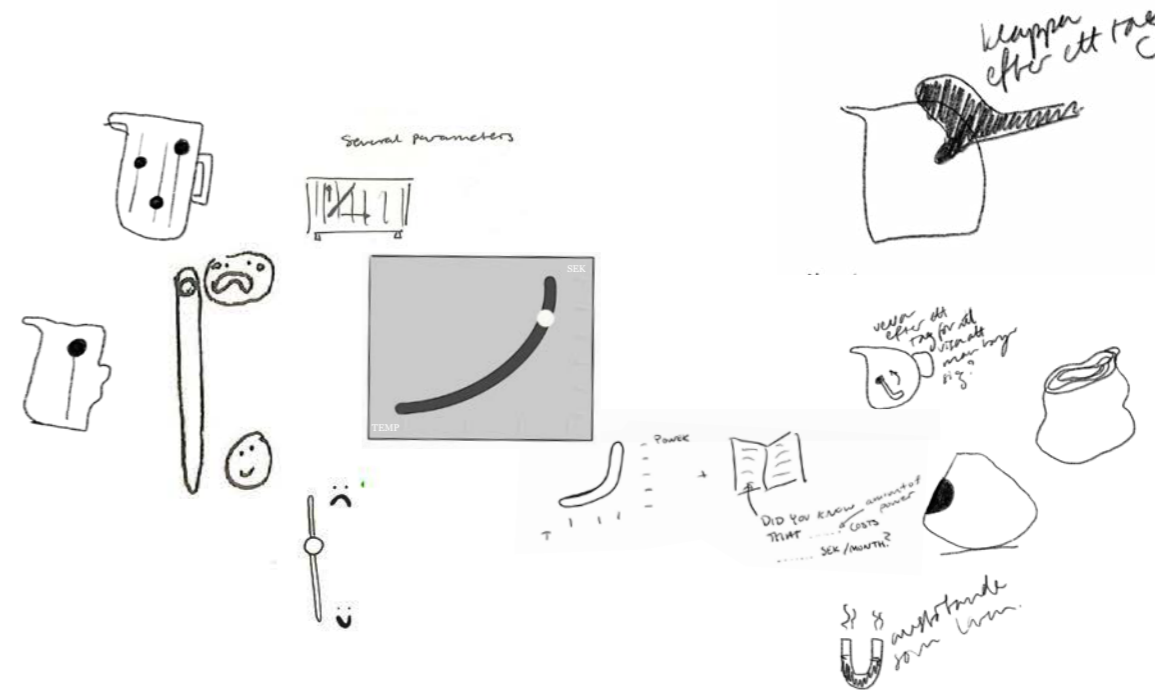
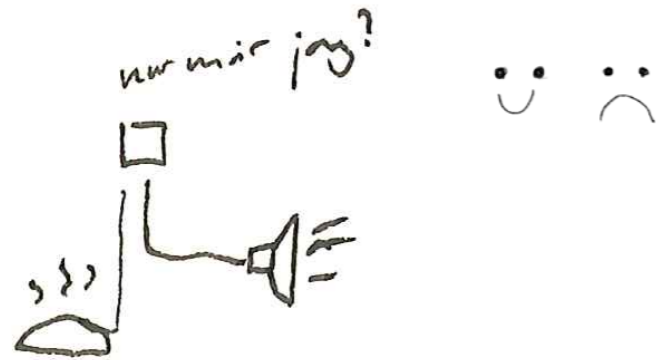
Our previous research phases helped us define the following requirements for this concept:

- Visualize what you don't see
- Showing ongoing resource use (energy)
- Including a consequence for mindless use
- Provide immediate and long-term feedback
- Appealing to emotion in order to act in affect

Mindless use often comes from habit, using resources we cannot see or feel, and with nothing giving us feedback on our use we carry on repeating the same actions over and over. If we are given feedback, we have the opportunity to change our behavior to the better. We also want to find a way to give ongoing feedback on the impacts of use without desensitising users to the message. A solution to this could be to connect the state of the kettle to its possibilities to perform. One of our major findings is how affect is a great trigger for action. If we feel for our products and can sense that they are stressed in another way than through figures and numbers, maybe we are more prone to treat them well and use them in a less extensive way.

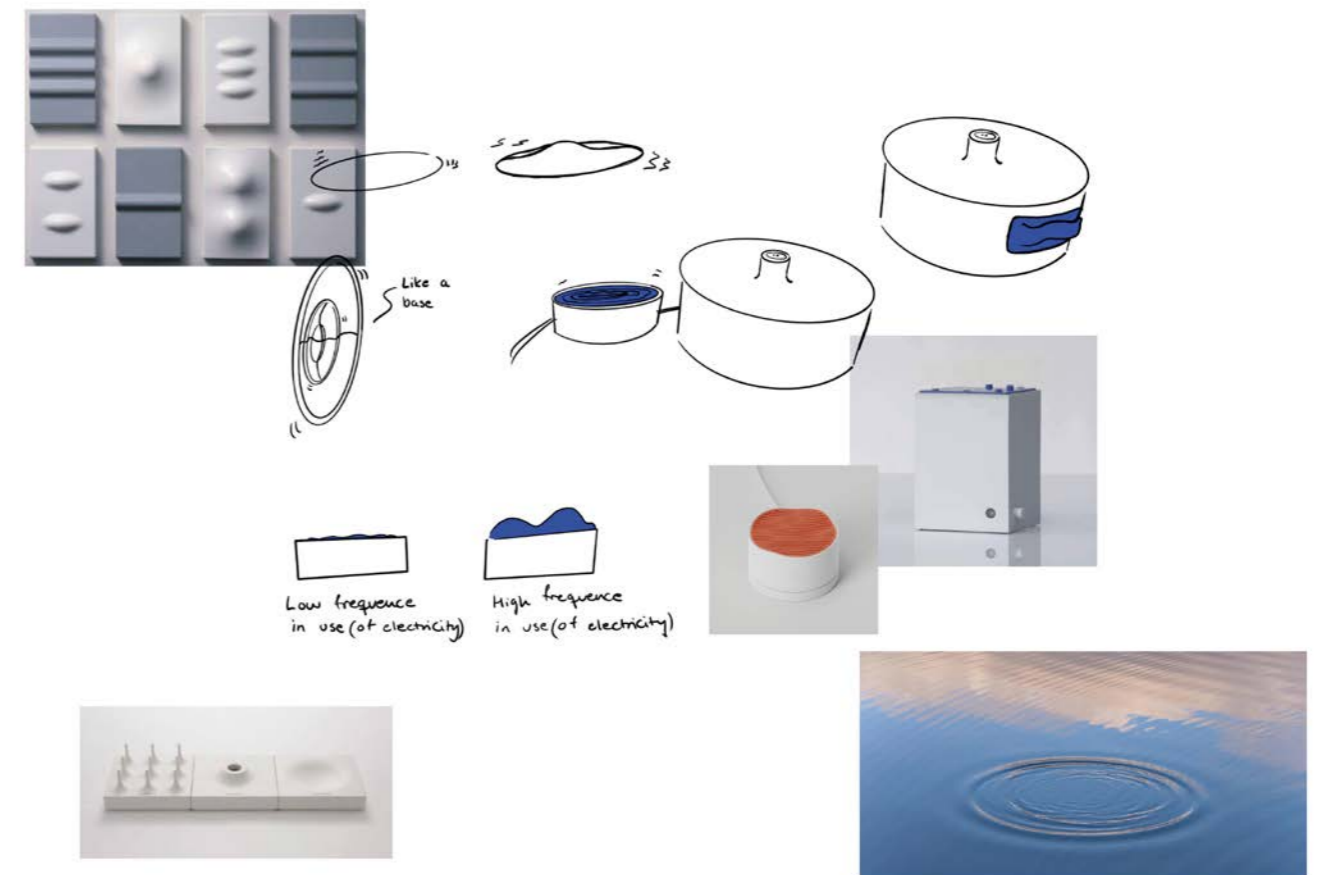
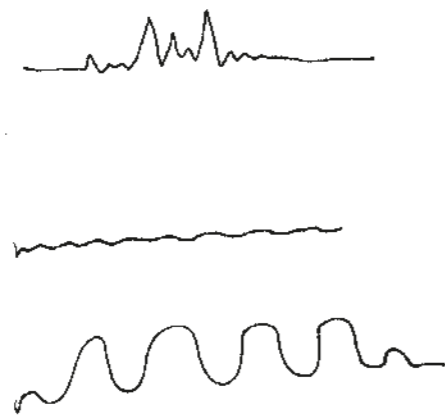


Soothing the product



Definition of function

The strategy we decided to continue with in order to call attention to the impacts of use was the idea of nervous jitters as a sign of anxiety and stress. The shaky movements increasing and decreasing in intensity dependent on use are intended to communicate the “stress” the product feels, with the intention to cause an inner stress and empathy from the user. By moving the information from a “dead” monitor to a moving medium we also want to prevent ignorance, by the visual impact of the pulsing movements calling for the user’s attention. The user is encouraged to sooth the product with the help of its own use. Extensive negative use will lead to the product collapsing for a short while in need of recovery. This will affect the product’s ability to perform and might mean that it cannot boil water at a certain temperature or volume. It might even mean that it stops working for a set period of time.



Marking the “end”- date

We wanted to create a system for labeling the product so that the user can identify the date for “climate-neutrality”, helping them make an active commitment in advance. A marking of a date when the product will have reached climate neutrality can be an important tool for customers to not get lost in the jungle of labels and hard-to-grasp markings. We are aware that there is nothing like a carbon neutral product or a date that will allow the product to reach carbon neutrality but we are willing to argue that there will be a day in the product’s life when it will be defensible to discard. This is the date we will try to identify and visualise, through a marking, to the user.

The analysis of the carbon footprint of the product will be based on the information available from the Delft University of Technology’s Idemat 2015 Excel database and the report Life cycle environmental evaluation of kettles: Recommendations for the development of eco-design regulations in the European Union done for the University of Manchester, UK, in 2017. There will be certain assumptions made by us during the gathering and the analysis of the information. For this model to be fully accurate we will need more time to do more extensive research on the exact manufacturing processes required for each product. What is shown in this part is a general calculation of a common plastic water kettle, globally used, that has been presented and specified in the report mentioned above.

We see this marking as being introduced to the market through legislation, much like the current CE marking for electrical appliances which is a requirement in order for it to be sold in the EU. The marking will be a way for governments and organisations to put pressure on the producers to create sustainable products and supply the consumers with valuable information.

What is the Idemat 2015 Excel database?

The Delft University of Technology’s Idemat 2015 Excel database is a part of the “The Model of the Eco-costs / Value Ratio” (EVR) and provides data on eco-costs, carbon footprint and other information about production and manufacturing processes.



We looked at some existing product and how they are market with standards and labels.

Produced in a certain way. You’ll have to read up on what this involves.

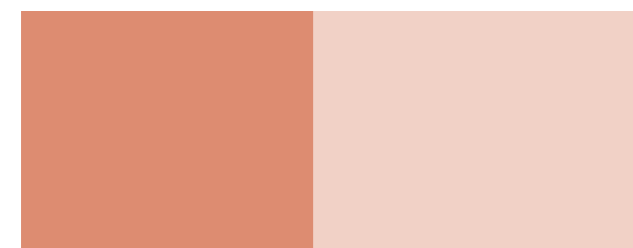


Can be used for 12 months after opened

Initially we looked into what kinds of labels there are on products today, and how they inform us of what they stand for. How can we create a label that contains the information you need without requiring too much research on the consumers part? The subject of greenwashing and climate compensation also arose, on how certain labels visually communicate a more sustainable product to the consumer that might not have a positive environmental impact.

There is no such thing as carbon neutrality, but there is a way to compromise

Today about 12% of the average Swede's carbon footprint is due to consumption of appliances and furniture within the home (Naturvårdsverket, 2017). Considering this around 6 % of the total consumption is estimated to be dedicated to electronic appliances and other gadgets. Further, the goal for a sustainable society is 0,7 - 1,5 ton CO₂ per capita per year which involves everything from transport, to living and consumption. (Naturvårdsverket, 2018) We have made the estimation that each person then has between 42 - 90 kg (0,042 - 0,09 tons) of CO₂e. If we estimate that each person has around 150 products within this category we can estimate that the maximum yearly CO₂ budget for each thing is 0,3 kg (0,042/150 = 0,00028 ton). This can then help us evaluate how long the user needs to keep a product in order for it to 'only consume' 0,3 kg of CO₂e a year.

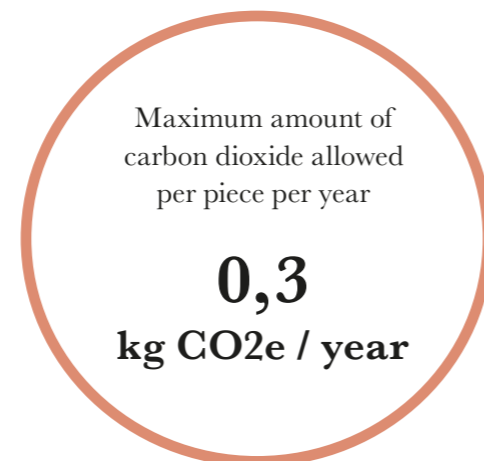


0,7 - 1,5
ton CO₂e / year
Sustainable average



0,042-0,09
ton CO₂e / year

Equivalent amount dedicated to consumption of home electronics and other appliances and gadgets



Maximum amount of carbon dioxide allowed per piece per year

0,3
kg CO₂e / year

Calculating the “end”- date

By using information about the components used in the water kettle (their weight, material and manufacturing method) as well as information about carbon footprint via the Idemat database we put together a model of how to evaluate the amount of carbon required in the production stage. Because we want this marking to be ingrained in the product during the manufacturing phase we have chosen not to include the transportation costs in carbon dioxide, as it will fully depend on where the product is purchased and initially produced.

In evaluating when the product has reached “climate neutrality” we have to make a few assumptions but will try to use research and information to validate these. A long process of investigation will be needed to make this fully accurate.

The model of evaluation

This example shows a commonly used kettle with plastic exterior sold globally.

Product Name	System Boundaries		Functional Unit		
Water Kettle (Plastic)	Materials - manufacturing - transport - disposal Not included Impact of use		Total impact		
	AMOUNT	UNIT	IDEMAT	UNIT	TOTAL KG CO2e
Materials (includes impact of material when disposed in landfill)					
Stainless Steel	0,248	Kg	8,08	KG CO2 / KG	2,00384
Brass	0,027	Kg	2,87	KG CO2 / KG	0,07749
Copper	0,02	Kg	3,00	KG CO2 / KG	0,06
Polypropylene (PP)	0,467	Kg	2,04	KG CO2 / KG	0,95268
Polyvinyl chloride	0,058	Kg	2,10	KG CO2 / KG	0,1218
Nylon	0,066	Kg	8,24	KG CO2 / KG	0,54384
Polyoxymethylene (POM)	0,013	Kg	3,32	KG CO2 / KG	0,04316
Polycarbonate	0,009	Kg	8,11	KG CO2 / KG	0,07299
Acrylonitrile butadiene styrene	0,04	Kg	3,96	KG CO2 / KG	0,1584
Silicone	0,016	Kg	8,15	KG CO2 / KG	0,1304
					4,2
Manufacturing					
Injection moulding					
Polypropylene (PP)	0,467	Kg	1,364	KG CO2 / KG	0,6
Polyvinyl chloride (PVC)	0,058	Kg	0,3784	KG CO2 / KG	0,2
Nylon	0,066	Kg	0,3946	KG CO2 / KG	0,0
Polyoxymethylene (POM)	0,013	Kg	1,1319	KG CO2 / KG	0,0
Polycarbonate (PC)	0,009	Kg	0,3869	KG CO2 / KG	0,0
Acrylonitrile butadiene styrene (ABS)	0,04	Kg	1,3163	KG CO2 / KG	0,1
Silicone	0,016	Kg	0,9411	KG CO2 / KG	0,0
Metal stamping (deep drawing)					
Stainless steel	0,248	Kg	0,5	KG CO2 / KG	0,1
Metal rolling					
Brass	0,027	Kg	0,2	KG CO2 / KG	0,0
Copper	0,02	Kg	0,27	KG CO2 / KG	0,0
					1,1
Total Impact/Lifetime					5,27
Lifetime	17,6	Years			
Total Impact / year	0,30				

Material	Amount		KG CO2 / KG material, sourced from IdeMat	Total amount of KG CO2 for a spec. material
Materials (includes impact of material when disposed in landfill)				
Stainless Steel	0,248	Kg	8,08	2,00384
Brass	0,027	Kg	2,87	0,07749
Copper	0,02	Kg	3,00	0,06
Polypropylene (PP)	0,467	Kg	2,04	0,95268
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Polyoxymethylene (POM)	0,013	Kg	3,32	0,04316
Polycarbonate	0,009	Kg	8,11	0,07299
Acrylonitrile butadiene styrene	0,04	Kg	3,96	0,1584
Silicone	0,016	Kg	8,15	0,1304
				4,2

Total amount of KG CO2

Manufacturing Process			KG CO2 / KG material, sourced from IdeMat	
Manufacturing				
Injection moulding				
Polypropylene (PP)	0,467	Kg	1,364	0,6
Polyvinyl chloride (PVC)	0,058	Kg	0,3784	0,2
Nylon	0,066	Kg	0,3946	0,0
Polyoxymethylene (POM)	0,013	Kg	1,1319	0,0
Polycarbonate (PC)	0,009	Kg	0,3869	0,0
Acrylonitrile butadiene styrene (ABS)	0,04	Kg	1,3163	0,1
Silicone	0,016	Kg	0,9411	0,0
Metal stamping (deep drawing)				
Stainless steel	0,248	Kg	0,5	0,1
Metal rolling				
Brass	0,027	Kg	0,2	0,0
Copper	0,02	Kg	0,27	0,0

				Total Impact/Lifetime	5,27
Lifetime	17,6	Years			
Total Impact / year	0,30				

Total amount (kg) of CO2 per year

Total amount (kg) of CO2

Comparing different products - how does this work in practice?

Navigating through all the different labels and markings in a store can be difficult and confusing. How do you weight short freight against ecologically produced and what does the labels actually mean in practice? By placing a date for climate neutrality on the product we hope to help the user to make comparisons between products more easily and make decisions they feel confident about.



An example scenario

A customer walks into a store to buy a coffee maker. She sees two competing companies' products. One of them is clearly saying that you will need to keep it until the year of 2060 (40 years from today) in order for it to compensate for the amount of carbon used during its production. The other coffee maker is marked with the date 2080 meaning the consumer will have to keep it for 60 years in order to reach the same result. In this situation the customer might have another method of comparison that they can

weigh together with the price in their purchase. 60 years of use might seem way too long to commit to and therefore the user will choose to buy the other product making a commitment of keeping it for 40 years.

The companies selling the product will have to take more responsibility for the manufacturing and material use in order for them to put a lower number of years the customer has to commit to on their products.

The benefits of a marking

This marking will be a tool for consumers to compare and assess different products, based on facts about their carbon footprint.

This will eliminate green washing attempts from the company side and make the carbon footprint of each product more tangible and visual to the consumer. The marking can also work as an incentive for companies and producers to reassess their manufacturing and material use in order for them to communicate a responsible and sustainable option for the user. The options and information, supplied by the company, about recycling will also have an effect on the "end"-date.

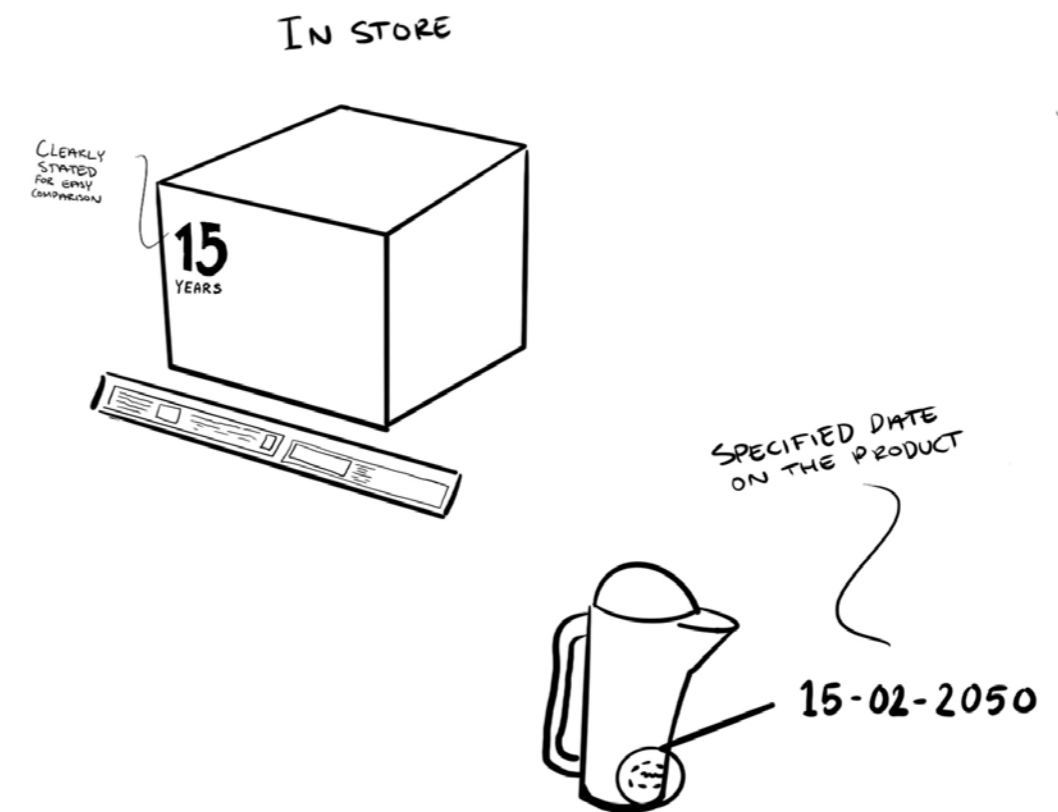


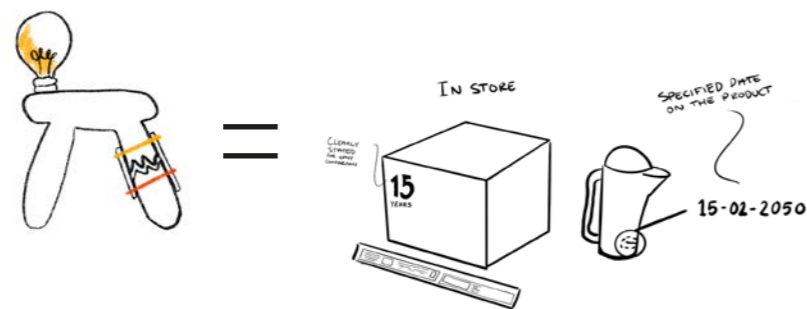
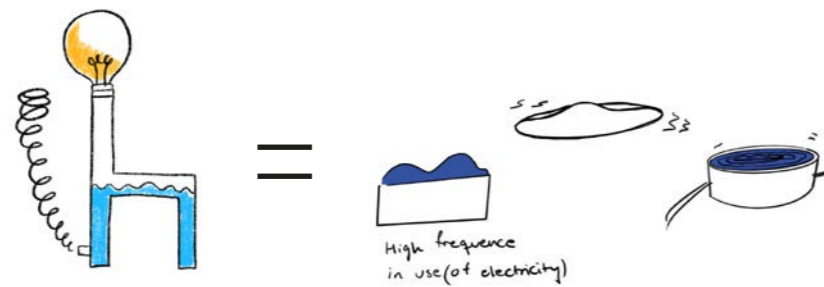
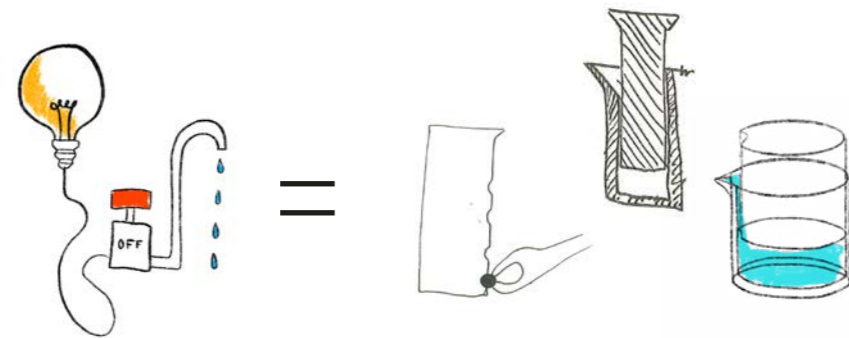
A simple comparison

Standard plastic: **17,6 years**
(Total impact: 5,27 kg CO₂e)

Standard stainless steel: **26 years**
(Total impact: 7,73 kg CO₂e)

Stainless steel closed loop recycling: **13,6 years**
(Total impact: 4,04 kg CO₂e)





Conclusions

The conclusions from this part of the process is that the heat settings of the kettle will be adjusted with the help of a knob that is moved up for increased heat and placed in place at the selected temperature. As the knob is moved higher up the resistance in the movement increases, making the user aware of that a higher temperature has a higher impact.

In order to limit the amount of water the lid of the kettle prevents the kettle from being filled more than selected. The uncomfortable height will also nudge the user to place it at the lowest setting, a mere 2,5dl which corresponds to a single cup. The adjustment is made through the press of a button and a manual movement of the lid to the required height.

The visualisation of use is carried out with the help of a moving piece connected to the kettle whose movements correspond to the energy use of the kettle. This will signalise that the kettle is stressed or being used in a positive way.

A marking in the material of the kettle will signalise for how long it is needed for it to be used before it has become "climate neutral" from production. This is accompanied by a marking on the packaging as well that gives a more direct indication, in the form of the amount of years it is required to be used. This will also help users to compare products with each other to find the most sustainable one.

The following chapter will go into the detailing and shaping of these concepts, as well as the final kettle design.

CHAPTER 4

Form iterations and finalising the design



Finding shape



playful



soft and sharp

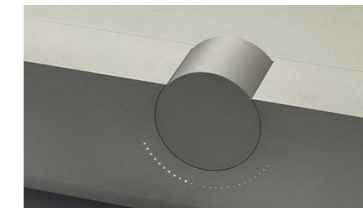


geometric



minimalistic

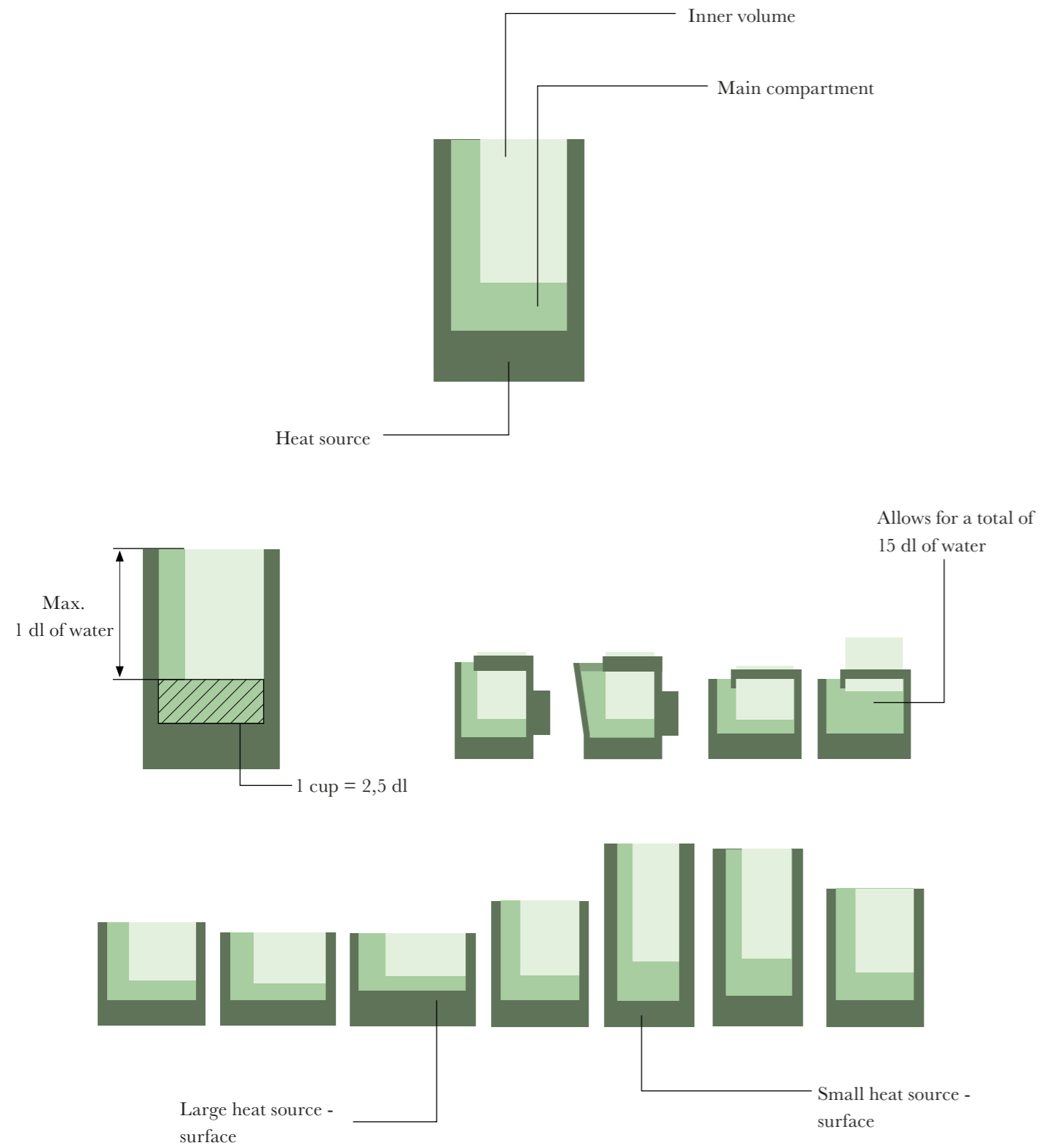
clean



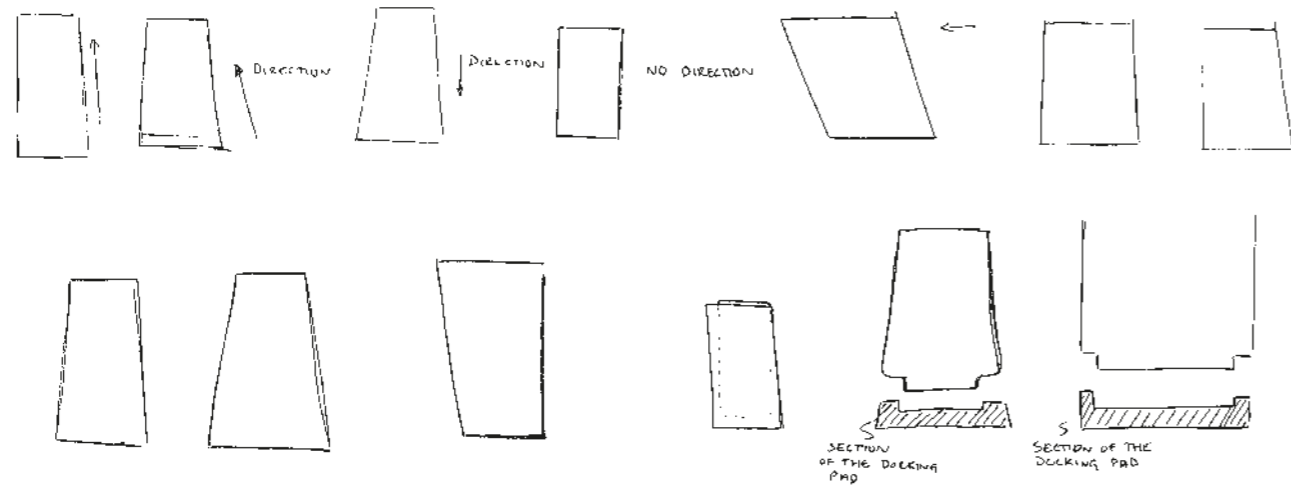
We want to give the kettle a calm expression with the help of minimalistic shapes. By keeping it clean we can allow for the different functions to stand out without the feeling of the kettle becoming cluttered.

The use should be intuitive and clear, with simple shapes these functions will stand out from the main body and give the user clear directions.

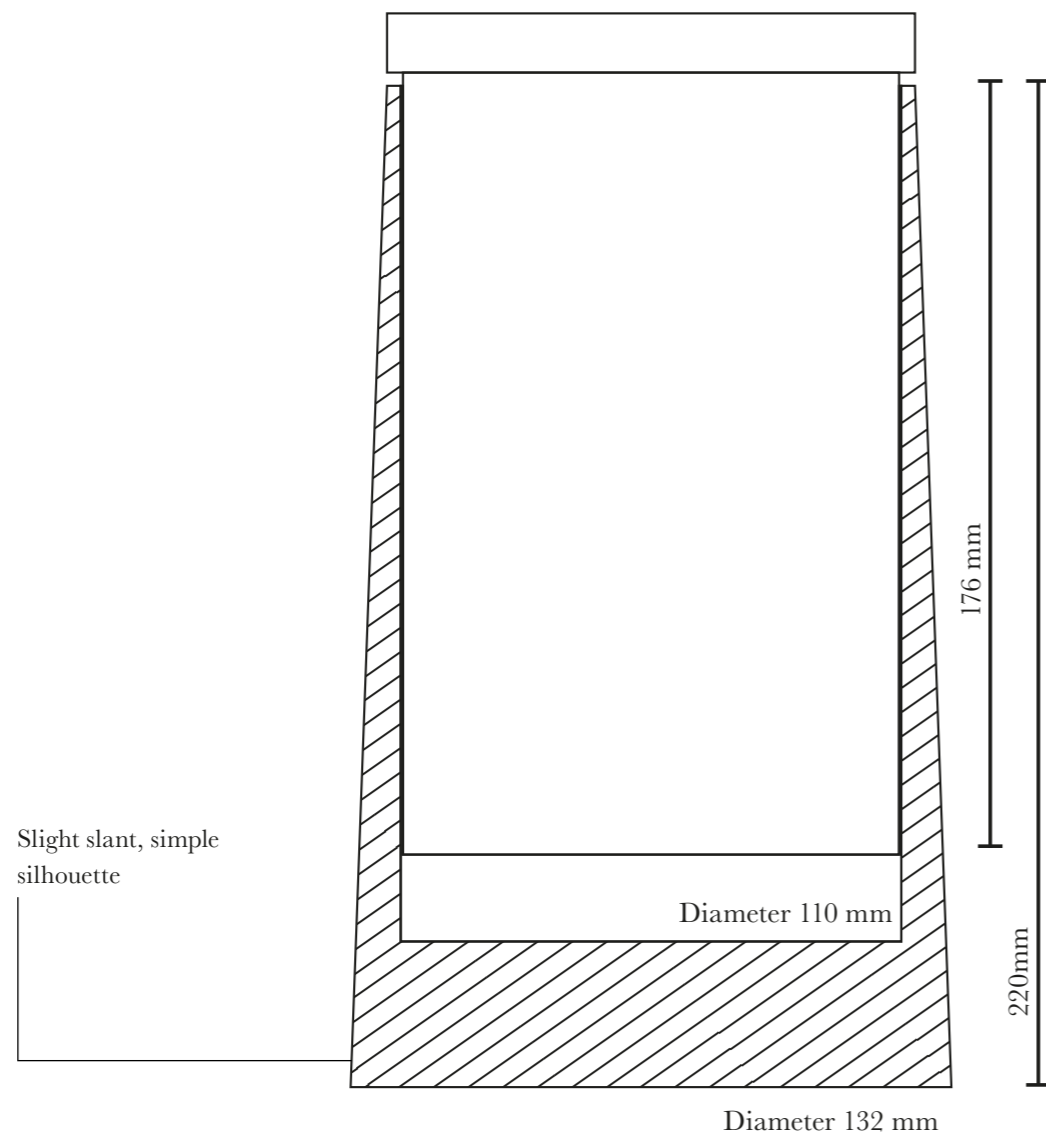
Trying out volumes



The shape of the body was set through a series of explorations to a slightly conical cylindrical shape. Within this main body a second cylindrical body is placed. In the process of deciding on measurements the total volume of 1.5 litres of water was considered, as well as that the cavity in the second cylinder could maximum hold 1 dl of water. The size of the cavity proved important in the selection process as it determined with what ease the kettle can be filled with water. As well as the surface area contact with the heating unit.



Final dimensions of inner volume and water kettle body



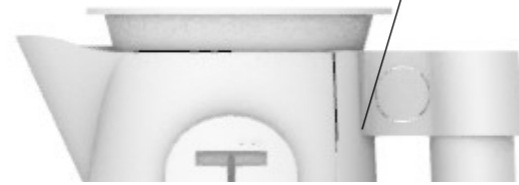
Water controller



Overhang for grabbing and lifting the volume



Conic helps the shape signal it'll stop at a certain level much like a cork

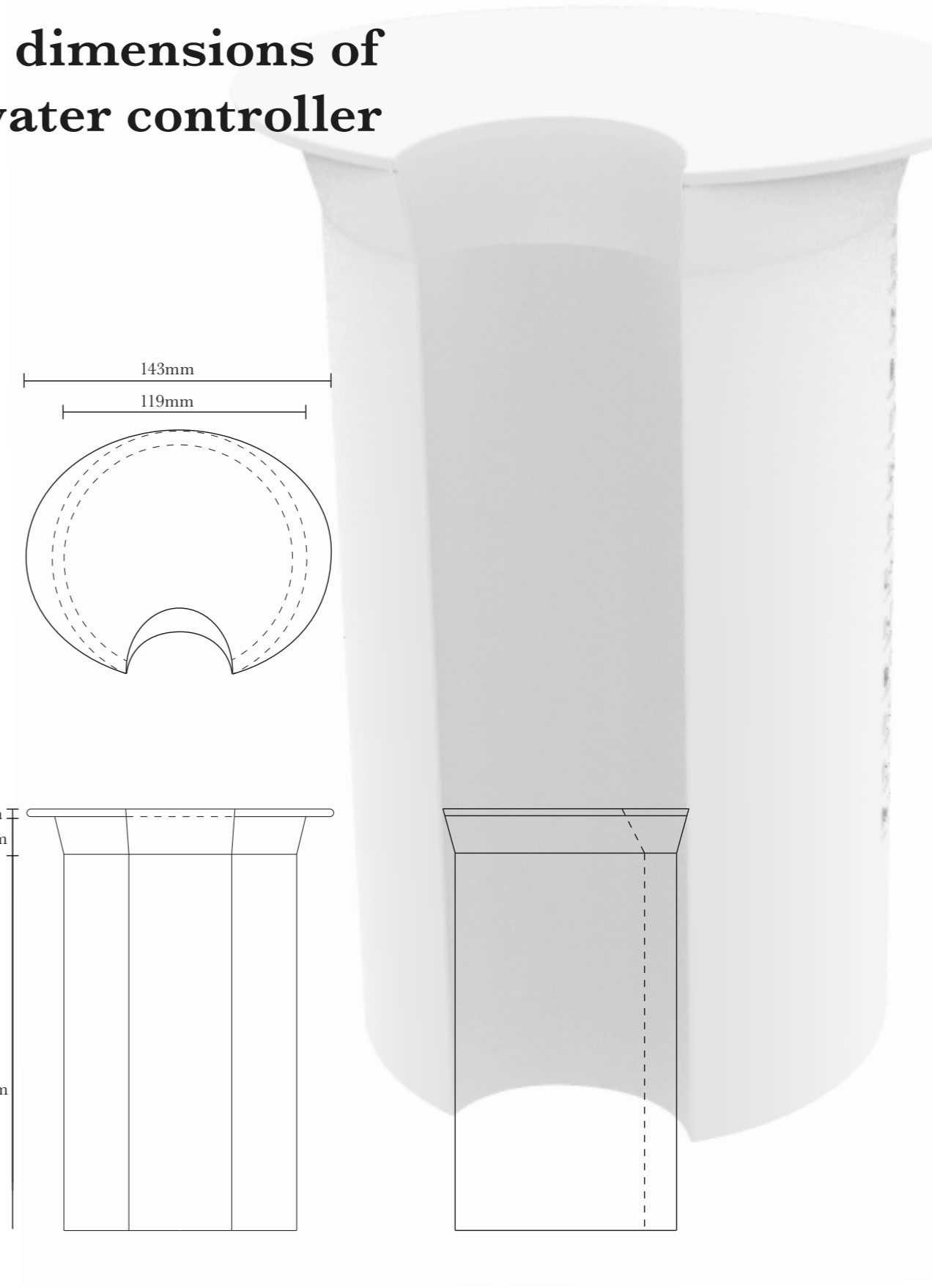
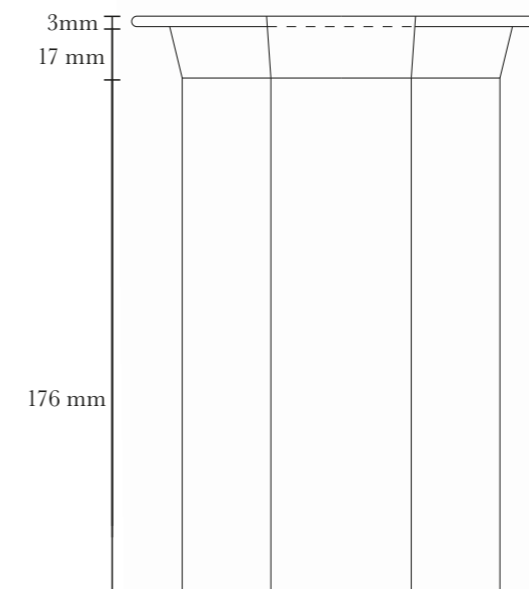
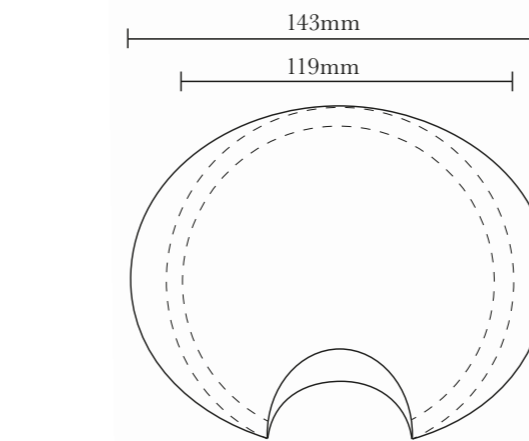


An oval top with overhang on the sides showed to be the most useable

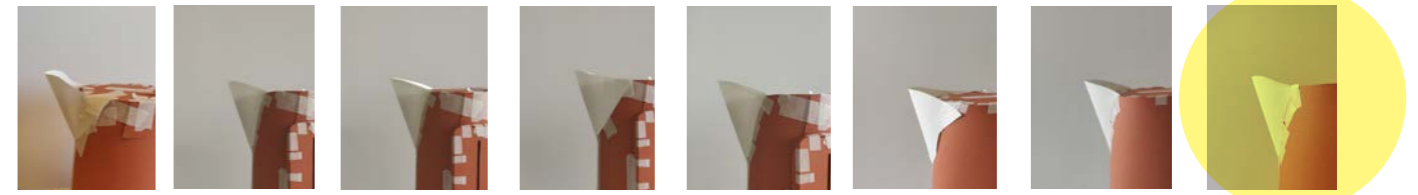
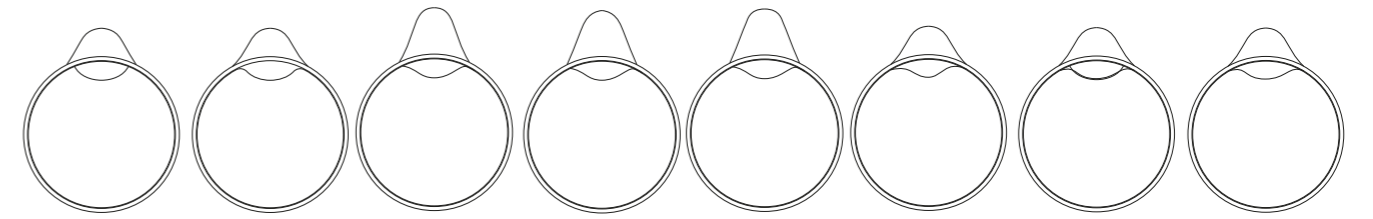
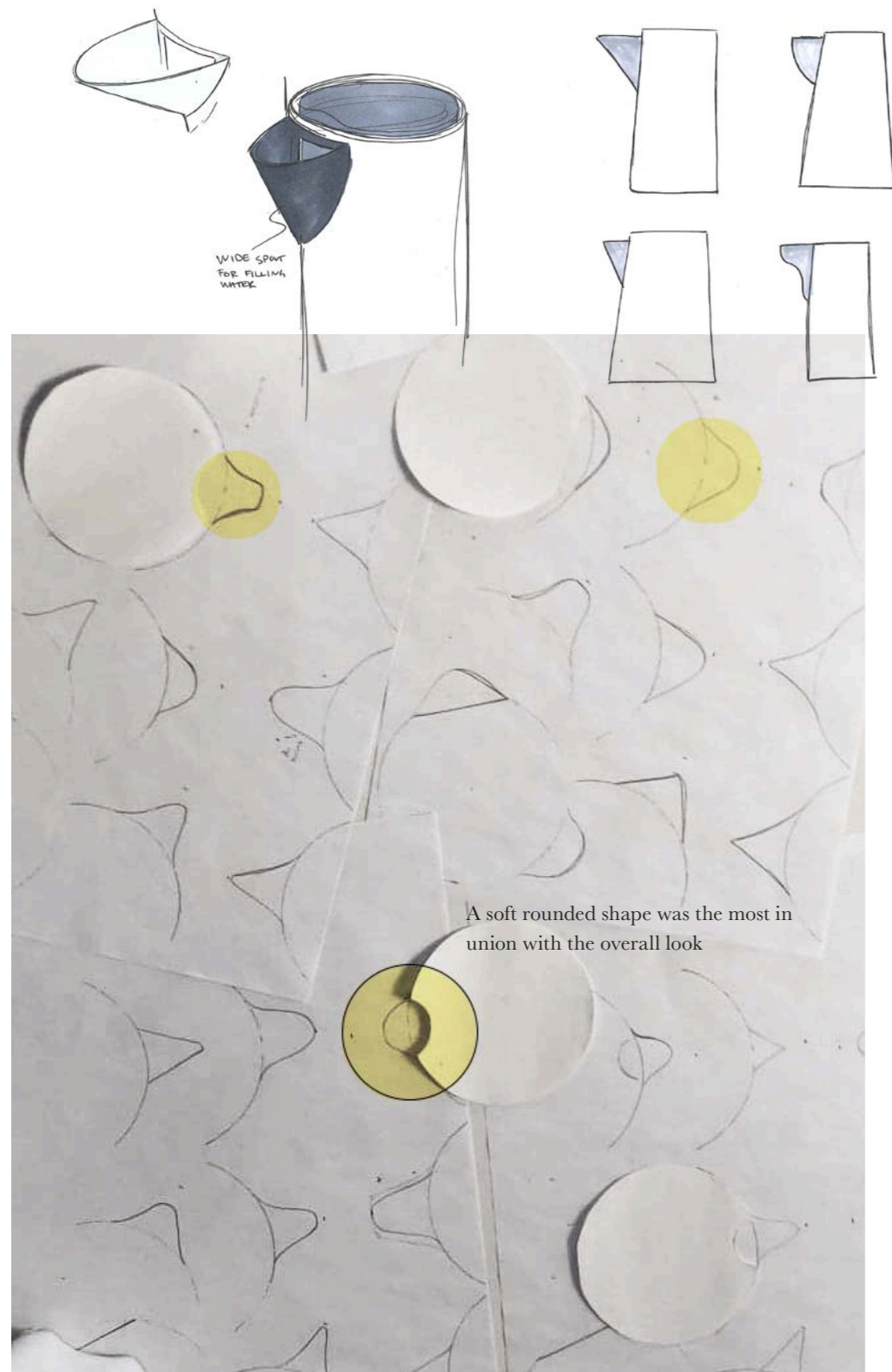
Since the decided geometry of the water regulator will be too big to grip with one hand, we decided to give the water regulator a small handle. After a few iterations this became a top-piece that stretched out on each side of the container, allowing for a precise fingertip-grip.

The conic top part of the cylinder ensures that it stops at the minimum level even without the clamping mechanism. The conical shape also intends to show the user that it has a direction and allows for lifting.

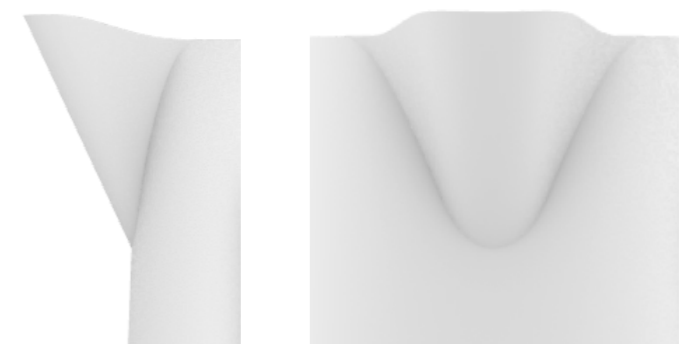
Final dimensions of the water controller



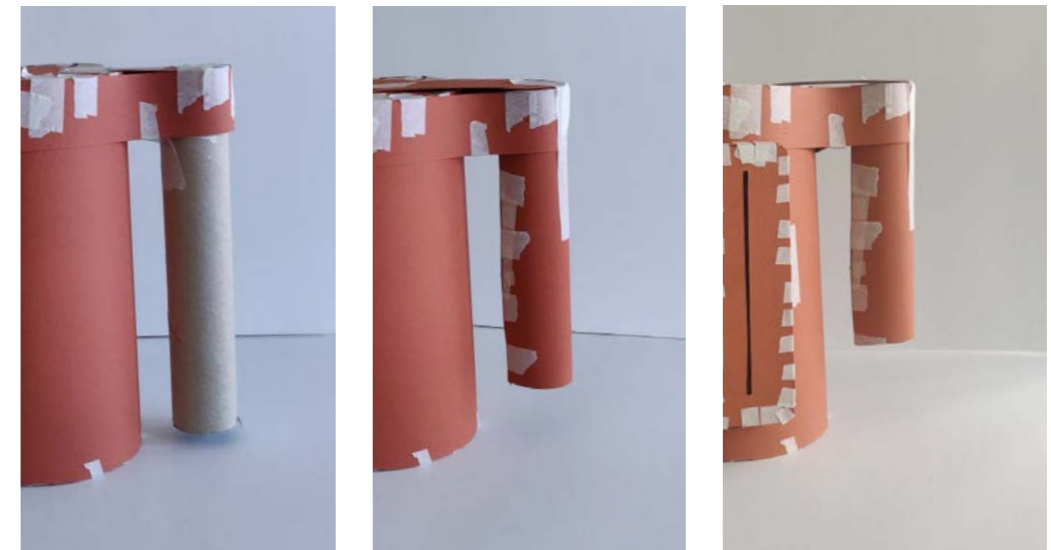
Spout



The size and shape of the spout was made rather large in order to ensure that the kettle easily could be filled with water by the user. Through iterations of profile and top-views a final result was found and tried out in a mock-up before being imported into 3D software.



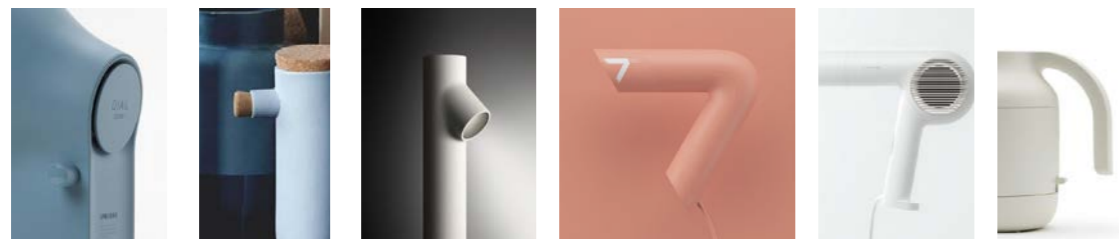
Handle



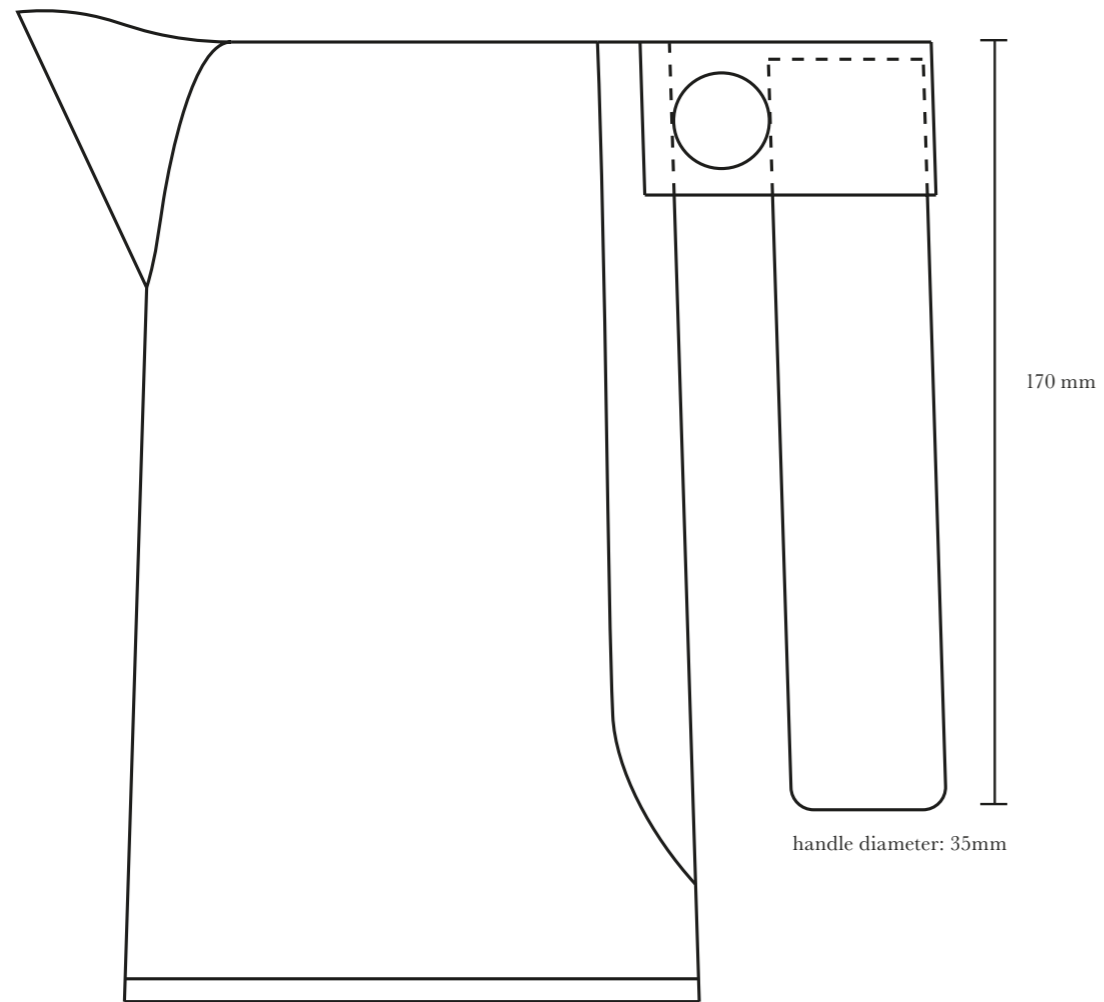
The shape of the handle was created after some quick paper mockup iterations. In order for the volume to be moved up and down we needed some sort of fixture which happened to fall in roughly the place as the handle would. Therefore we decided on incorporating this control into the handle, which required the connecting part from the handle to the water kettle body to be quite flat and broad. We hoped to create a simple look that wouldn't interfere with the rest of the kettle as it already had a quite busy expression.



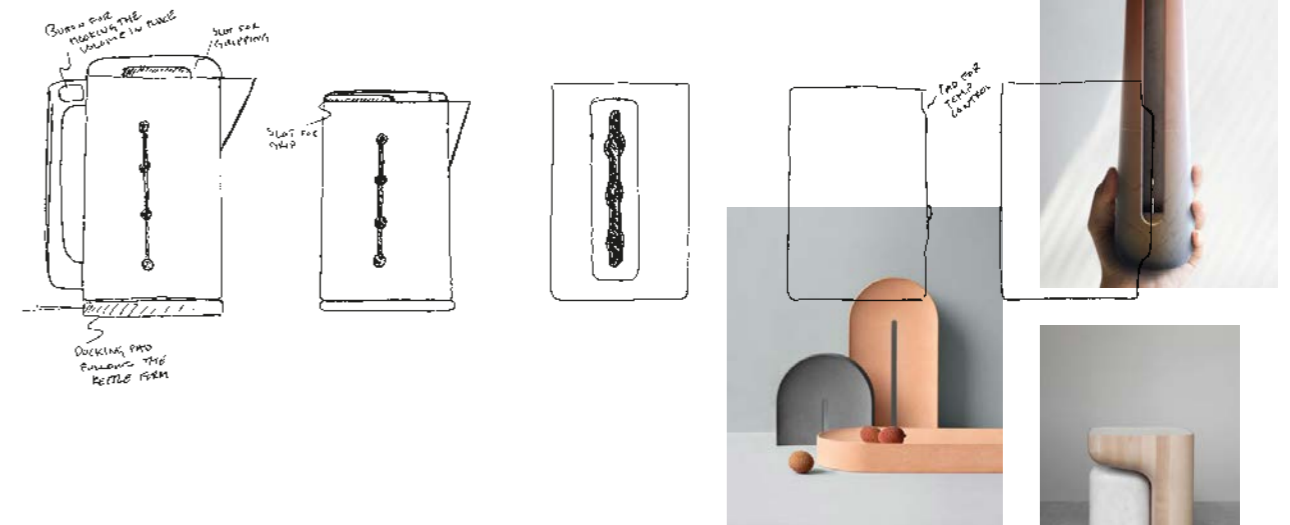
A rounded side button fit the best to the rest of the aesthetics of the handle



Final dimensions of the handle



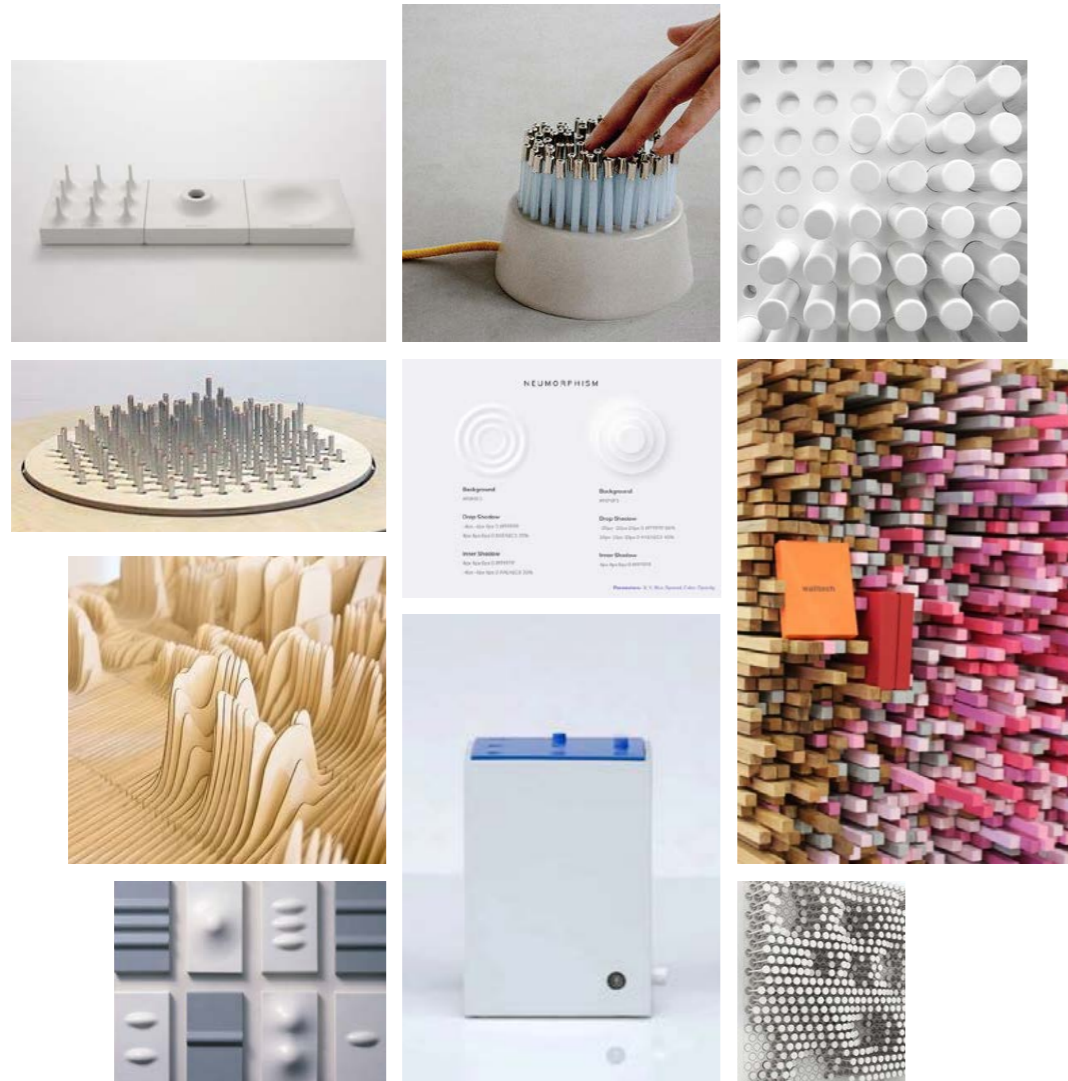
Regulator side piece



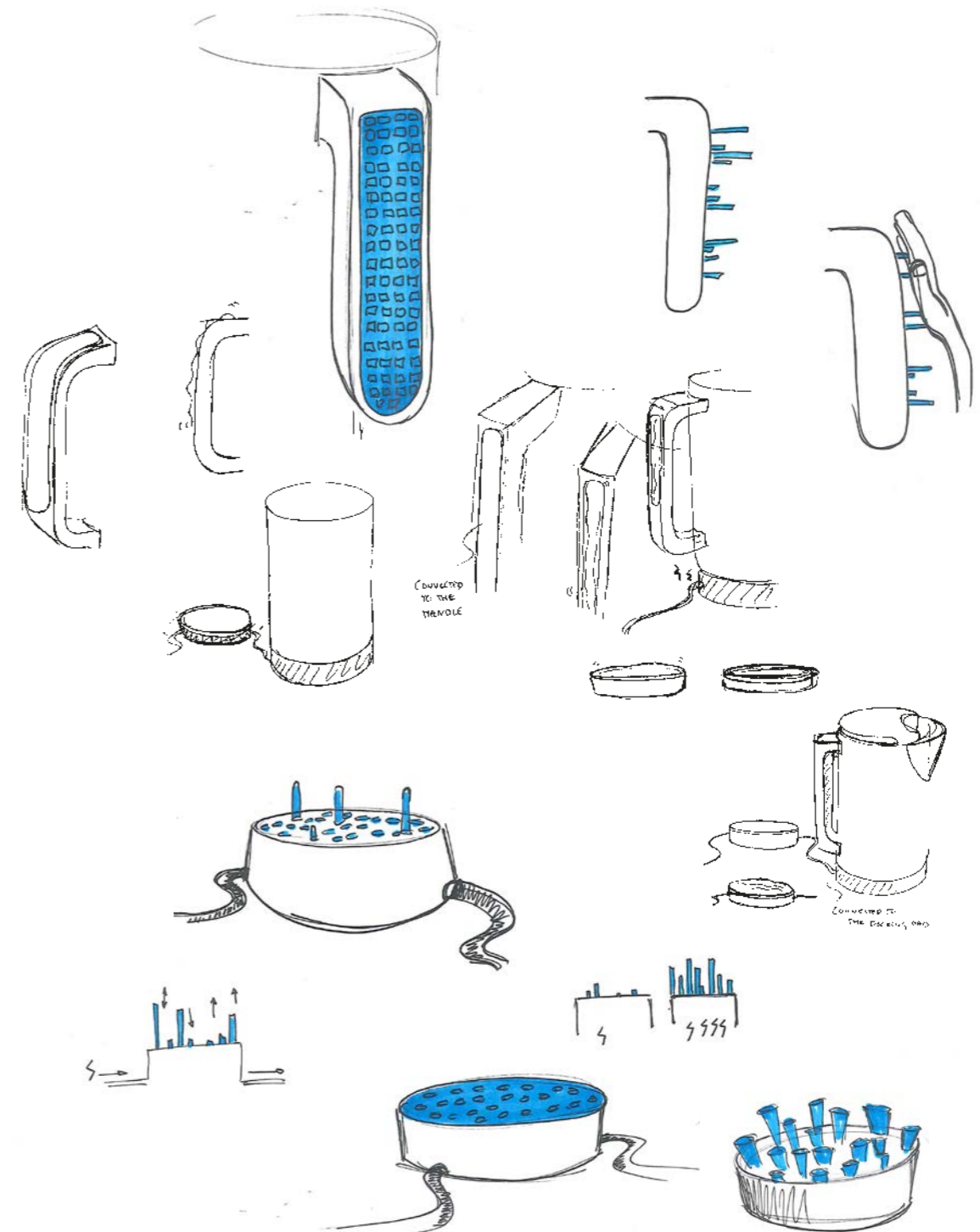
The visuals of the side-piece intend to be simple and intuitive showing clearly where the peg can be moved and placed, in regards to the different temperature settings. The clear indentions guide the user to pushing the peg into place whence reached. The rounded shape is a reflection of the rounded button on the handle.



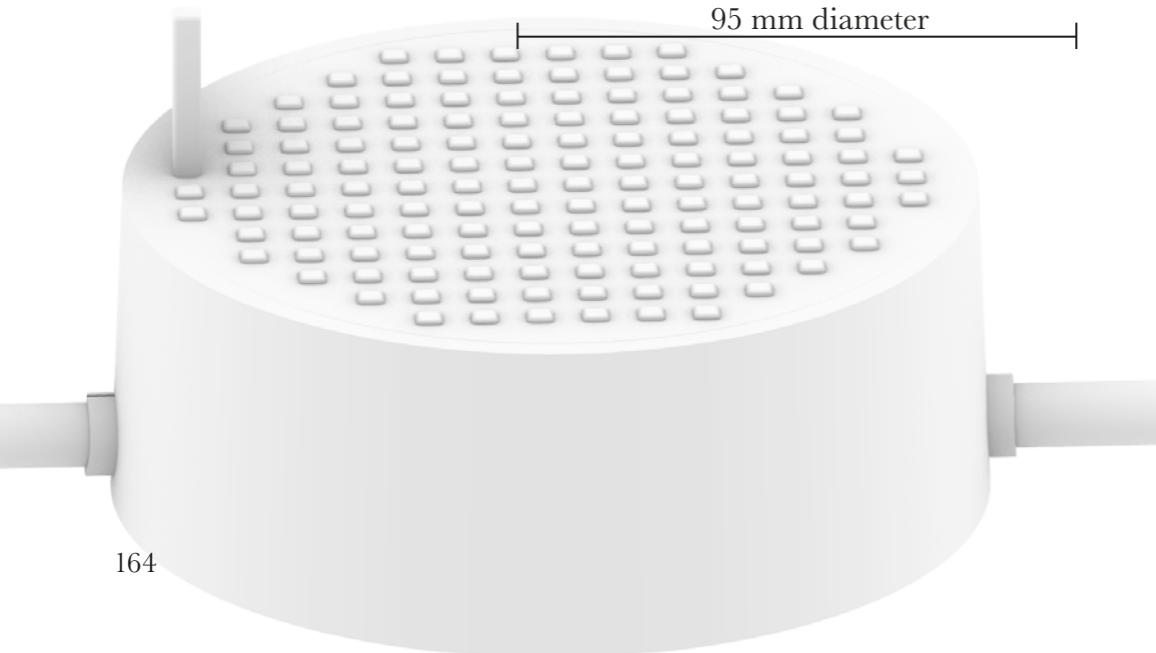
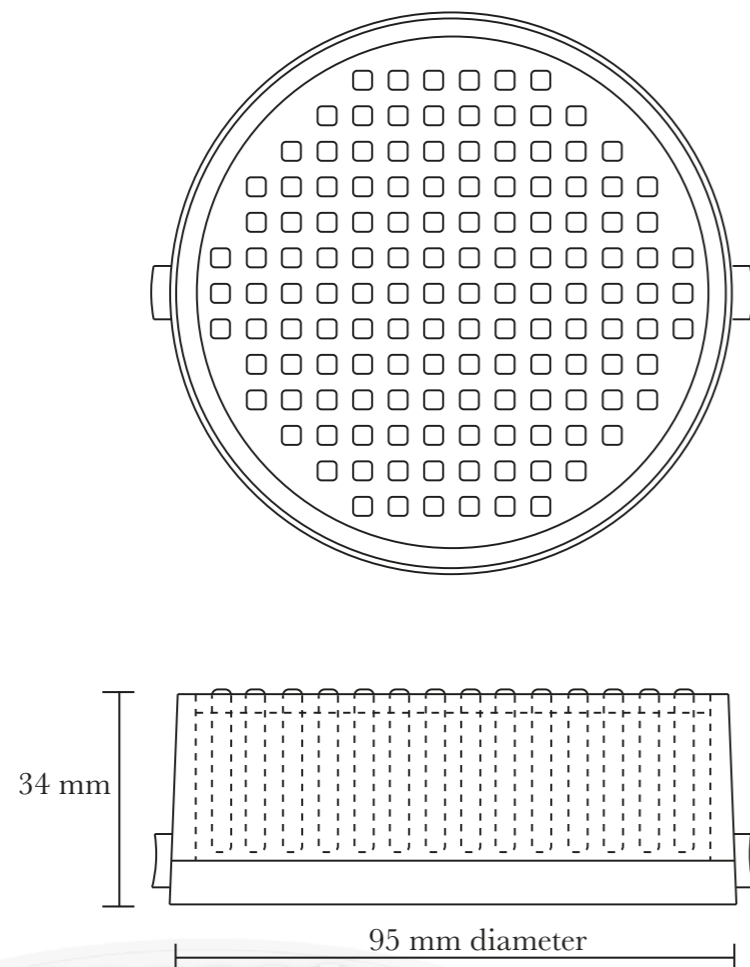
Visualisation of use through an energy tracker



As already established the visualisation should give an anxious look, alarming the user when used excessively. This could either be done by vibrations or a flow of individual markers bouncing up and down as a result of use. The latter was chosen as it would prevent the user from becoming used to the movements due to the irregular movements and continuous pattern change as an effect of use. The weather systems project by Studio psk shows us how the technology for the function is possible. Initially this function was intended to be placed on the handle, giving the user a clear connection to the usage, however, we found it to be more sound in the production aspect to place it in a separate “monitor” showing how this can be easily applied to other products as well, not only limiting the function to the water kettle.

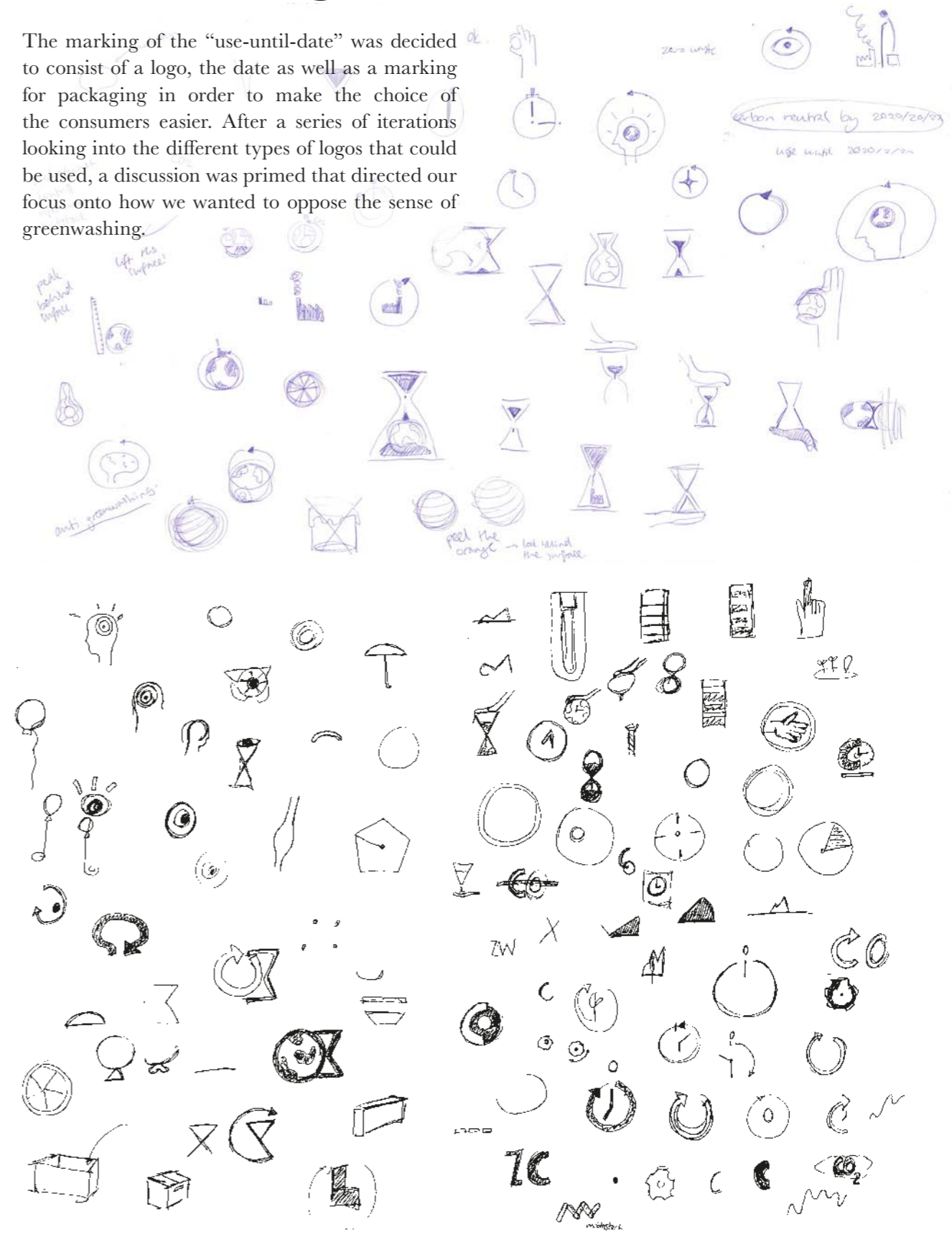


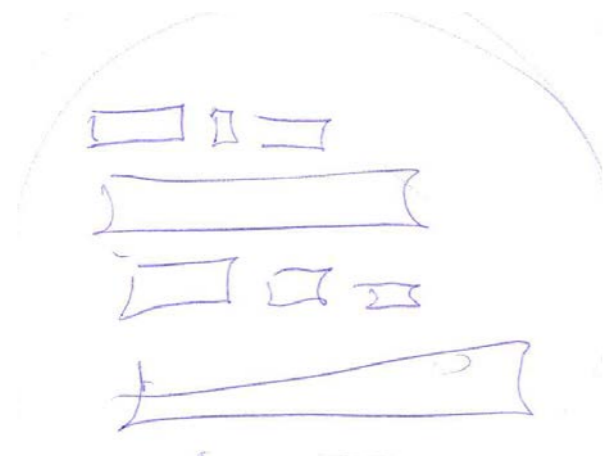
Final dimensions of the energy tracker



Prolonging lifetime - the marking

The marking of the “use-until-date” was decided to consist of a logo, the date as well as a marking for packaging in order to make the choice of the consumers easier. After a series of iterations looking into the different types of logos that could be used, a discussion was primed that directed our focus onto how we wanted to oppose the sense of greenwashing.

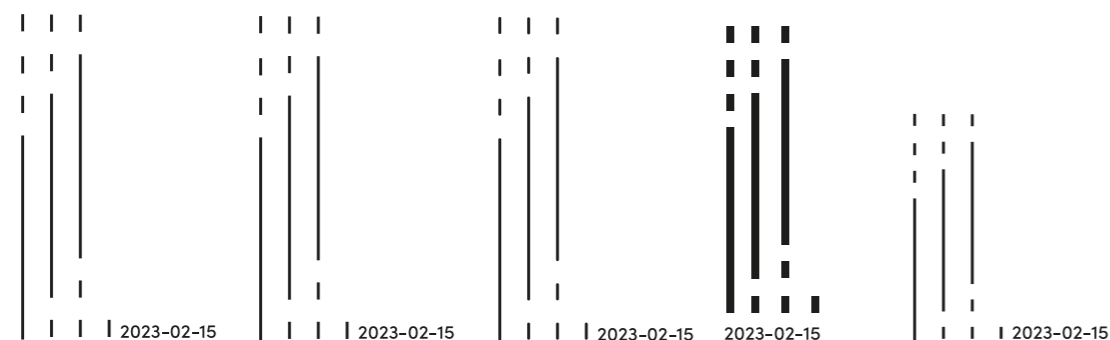
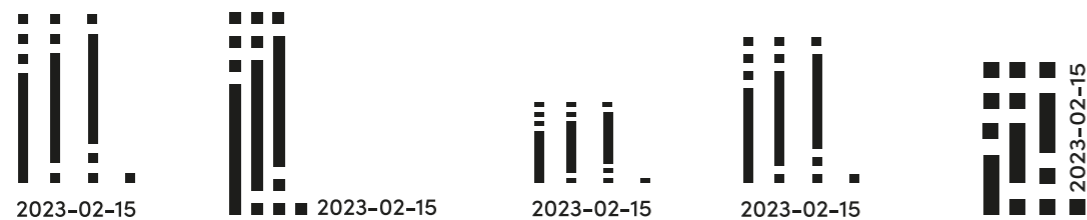




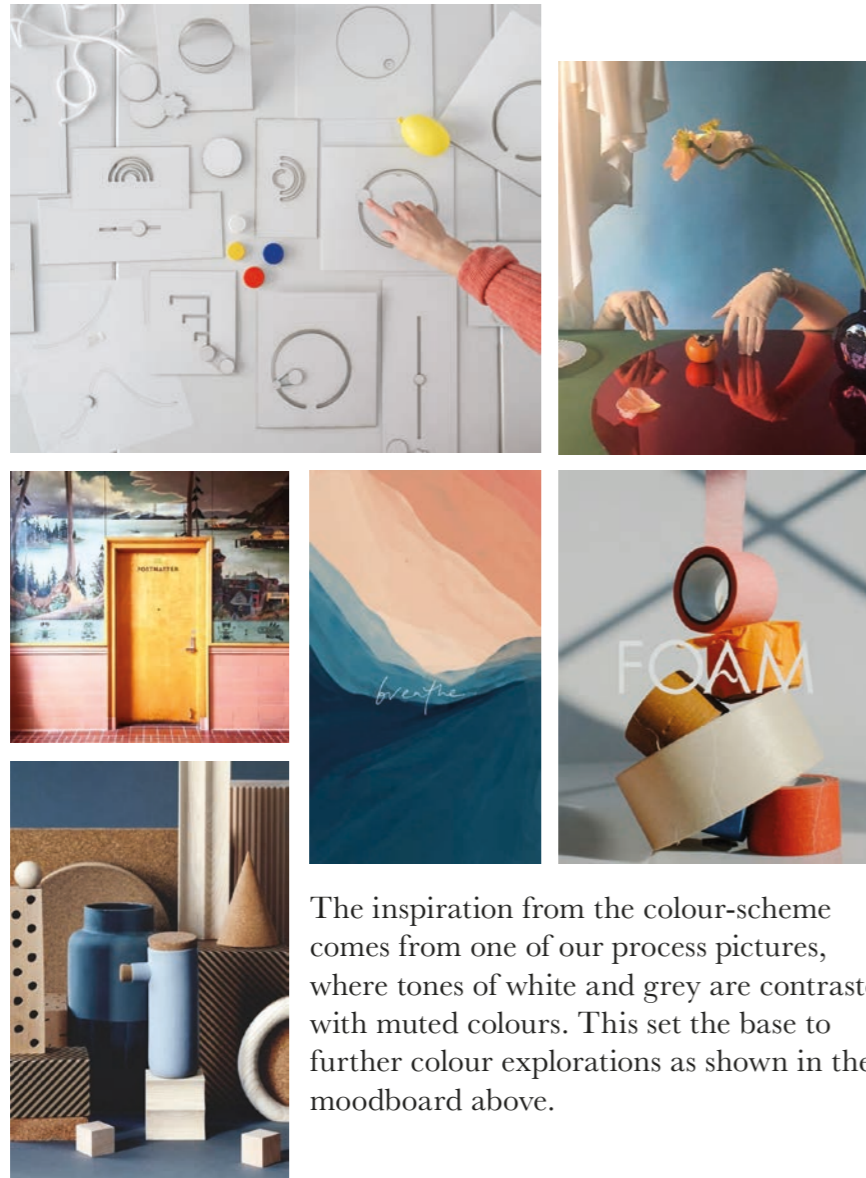
Instead of using a logo that connected to “green” themes we decided to take a different approach. Instead of a green product we wanted to make a blue product. The concept of a blue product stands for the aim towards a blue sky, together with taking a stand against greenwashing. The illustration accompanying the name “blue product” is an abstraction of the morse-code for the word blue, and is intended to become a clear signifier on products that both guides the user to the marking of the date on the product, as well as enabling users to see at a distance that the product has the marking and works towards a more sustainable user experience.

blue product

The marking intended for packaging is made fairly simple with a circular arrow showing use surrounding the amount of years, together with the accompanying text “years until carbon neutral”. This as the interpretation of the consumer has to be straightforward and clear.

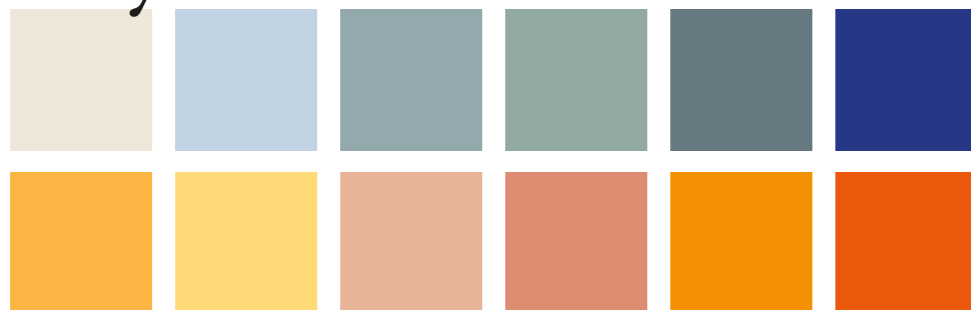


Calm, clear and playful

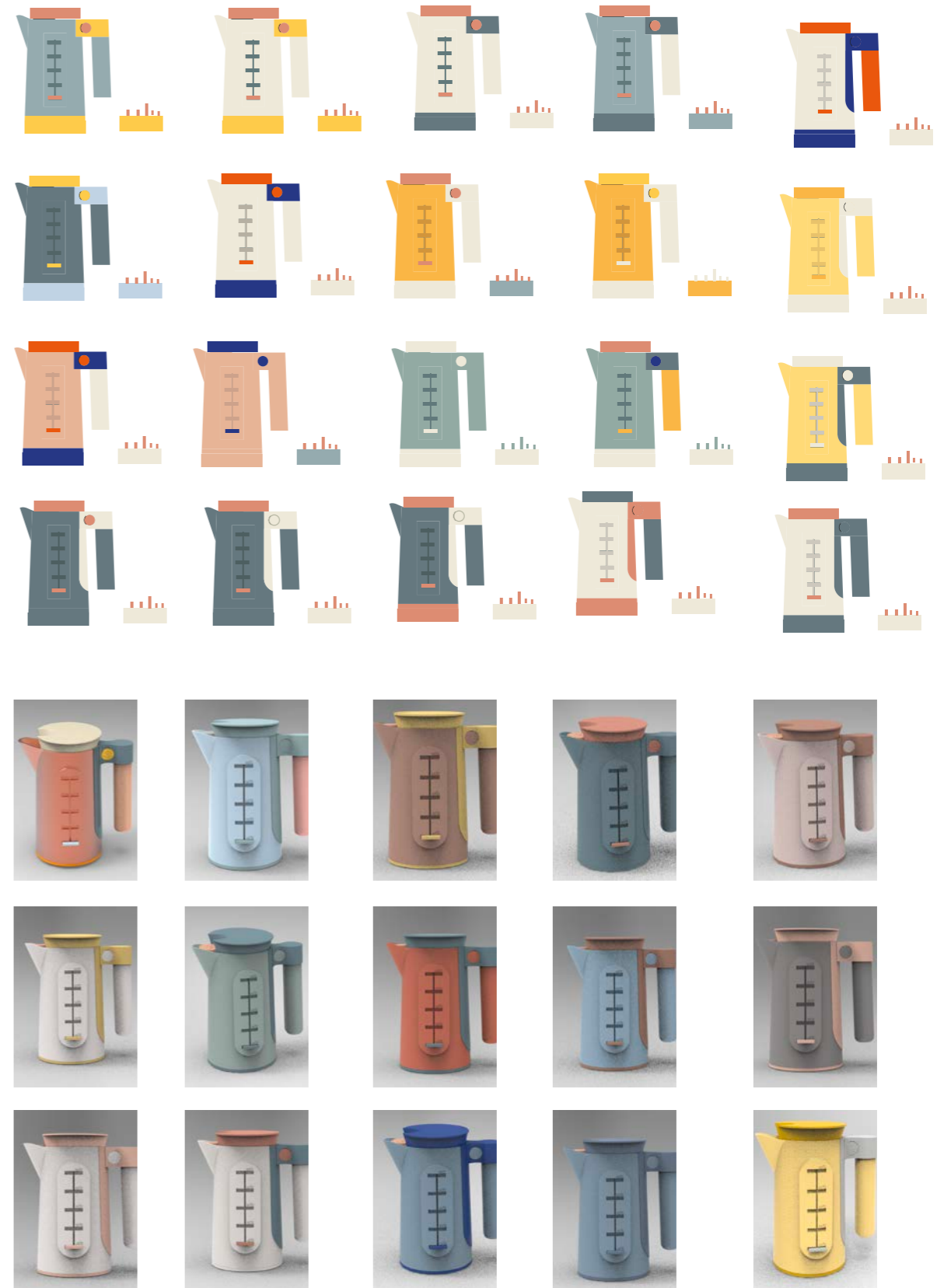


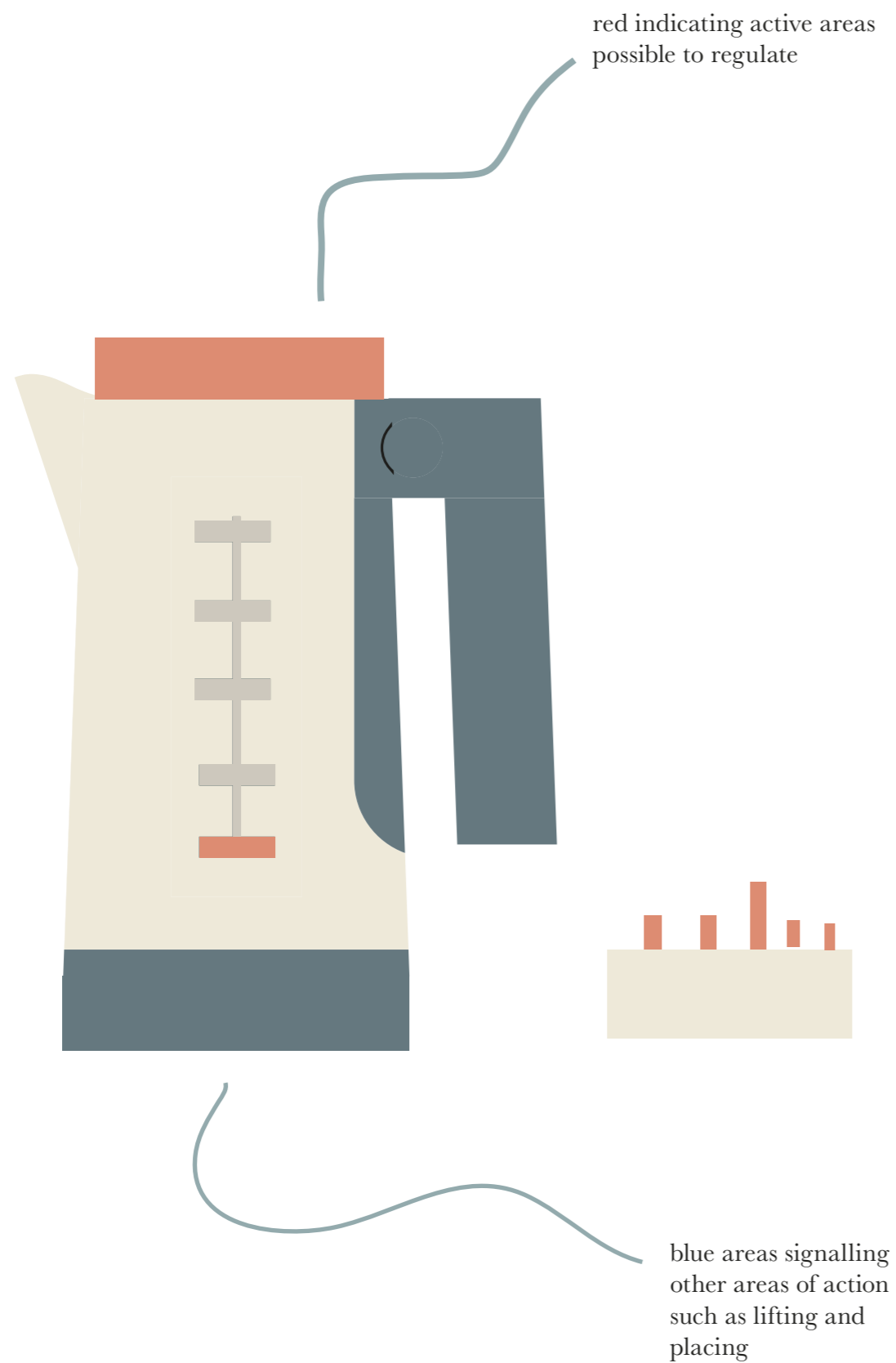
The inspiration from the colour-scheme comes from one of our process pictures, where tones of white and grey are contrasted with muted colours. This set the base to further colour explorations as shown in the moodboard above.

Playful + serious



Color iterations





the more intense red acts as a warning signal for the user upon excessive use

The colouring for the product was made to show off the different properties as well as to show modes of use. By connecting the colour of the peg and the volume controller we wanted to signify that these were active areas.

Likewise, connecting the baseplate with the piece below the split-line through the same colour shows semantically that they ought to be combined. The colour of the body should feel as if it fits into a regular kitchen and the muted colours intend to give off a playful yet serious expression.

the calm dark blue enables continuous use without making the kettle dirty

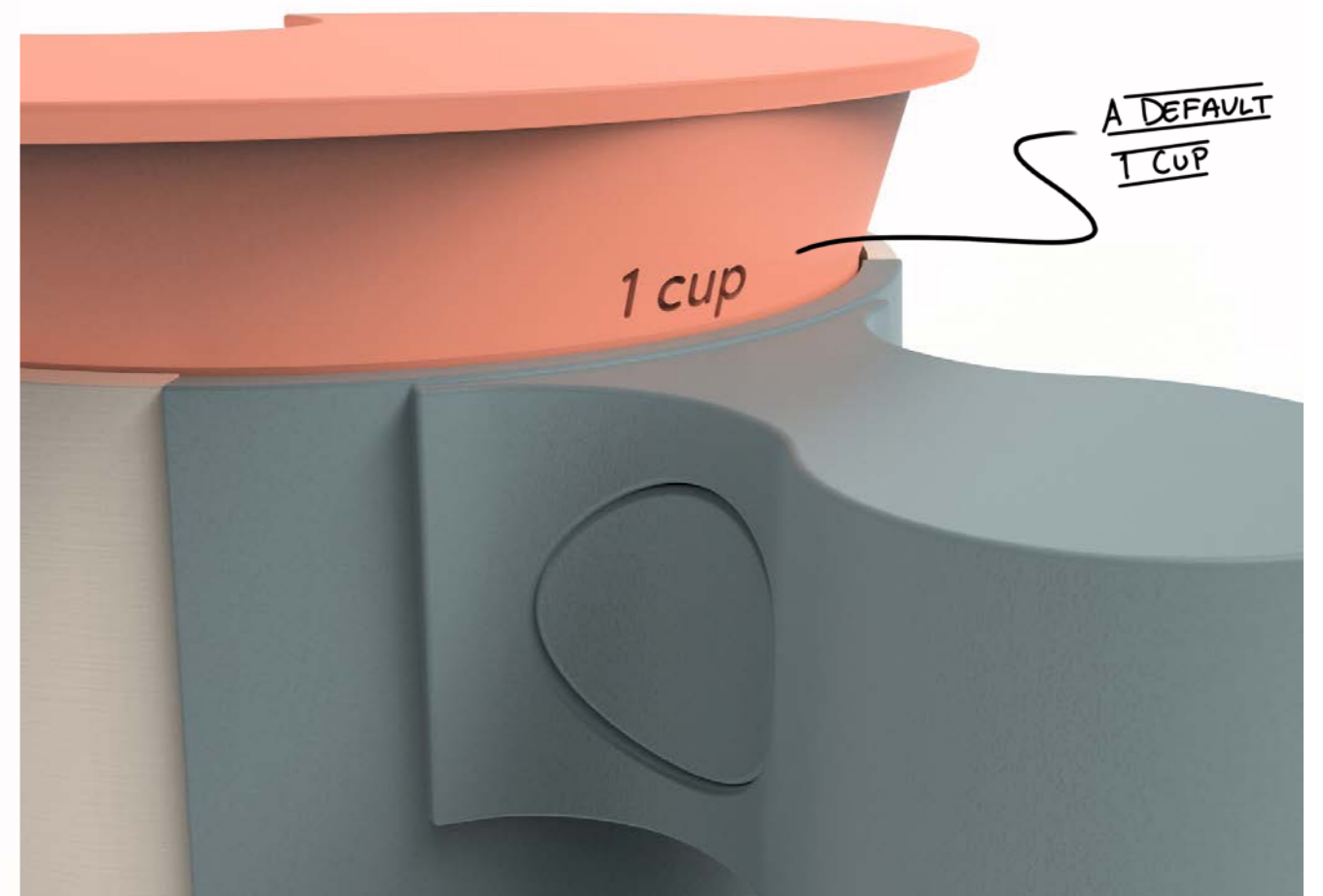
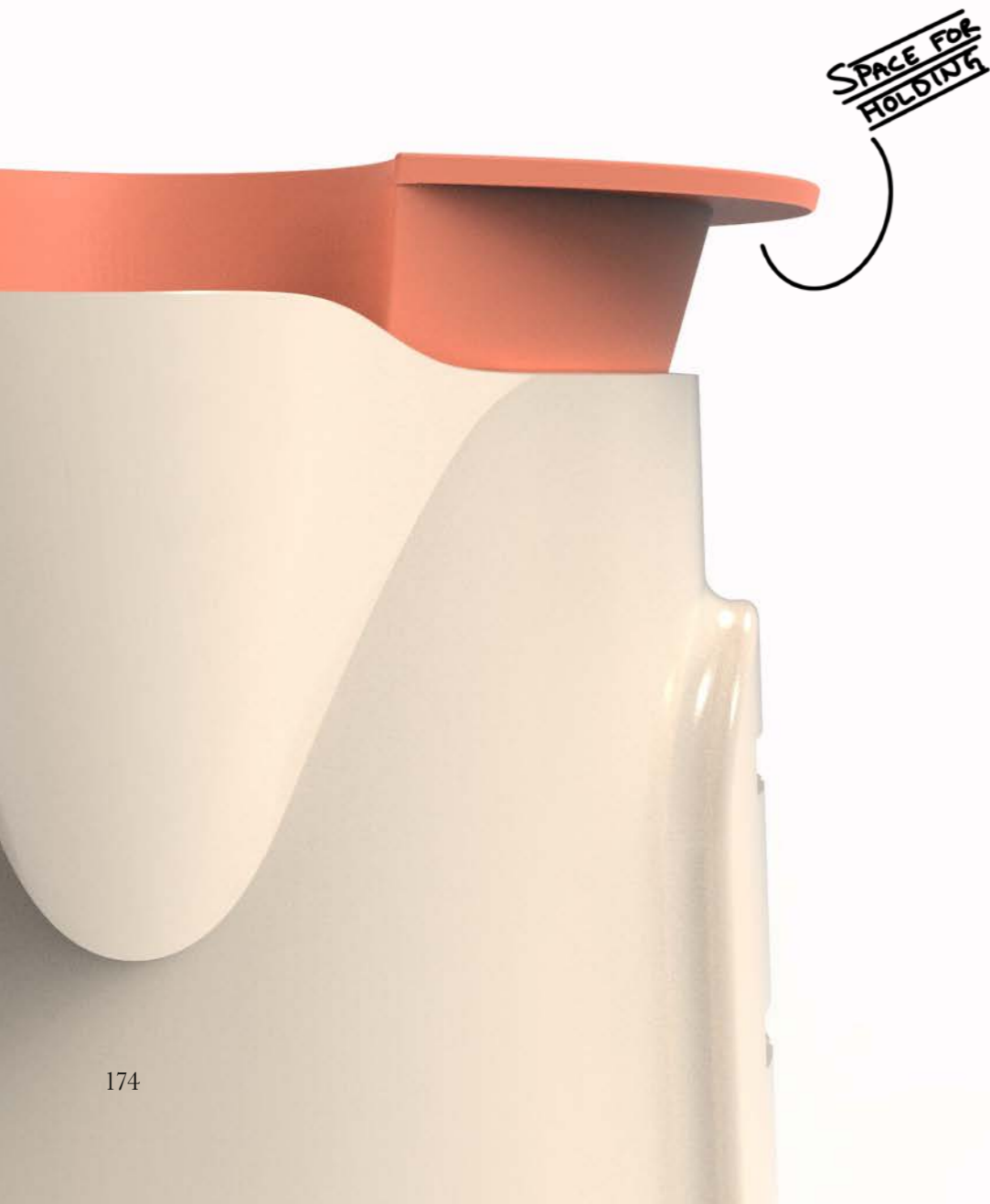
CHAPTER 5

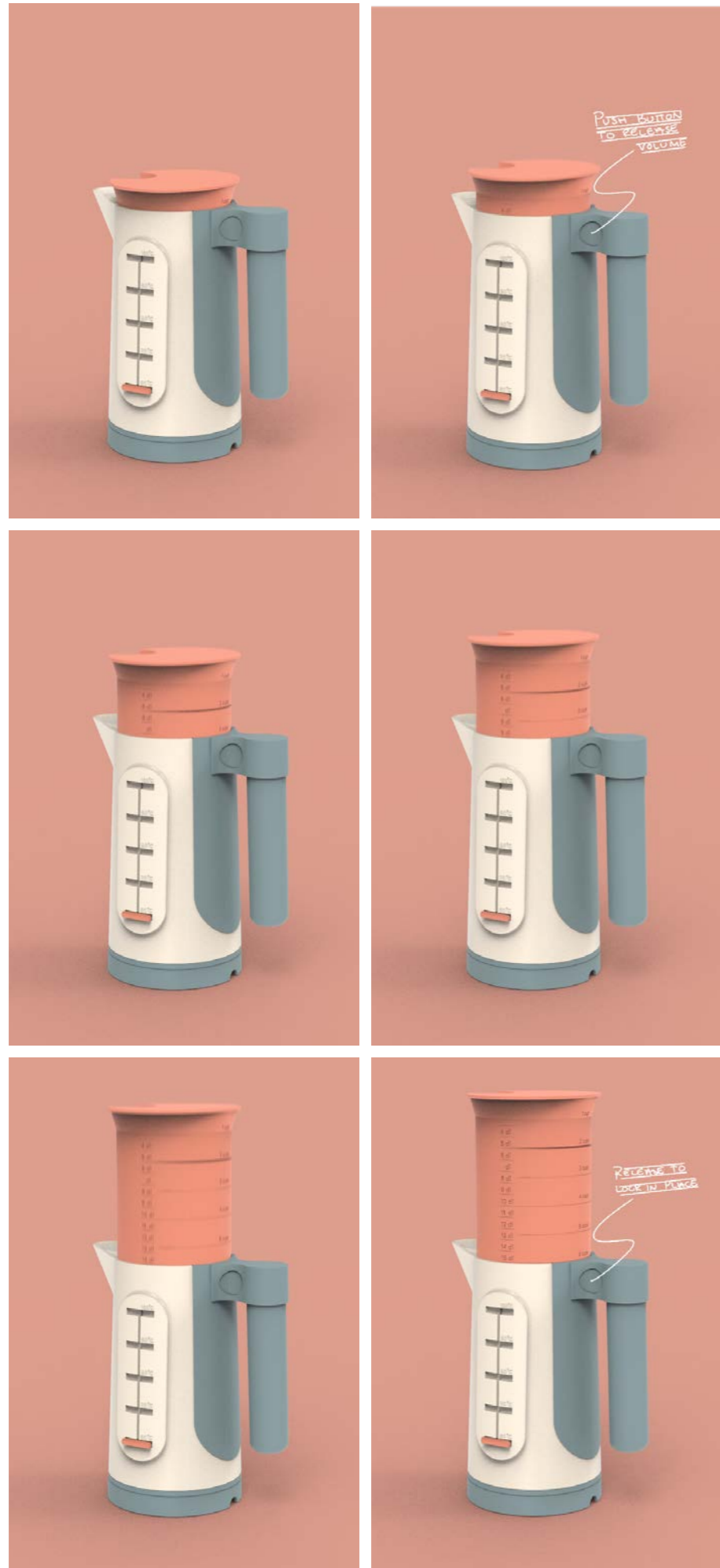
Presentation of the result - scenarios and explanation of concept



Water volume controller

The volume controlling water volume is pulled up in order to make room for water inside the kettle. By making the use make a commitment in advance this feature aims to eliminate mindless use. If the user needs two cups of water they'll set it to 2 cups and fill it up. When the amount of water desired is set it is impossible to overfill because this would make the excess water to start pour out of the kettle. The volume is fixated using a fixing device inside the kettle which is controlled using the buttons on the side of the handles. Once you push the buttons the volume is released to freely move up and down allowing the use to choose a water amount. The pressure on the buttons is released in order for the volume to be fixated in its current position.

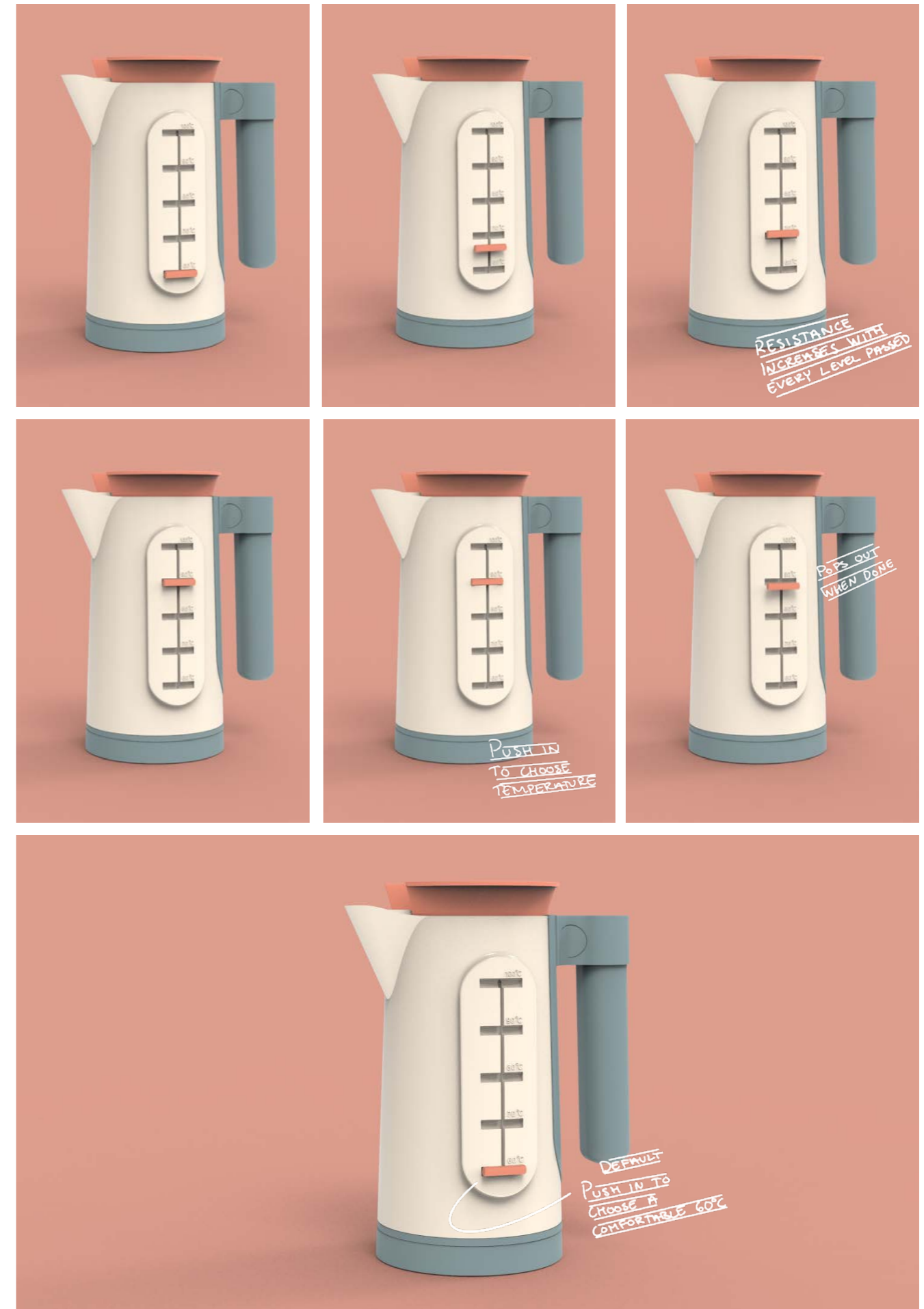
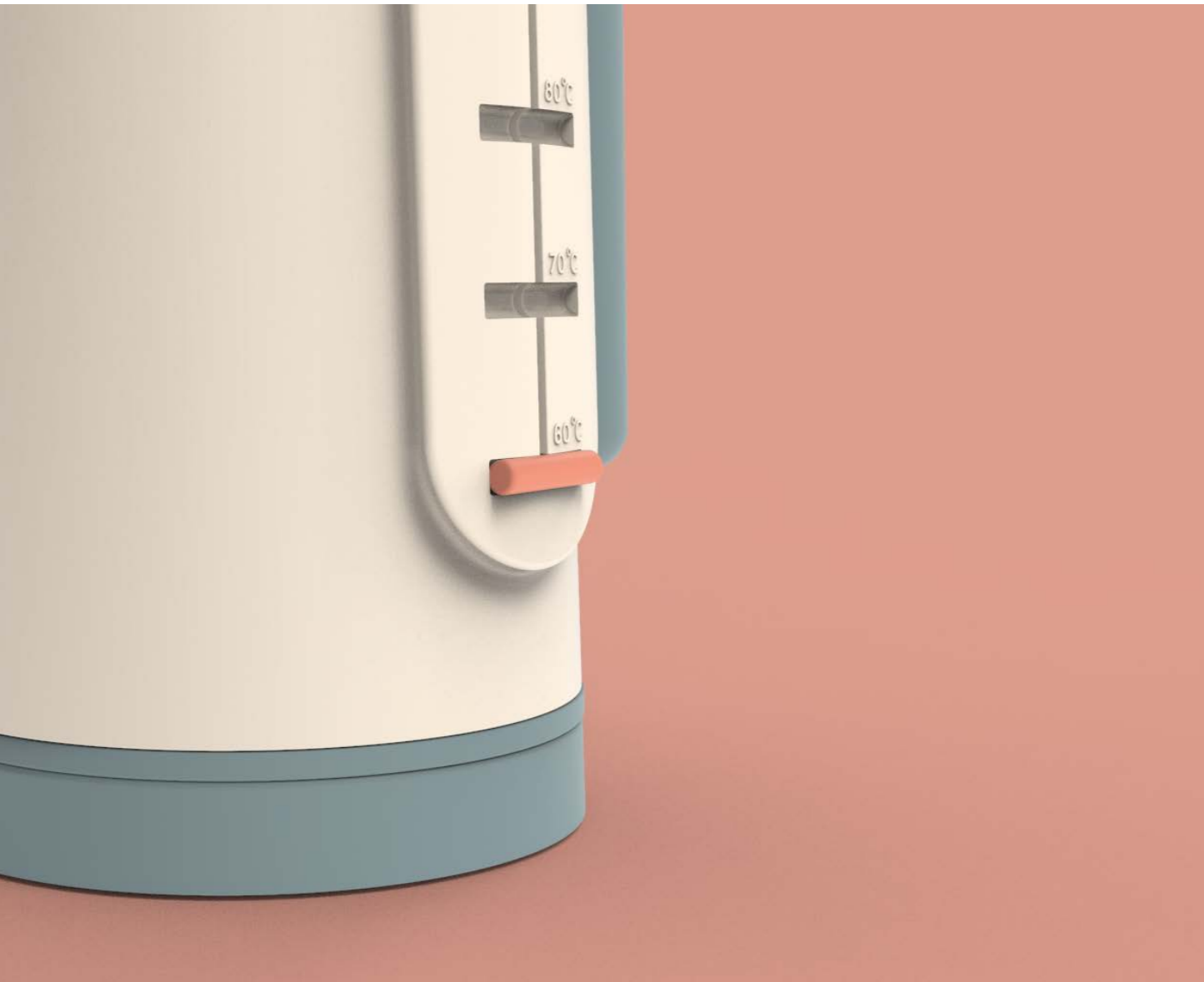




Having the water kettle set to the maximum level (1,5 L) will create an inconvenient height for storing. This will hopefully make the user willing to push the volume done after use, restoring it to the default setting of one cup as well as making it easier to store away in a cupboard.

Temperature regulator

To choose temperature the lever is pulled up. For each step it passes the user will feel an increasing resistance making them aware that their choice means an increased use of electricity. When the user has reached the desired temperature-slot they push the lever in to choose the temperature while also turning the water kettle on. When the water has reached the set temperature the lever will pop out and fall back to the starting position at 60 degrees celsius. If the user decides to push the lever in without pulling it upwards it will heat the water to 60 degrees celsius, which will work as a comfortable default setting.



Calling attention to use

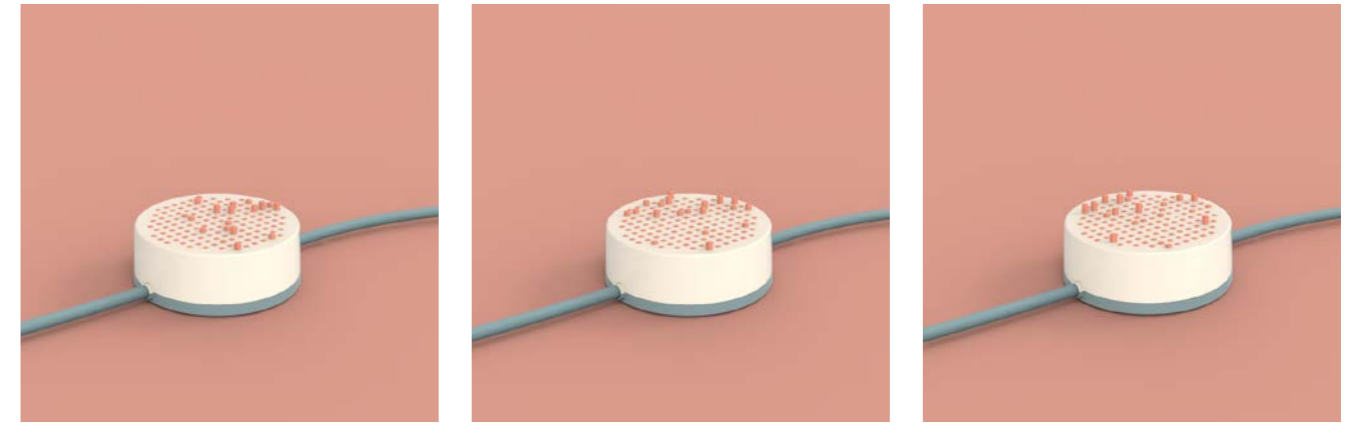
The helping puck will let you know how you are using electricity in real time without numbers. This device will try to catch your attention through a physical representation of use. As you increase your usage of electricity the device will increase its movement frequency.

When you turn off the device it will freeze into a position which reflects your last 10 days of use. The more you've used, the more aggressive it will look. This will hopefully create an incentive for the user to be more mindful when they can view the direct and longer term impact of their choices.

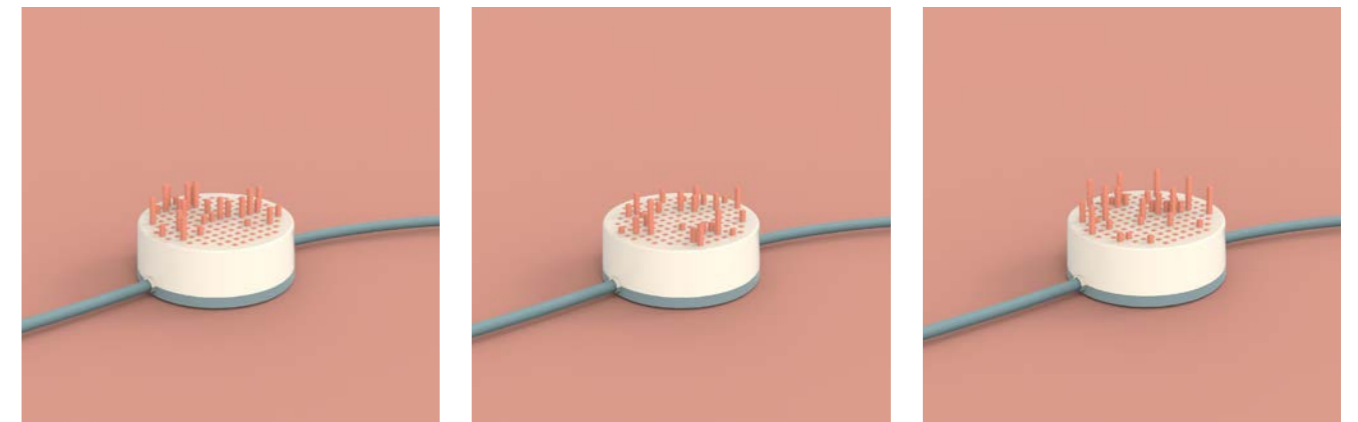
Another feature is when the device have recorded a frequently excessive use it will make the water kettle harder to turn on by increasing the resistance when pulling the regulator up. It will also give you feedback by popping some of it's rods up to let you know it is not happy at the moment and that it is your action that is causing it to behave this way.



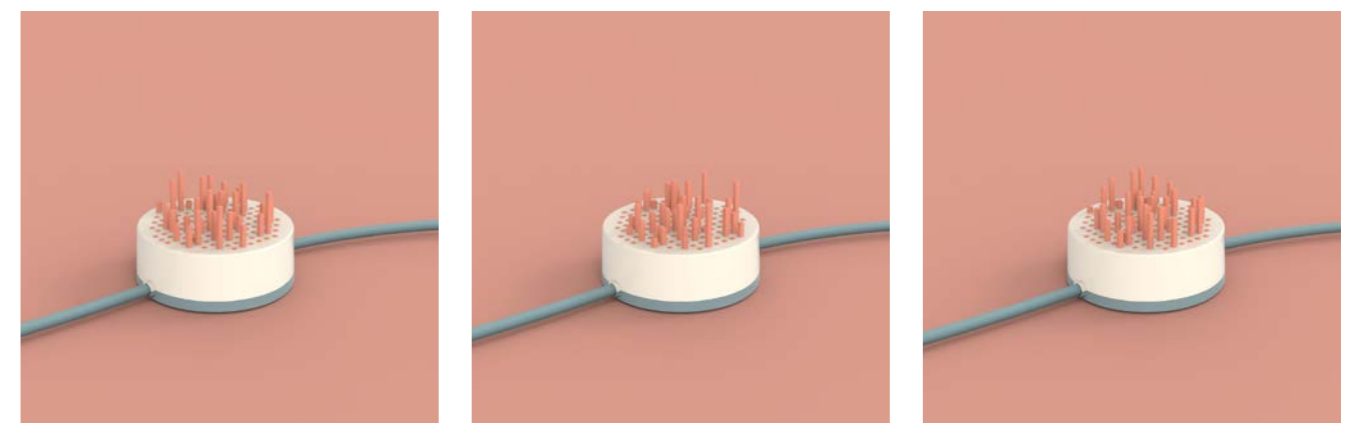
Low energy usage



Higher energy usage

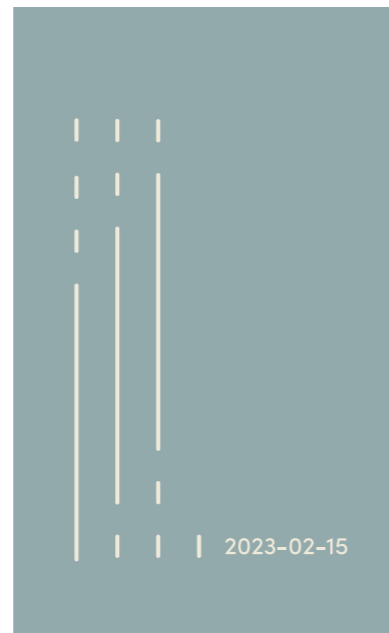


Excessive energy usage



“End”-date

The end date is permanently stamped on to the product, clearly visible to the user. This marking will make it easy for the user to see when it has been kept for the amount required for it to compensate for the resources used during its manufacturing. By visualising this to the user we hope to give them a new incentive of repairing and caring for the product. If the product breaks before the date of its compensation the user will have something telling them that this product has more to give. Throwing it away might feel more difficult when you know that you shouldn't. Also, when the user passes the date they can follow how they are moving towards a 'climate positive' state of their product showing the user how good / useful a product they've kept for a long time is.



Using a marking with a year on the packaging is a way of showing the “end”-date but will require less calculations from the buyer. They will be able to compare the products simply on the amount of years stated on the package. The higher the number on the package the higher the resources required during its manufacturing.

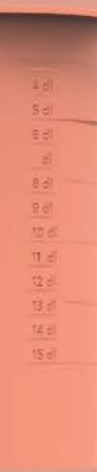
Parts and details



Lid to prevent
splashing



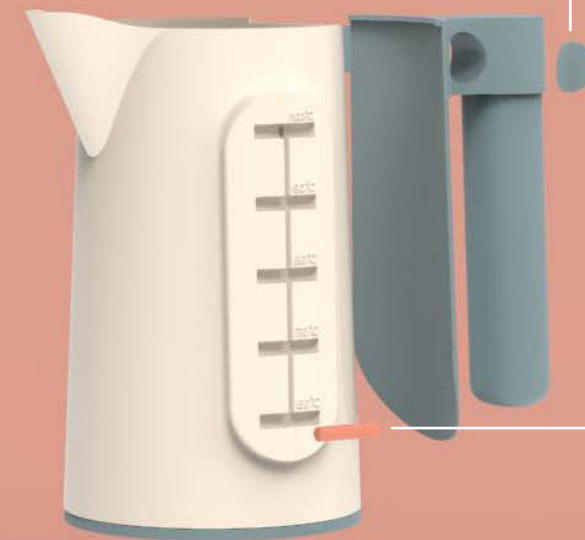
Controlling
water volume



Fixating device
- controlled by
handle buttons



Temperature
regulator



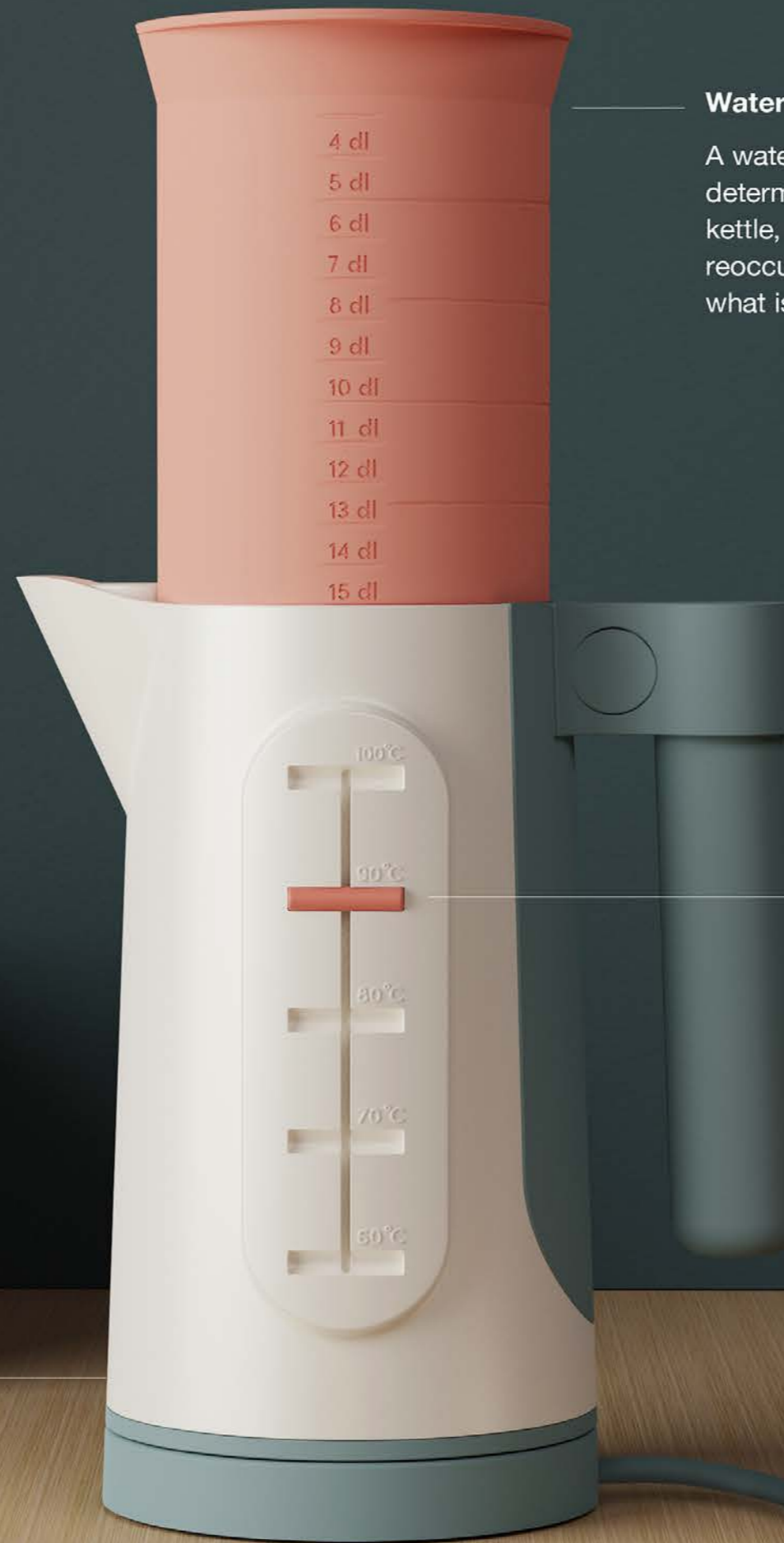
Docking pad





Date of climate compensation

A marking showing the date of when the product reaches a point in time where the resources for its manufacturing has been compensated. An indication that makes it easier for consumers to compare products and make sustainable choices in store (the lower the number of years = the more sustainable the manufacturing process).



Water volume regulator

A water controller that forces the user to determine water volume before filling the kettle, limiting energy waste due to the reoccurring case of boiling more water than what is needed.

Temperature regulator

A regulator that increases in resistance as the user increases the temperature, giving feedback about how this choice will require more resources.

Energy use tracker

A device that measures and visualizes energy use. Through an anxious shaking it calls attention to ongoing use and appeals to the user's emotions.

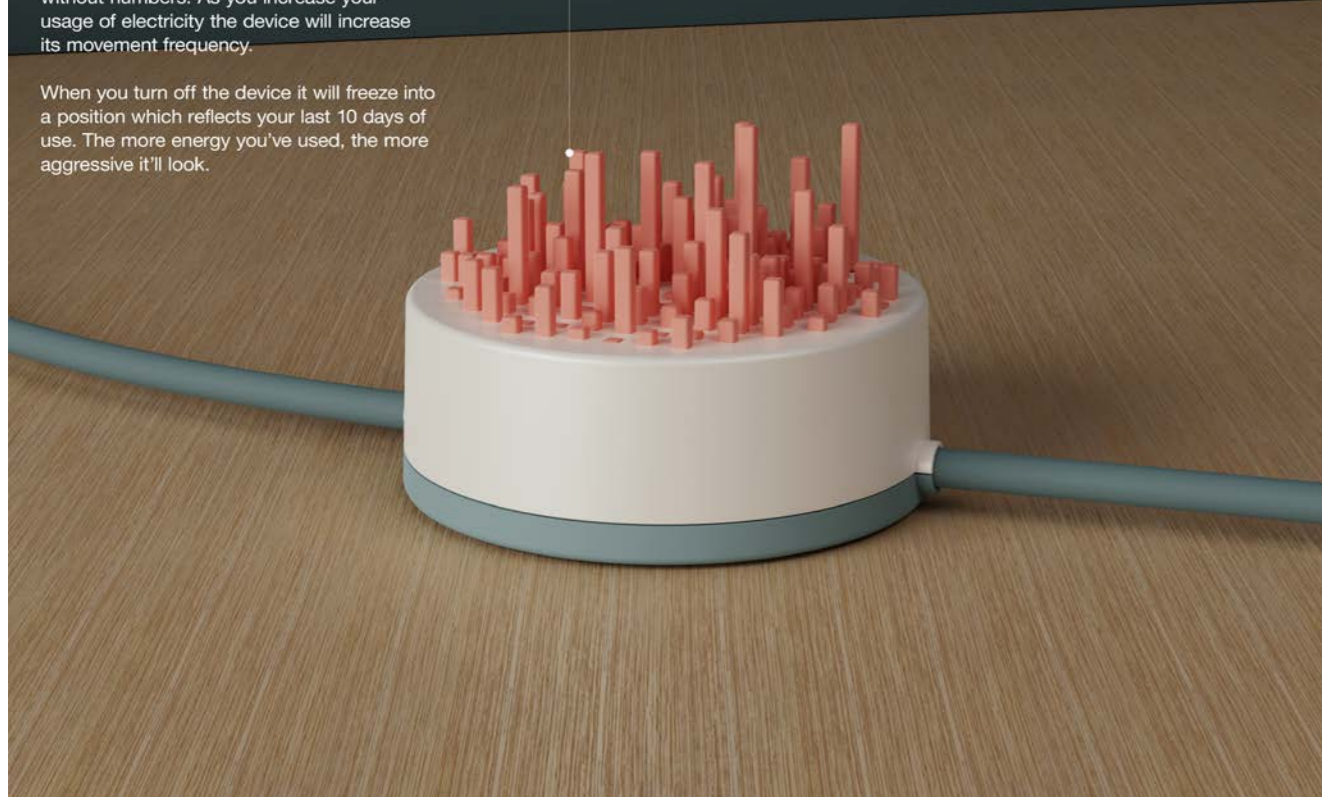




Energy use tracker

The helping puck will try to catch attention through a physical representation of use calling to the user's emotions. It will give you a real-time update on your use of electricity without numbers. As you increase your usage of electricity the device will increase its movement frequency.

When you turn off the device it will freeze into a position which reflects your last 10 days of use. The more energy you've used, the more aggressive it'll look.





4 dl

5 dl

6 dl

7 dl

8 dl

9 dl

10 dl

11 dl

12 dl

13 dl

14 dl

15 dl

100°C

90°C

80°C

70°C

50°C

CHAPTER 6

Our reflection from the project and references
to our conducted research



Reflection

This project started with a very broad topic and a heavy subject on the environmental issues of today. The openness of our starting point has driven us to discussion after discussion where we at many times have felt overwhelmed by our hopelessly small part in the world and the future we are facing.

This project has not only been about creating understanding around everyday interactions but also a personal journey of overcoming doubt and continuously rediscovering motivation in tackling the overpowering problem of climate change.

In this project we set out to find new ways of how we could nudge users into new patterns of thinking and question habitual interactions with the world. The result was a speculative concept where we tried to find a way of being both feasible in our proposal yet provocative in order to raise questions and create possible relevant solutions at the same time.

We believe that we succeeded fairly well with creating new physical interfaces that nudges the user into new habitual actions and helping them to understand their resource use more effectively than in the current situation. One major realisation was how the most impactful change in terms of the water kettle is the one which applies directly to it and its specific problem areas – the water controller. Thus it can be seen that although we present solutions that can be applied to other products as well, and in the context of the marking should be provided to all products, it is important to note the specific environmental impacts as a result of behaviour in each product.

Although we are satisfied with our concepts, we feel that the actual shaping and design of the water kettle could have been more thoroughly investigated and executed. This could have been done with some better planning, but since the conceptual part of this project needed to be thorough in order to stay relevant we chose to use the majority of the time on that section of the project.

Presenting the project it felt like there was a

potential misunderstanding that this project contains separate proposals that we hope could be included in one product but should be able to be applied to products separately. The regulator and the device calling attention will have a negative impact on the amount of years of the marking, since they require more parts and production process. This is something we are aware of but disregarded since we viewed them as separate proposals, and still can see a value on the other concepts as they work more active with the in-use behaviour. We acknowledge that we might have benefitted from presenting some of the concepts separately.

During this project we have learnt valuable lessons about human behaviour and how it is possible to change it through design. Through discussions we have turned the problem inside out viewing it from several different angles and found insights we wouldn't have found if we didn't work together. We have spent a lot of time exchanging ideas which have driven us to communicate our thoughts and ideas through formulations and sketches. During the last period of this project we spent a lot of time working in the 3D software Rhino improving our skills and learning to come up to speed in computer generated iteration.

If we were to continue from here we hope to be able to do some further iterations of the detailing of the water kettle, keeping the general shape of the body. We would also like to go further into the feasibility of the different concepts and look into the mechanical solutions required in order to truly evaluate whether our solution is the best for the effect we have decided upon.

All in all, this has been a trying but fun experience, where we have learnt a lot about ourselves and each other. In the end it would not have been the same if we had worked separately and together we have been able to cover more ground in this field. In the end, we were able to tackle the overwhelming subject and frustrations we had going in, in a relatively feasible manner. At least, we have been able to raise some thoughts.

Once again we would like to thank our friends and colleagues for their support, as well as the great support and thought-checking discussions provided by our supervisor Jasjit Singh.



References

- Acaroglu, L. 2013. Paper beats plastic? How to rethink environmental folklore [Online]. TED Talks. https://www.ted.com/talks/leyla_acaroglu_paper_beats_plastic_how_to_rethink_environmental_folklore/transcript?language=en (Accessed 2020-02-03)
- Axon, S. 2016. Keeping the ball rolling: Addressing the enablers of, and barriers to, sustainable lifestyles. *Journal of environmental psychology*. 15 May.
- Bamberg, S., Rees, J., 2015. Environmental Attitudes and Behavior: Measurement. *International Encyclopedia of the Social & Behavioral Sciences*, 2nd edition, Vol 7. Oxford: Elsevier. pp. 699–705.
- Berners Lee, M. 2011. How bad are bananas? The carbon footprint of everything. Friesens, Canada.
- Boks, C. 2011. Design for sustainable behaviour [online]. Technoport Talks. 18 may. <https://www.youtube.com/watch?v=hFnJMrrB65s> (Accessed: 2020-02-10).
- Center for Sustainable Systems, University of Michigan. 2019. “Residential Buildings Factsheet” (Accessed: 2020-02-09) http://css.umich.edu/sites/default/files/Residential%20Buildings_CSS01-08_e2019.pdf
- Cherry, K. 2020. How Cognitive Biases Influence How You Think and Act. <https://www.verywellmind.com/what-is-a-cognitive-bias-2794963> (Accessed 2020-02-07)
- Ciotti, G. n.d. 10 Ways to Convert More Customers. <https://www.helpscout.com/consumer-behavior/> (Accessed 2020-02-14)
- Gallego Schmid, A, Jeswani, H, Fernandez Mendoza, JM & Azapagic, A , 2018. ‘Life cycle environmental evaluation of kettles: Recommendations for the development of eco-design regulations in the European Union’, *Science of the Total Environment*, vol. 625. <https://doi.org/10.1016/j.scitotenv.2017.12.262> (Accessed 2020-03-10)
- Gifford, Robert. 2015. The road to climate hell. *The New Scientist*. 11 July, 28-33.
- Habib, R, Hardisty, D, and White, K. 2019. The Elusive Green Consumer. <https://hbr.org/2019/07/the-elusive-green-consumer> (Accessed 2020-02-07)
- Kenton, W. 2019. Convenience Good. <https://www.investopedia.com/terms/c/convenience-good.asp> (Accessed 2020-01-20)
- LIVE INCITE]. 2020. BEHAVIOR CHANGE THEORY: An introduction to a behavior change theory framework. https://www.karolinska.se/globalassets/global/utveckling-och-innovation/live-incite/behavior-change_web-site-information-28112017.pdf (Accessed 2020-02-11)
- Ly, K; Mazar, N; Zhao, M and Soman, D. 2013 A practitioners guide to nudging. *Research Report Series Behavioural Economics In Action*. 15 March.
- Naturvårdsverket. 2018. Fördjupad analys av svensk klimatstatistik. <http://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6848-6.pdf?pid=23767> (Accessed 2020-04-15)
- Naturvårdsverket. 2017. Konsumtionsbaserade växthusgasutsläpp per person och år. <https://www.naturvardsverket.se/Sa-mar-miljon/Statistik-A-O/Vaxthusgaser-konsumtionsbaserade-utslapp-per-person/?visuallyDisabledSeries=b18ffb8be1a72f6> (Accessed 2020-02-20)
- Norton, MI, Mochon, D, & Ariely, D. 2011. The IKEA effect: When labor leads to love. Elsevier Inc <https://doi.org/10.1016/j.jcps.2011.08.002> (Accessed 2020-02-20)
- Paulsson Rönnbäck, Erik. 2016. WWF: Svenskarna behöver 4.2 jordklot. *Dagens Nyheter*. 27th of October.
- Sgarro, V. 2019. The tyranny of frictionless design. <https://uxdesign.cc/the-tyranny-of-frictionless-design-1325ab14432c> (Accessed 2020-01-13)
- Sharot, T. 2014. How to motivate yourself to change your behavior [online]. TEDx Talks. 28 oct. <https://www.youtube.com/watch?v=xp0O2vi8DX4> (Accessed 2020-02-10)
- Shove, E. 2003. Comfort, Cleanliness and Convenience: The Social Organization of Normality. <https://ebookcentral.proquest.com/lib/lund/reader.action?docID=243469> (Accessed 2020-01-13)
- Smetschka, B., Wiedenhofer, D., Egger Edeltraud Haselsteiner, C., Moran, D. and Gaube, V., 2019. Time Matters: The Carbon Footprint of Everyday Activities in Austria. *Ecological Economics*. Volume 164, October.
- Sveriges Konsumenter. 2017. Så kan du bidra till de globala målen som konsument. <https://www.sverigeskonsumenter.se/vad-du-kan-gora/konsumera-medvetet/globala-malen/> (Accessed 2020-02-10)
- The Sound: Exploration Strategy Innovation. 2017. The Art and Science of Changing People’s Behaviour. <https://www.slideshare.net/thesound/the-art-and-science-of-changing-peoples-behaviour> (Accessed 2020-02-10)
- UN. n.d. Sustainable Development Goals. <https://www.un.org/sustainabledevelopment/sustainable-development-goals/> (Accessed 2020-02-10)
- Willen, B. 2019. In Defense of Inconvenience. <https://designobserver.com/feature/in-defense-of-inconvenience/40056> (Accessed 2020-01-17)
- Wu, T. 2018. The Tyranny of Convenience. <https://www.nytimes.com/2018/02/16/opinion/sunday/tyranny-convenience.html> (Accessed 2020-01-13)
- Young, William, Hwang, Kumju, McDonald, Seonaidh, Oates, Caroline. 2009. Sustainable Consumption: Green Consumer Behaviour when Purchasing Products. Wiley InterScience 10 March.



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