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Staying Cool in the Face of Heat

Exploring Sustainable Everyday Climate Adaptation through Practice-Oriented Design

Master's thesis in Industrial Design Engineering

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Cover image: Sunlight shining through window blinds (generated with Copilot, 2025)

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Abstract

Climate change is already seen to cause extreme weather and climate across the world. Extreme heat events are projected to become more frequent, intensive and longer-lasting as climate change proceeds, which creates various challenges in a society adapted to a cold climate. This has been identified as a national focus area in Swedish climate adaptation, given its significant effects on societal functions, the energy system and human health, particularly in urban environments. There is an urgency to adapt on different levels of society, and the role of civil society is gaining attention. Thus, this master thesis aimed to contribute to the understanding of what household climate adaptation is, and could be, in Sweden, as this had been identified as rather unexplored.

The project used a research-through-design approach informed by practice-oriented design, focusing on everyday practices related to energy use and how these are affected by extreme heat. The combined findings from exploring varieties of the target practice in Sweden, other countries and contexts, inspired opportunities for desirable ways for households living in apartments to adapt to periods of extreme heat. Two proto-practices were developed around the idea of heat-conscious daily rhythms, building on general heat advice and sustainable ways to address urban indoor overheating. These were used to understand households' perceptions and imaginations of adaptation in future everyday life. Heat already affected households' thermal comfort and quality of life, but currently manageable by different improvised strategies. Summer was associated with temporary lifestyle shifts, often related to viewing heat and daylight as limited resources, which affected households' willingness to follow behavioural advice. Finally, opportunities both for what can be designed to support households' adaptive capacity in apartments, and a perspective on possible roles of design in household climate adaptation, were discussed.

Keywords: *behavioural adaptation; urban; overheating; household; climate change; household energy resilience; thermal comfort; adaptive capacity; heatwave; research through design*

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Before the start of this master thesis, I was completely new to the field of climate adaptation, but with the support of many people, it has been an exciting challenge with many unexpected and fascinating insights about everyday life, summertime and possible futures.

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Karolina Ekdahl

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1. Introduction

In this section, the background and aim of the project will be presented, situating the project in relation to current climate change developments. This is followed by a description of the theoretical framework, which introduces practice-oriented design, and the project point of departure, which presents important climate adaptation domain knowledge and terminology.

1.1. Background

Climate change is already seen as the cause of various extreme weather and climate phenomena across the globe, including heatwaves, droughts and heavy precipitation, with severe effects for human well-being and planetary health. There is a rapidly narrowing window of opportunity to ensure a liveable future and so-called climate resilient development, which involves both climate mitigation and adaptation actions (Lee et al., 2023).

With further global warming, it is expected that the adverse effects of climate change will intensify, while also becoming increasingly complex and difficult to manage (Lee et al., 2023). For example, the frequency and intensity of weather-related crises and disturbances are expected to increase (Regeringen, 2023). At the same time, the transition to increased electrification and diversification of the energy system may also introduce risks and vulnerabilities for the access to electricity. Meanwhile, society is becoming increasingly dependent on electricity, contributing to more severe consequences of disruptions (MSB, 2021b), both for individuals and important societal functions (Nationella expertrådet för klimatanpassning, 2022). On a household level, this implies that a future impacted by climate change could be expected to bring challenges to current ways of doing in everyday life.

Current national and international crises have cast attention to the need to create a more resilient society overall, with the three fields climate adaptation, sustainable energy transition and crisis preparedness as important dimensions. While actors in these fields offer different initiatives to support households, collaboration between them is limited and there is a risk of conflict both between initiatives and between fields. This is the focus of the ongoing research project *Household energy resilience in crisis and sustainable transition* lead by RISE, with Chalmers University of Technology and Mittuniversitetet as partners. The research project takes a wider perspective on household resilience by looking into synergies and conflicts between the three fields mentioned above. The aim is to learn how to design initiatives for enhancing overall *household energy resilience* (RISE, n.d.), a term which has been defined to explore how to ensure a good life for households in the face of different energy-related disturbances (Hasselqvist et al., 2022b).

On a global scale, climate adaptation action is progressing with increased public and political awareness of climate change risks. In addition to government action at different levels, the role of civil society and private sector is becoming evident (Lee et al., 2023). Individuals and households are, as of today, rarely considered in adaptation policies and to great extent not taking action to adapt (van Valkengoed & Steg, 2019). In Sweden, a lack of knowledge has been identified regarding the capacities of individuals and households in adapting, compared to the substantial information available about institutions (Wamsler & Brink, 2015). Consistent with this, it was identified in the early stages of the project that the household perspective on climate adaptation is still rather unexplored, revealing an opportunity that was the starting point for this master thesis.

1.1.1. Climate change risks and adaptation in Sweden

Even if global warming is limited to the levels outlined by the Paris agreement, significant effects on the natural environment and different societal sectors in Sweden are expected (Regeringen, 2023). For instance, climate change is a major concern for the safety of civil society (Nationella expertrådet för klimatanpassning, 2022), with many direct and indirect risks for human health, expected to get more serious and extensive as climate change proceeds (Folkhälsomyndigheten, 2019). Apart from health, Swedish citizens believe that climate change will also impact them personally through their economic situation, property, social contacts and leisure activities, as well as quality of life (Sonnek et al., 2012). However, it has also been found that the general perception is that climate change will primarily impact distant places, only affecting Sweden indirectly through social and economic consequences (Uhrqvist et al., 2021).

To evaluate and set a direction for national climate adaptation work, the Swedish government has appointed *The Swedish national expert council for climate adaptation*. In their report, their key messages include that there is an urgent need to take action for keeping society safe in climate change and that adaptation is required across all sectors of society (Nationella expertrådet för klimatanpassning, 2022). Some of the main challenges identified in the national climate adaptation strategy are: floods, increased temperatures, landslides and erosion, deficiencies in water supply and increased pests and diseases (Regeringen, 2023). Meanwhile, there are many barriers related to different actors' responsibility and agency for climate adaptation (Norlöf et al., 2020).

Sweden is facing a faster warming than the global average (Sjökvist et al., 2025). Over the last two centuries, particularly in the last decades, there has been a dramatic increase in temperatures. Different climate scenarios project continued warming of the Swedish climate, but the extent and severity of its effects depend on a range of factors (Nationella expertrådet för klimatanpassning, 2022). The summer season has so far seen the smallest temperature increase (Sjökvist et al., 2025), but it is projected that heatwaves will become more intensive, frequent and longer-lasting (Nationella expertrådet för klimatanpassning, 2022). This creates various challenges in a society adapted to cold weather. For example, related to overheating of indoor spaces and electrical equipment. Heat may impact societal functions such as the energy system, water provision and transportation systems (MSB, 2015), although knowledge is currently lacking about the effects of extended periods of high temperatures in Sweden (Norlöf et al., 2020). Folkhälsomyndigheten (2024a) also identifies heatwaves as the most significant climate-related health risk in Sweden, having consequences that are both highly critical and probable to occur, and that society currently has a low capacity to handle this (Folkhälsomyndigheten, 2024a).

With this background, this master thesis focused on adaptation to heatwaves and increased temperatures in Sweden. The urgency of climate adaptation, and the calls for action on different societal levels, specifically in the face of extreme heat, have motivated the formulated aims and objectives described in the upcoming section.

1.2. Aim

The aim of this master thesis was to contribute to the understanding of what climate adaptation is, and could be, from a Swedish household perspective, specifically in relation to extreme heat. Focusing on everyday practices related to energy use and how these are affected by climate change, this would complement the ongoing research project *Household energy resilience in crisis and sustainable transition*, as well as suggest a design perspective in the discussion of household climate adaptation.

1.2.1. Research questions

1. How can increased temperatures and heatwaves impact energy-related everyday practices of households in Sweden?
2. How can households in Sweden be supported to adapt to increased temperatures and heatwaves in a way that contributes to household energy resilience?
3. What opportunities for design are there in household adaptation to increased temperatures and heatwaves?

1.2.2. Project demarcations

This project focused on climate adaptation with households as the target group, revolving around the home and everyday practices. Thereby, seeing for example institutional settings and workspaces as beyond the project scope. Given the project background, it was also natural to primarily focus on practices that directly or indirectly related to energy consumption in the household.

The context was limited to Sweden, as risks addressed by climate adaptation actions are typically local and prioritised based on local conditions (Regeringen, 2023). Furthermore, by focusing on extreme temperatures and heatwaves, adaptation measures that cope with other prioritised national challenges such as flooding, landslides and ecological effects were not studied in this project.

Moreover, the project primarily studied behavioural changes, with the built environment seen as rather fixed preconditions. Thereby, not investigating aspects of long-term urban planning, construction and infrastructure, as these are often beyond the influence of households. Additionally, the project was not to measure the effectiveness or functionality of the suggested concepts, rather suggesting them as experiments for thought.

1.3. Theoretical framework

In this section, the theoretical framework that inspired the project process and approach will be described, introducing important concepts and terminology that will be used throughout the report.

1.3.1. Social practice theory and practice-oriented design

Practice-oriented design refers to design approaches which focus on practices as their fundamental unit of analysis (Kuijer, 2014). A widespread definition of a practice is: "*a routinized type of behaviour which consists of several elements, interconnected to one other*" (Reckwitz, 2002, p. 249). This definition captures that practices can be seen as consisting of interconnected elements. One interpretation of these elements that has been suggested to have relevance for design is: stuff, skills and images (Figure 1). *Stuff* concerns tangible, material elements that are used in the practice, which includes objects, infrastructures, tools and bodies. *Skills* refer to learned bodily and mental routines, including shared knowledge about what is good, normal, acceptable and appropriate and how to achieve such standards. Finally, *images* are socially shared ideas that give meaning to a particular practice and why people participate in it. This revolves around concepts such as norms, values and ideologies.

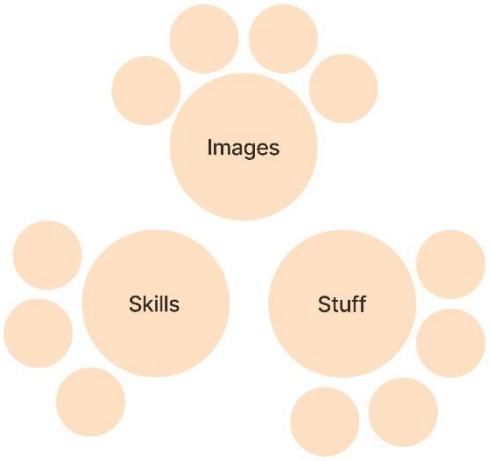


Figure 1: Representation of practice elements. Inspired by Kuijer (2014)

Between the elements there are links that are just as important for understanding the practice. Some elements or links are more important to the practice than others (Kuijer, 2014). As links between the elements are made and broken, practices emerge, persist and disappear (Shove et al., 2012), in some cases becoming a reconfiguration that works and spreads (Kuijer, 2014).

Practices can interact in different ways, for example by being performed by the same people, in the same location, in sequence to each other or by sharing images or skills. Thereby, forming looser bundles or stronger *complexes of practices*. Practices mutually influence each other, meaning that changes in one practice may lead to consequences in co-existing or co-dependent practices. In practice-oriented design, adaptation, improvisation and experimentation can be considered routine parts of daily life and point to situations where change happens. Therefore, such practices, as defined below, are seen as highly relevant for sustainable design (Kuijer, 2014):

- *Adaptation*: to adapt a configuration to fit a non-standard situation by slightly adjusting (familiar and/or unfamiliar) elements and/or links
- *Improvisation*: to creatively invent a reconfiguration in the spur of the moment of a non-standard situation with what is conveniently at hand
- *Experimentation*: to think up, try out and reflect upon a reconfiguration

Crises of routines are occasional changes in circumstances that prevent the routine performance of a practice, causing people to adapt, improvise and experiment with the practice in a way which adds or removes elements or creates new links. These can occur naturally or artificially created through different kinds of interventions (Selvefors et al., 2023).

1.3.2. A practice-oriented design process

Kuijer (2014) proposes a practice-oriented design approach to sustainable design consisting of two main phases: first an analytic phase of taking practices as a unit of analysis, and then a generative phase of taking practices as a unit of design (Kuijer, 2014, p. 183).

In *taking practices as a unit of analysis*, Kuijer (2014) suggests focusing on the three areas: tracing the historic career, exploring desirable varieties and mapping the target practice. Based on this analysis, opportunities for desirable change can be identified (Kuijer, 2014).

Tracing the historic career of the target practice has been shown to contribute with a deeper understanding for how images, skills and stuff have changed over time and what elements have proven to be most important. Furthermore, revealing that elements of the practice may not be as fixed as they appear today. Historic versions of the practice are also likely to showcase lower levels of resource consumption than current ones. While historic ways of doing cannot simply be brought back, they can serve as an inspiration for desirable and feasible directions for change. Another part of the process is to *explore similar practices*, both in space and time. Studying varieties of the target practice helps get an overview of different levels of resource consumption, which can inspire desirable reconfiguration of the target practice. It is recommended to study the details of the *target practice* after these two parts, as it helps distancing from a familiar practice, thereby possibly revealing aspects that may have otherwise been missed. This analysis usually results in an overview of how the practice relates to resource consumption and a list of core characteristics for opportunities for desirable change (Kuijer, 2014).

The opportunities identified by the process above serve as a starting point for a generative phase of *taking practices as a unit of design*. In this phase, iteratively refining the desirable reconfiguration in the three steps: suggest and trigger; facilitating performances; and combine, evaluate and refine. A practice-oriented design process has no clear end, as practices keep evolving in different directions. To make an extensive reconfiguration work, many cycles of improvisation and experimentation may be needed (Kuijer, 2014).

Suggest and trigger involves preparing increasingly refined practice prototypes. Generally, prototypes refer to physical objects, but in practice-oriented design, they can be ideas of configurations of the practice elements stuff, skills and images. These are called *proto-practices*, differing from practices in that they are yet to work and spread, but can evolve from generative to evaluative and have different degrees of fidelity. *Facilitating performances* aims to generate a variety of reconfigurations that could work, often by recruiting participants to experiment with the proto-practice and documenting the elements, links and evaluations associated with these performances. Finally, in *combine, evaluate and refine*, the findings from separate performances are combined to one narrative and it is evaluated whether the proto-practice works and reaches the desired levels of resource consumption. The proto-practice is refined and another cycle of started (Kuijer, 2014).

1.4. Point of departure

In this section, some fundamental concepts and terminology related to climate adaptation, risk and vulnerability will be defined. This will be followed by a description of factors that contribute to risk and vulnerability specifically in extreme heat, and related demographic trends in Sweden.

1.4.1. What does it mean to "adapt" to climate change?

The IPCC defines *adaptation* as "*the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities*" (Möller et al., 2022, p. 2898). The ability of a system, institution or human to do so is called *adaptive capacity*. *Adaptation options* refer to the strategies considered appropriate for addressing adaptation, including structural, institutional, ecological, or behavioural actions (Möller et al., 2022). Adaptive practices, on both an institutional and individual level, include hazard reduction and avoidance, vulnerability reduction, preparedness for response and preparedness for recovery. Institutions can support individuals by reducing the risks directly or by improving their ability to reduce the risk themselves (Wamsler & Brink, 2014b). An *adaptation gap* occurs when there is a difference between implemented adaptation and the targets set by society. *Coping* is about using available skills and resources to handle adverse conditions (UNISDR, 2009), aiming to achieve "*basic functioning of people, institutions, organisations and systems in the short to medium term*" (Möller et al., 2022, p. 2904).

Maladaptation refers to actions that may increase the risk of negative consequences, such as an increase in greenhouse gas emissions or vulnerability (Möller et al., 2022). Globally, there is strong evidence of climate change maladaptation in different sectors and regions. Actions that address isolated risks and have a short-term perspective often cause maladaptation, leading to lock-ins of vulnerability, exposure and risks that may be difficult to change (Lee et al., 2023).

1.4.2. Climate resilient development

The IPPC suggests *climate resilient development* as a pathway that involves both mitigation of climate change and adaptation to its effects, enabling sustainable development for all. Increasing global warming may limit the feasibility and effectiveness of current adaptation options (Lee et al., 2023). Ultimately, there are limits when adaptation will come at very high social, economic and environmental costs, or no longer be possible due to the magnitude of climate change (Klein et al., 2007). The Swedish government has defined ten guiding principles for national climate adaptation. For example, emphasising the importance of sustainable adaptation options and avoiding conflicts with interventions for reducing climate impact (Prop. 2017/18:163, 2017).

Equity, justice and inclusion are brought up as important priorities in climate resilient development (Lee et al., 2023). Justice aspects have more recently gained international recognition in the context of climate adaptation, such as in the Paris agreement and the new EU strategy for climate adaptation. Climate change effects are exacerbating already existing inequalities, and if not considered in climate adaptation, certain groups may be particularly vulnerable to further negative consequences (Nationella expertrådet för klimatanpassning, 2022) and excluded from benefiting from adaptation measures (Granberg & Glover, 2021). For example, posing questions such as who is most affected, who can adapt their property and who has the privilege of being able to escape their hot apartment in a heatwave (Nationella expertrådet för klimatanpassning, 2022). In general, there is a tendency that older people, children, groups of low socio-economic status and individuals with health conditions are more vulnerable to effects of climate change (European Environment Agency, 2022).

1.4.3. Factors of heat risk and vulnerability

Heatwaves can affect anyone, but some groups are identified as particularly vulnerable (Anderson et al., 2013), summarised in Figure 2. *Vulnerability* refers to a predisposition for adverse effects, and includes for example *sensitivity*, which is susceptibility to harm, and lack of adaptive capacity (Möller et al., 2022). Various factors can influence the level of adaptive capacity in the groups identified as vulnerable, including receptivity to adaptation and mitigation options, perceived heat risk and available skills and resources for coping (Guardaro et al., 2022).

Age and pre-existing medical conditions contribute to more severe health effects of extreme temperatures (WHO Regional Office for Europe, 2021). Numerous studies have shown that the older population, usually defined as above 65 years old, are one of the most vulnerable groups. This is largely due to pre-existing diseases, but also due to reduced ability to regulate the body temperature. Reduced physical or mental health have been shown to affect sensitivity to heat (Folkhälsomyndigheten, 2022b). Research suggests that aspects such as being confined to bed, not leaving the home, and not being able to care for oneself contribute to higher risks of heat (Bouchama et al., 2007). This could be related to compromised environmental awareness and inability to engage in adaptive behaviours (Lõhmus, 2018). Children are another sensitive group due to physiological attributes and because they need help taking care of themselves (Folkhälsomyndigheten, 2022b). Pregnancy has also recently gained attention as a risk factor in extreme heat (Nationella expertrådet för klimatanpassning, 2022).

Exposure is another important part of risks related to climate change impact. It is about being present in settings that could be adversely affected (Möller et al., 2022). Urban areas generally experience higher temperatures than surrounding areas due to a well-studied phenomenon known as the *urban heat island effect*, which can be particularly problematic during heatwaves. Materials such as concrete and paving absorb energy from sunlight during daytime, and released it as heat slowly at night (Heaviside et al., 2017). Other contributing factors include emissions from vehicles, industrial and commercial activities, air-conditions, and a lack of vegetation (WHO Regional Office for Europe, 2021).

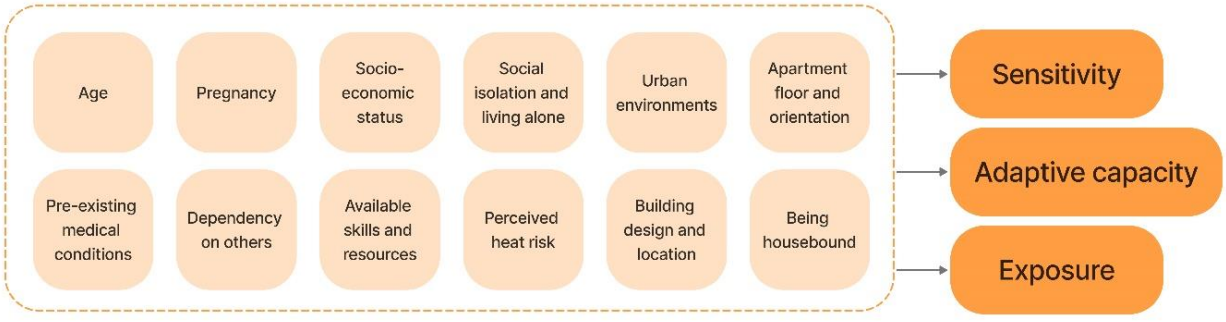


Figure 2: Examples of factors that may contribute to heat vulnerability, as identified in literature

More research is needed to understand the relationship between indoor and outdoor temperatures, but in general there is a correlation (WHO Regional Office for Europe, 2021). Factors such as the placement, orientation and material properties of the building, as well as window design and isolation, can affect indoor temperatures (Folkhälsomyndigheten, 2019). However, the temperatures that people are exposed to indoors can become significantly higher than the meteorological conditions outdoors (SMHI, 2011). Living in upper floors, south-facing apartments or with inadequate ventilation have been identified as risk factors for heat-related illness (Anderson et al., 2013). Literature suggests that the indoor temperature is more important in assessing health risks than the outdoor temperature. One explanation is that people spend a large portion of their time indoors, meaning that the indoor temperature more realistically represents exposure to heat (van Loenhout et al., 2016). However, availability of such information is generally low globally, and therefore outdoor temperatures are often used to describe health risks (WHO Regional Office for Europe, 2021).

Research is inconclusive about how socio-economic status impacts heat risks, with evidence being even less clear in the European context. Studies in Sweden suggest that the effects of heatwaves may differ because of socio-economic status, with the most affluent neighbourhoods facing lower risks (Oudin Åström et al., 2020). Low socio-economic status can also be connected with other risk factors, for example chronic disease or substandard housing (Kovats & Hajat, 2008). Living alone or in social isolation are also identified as possible risk factors (Anderson et al., 2013). Furthermore, certain occupational groups are at risk of exposure to heat for longer periods, especially in roles with physical work and requirements on protective clothing (WHO Regional Office for Europe, 2021).

1.4.4. Demographic trends in Sweden

Over the last century, Sweden has seen a strong trend of urbanisation. The increase of the urban population has now slowed down, having stabilised at around 88 percent of the total population in 2020 (SCB, 2020). However, urbanisation is acknowledged as one of the global megatrends, and is expected to continue both globally and in Sweden (Nationella expertrådet för klimatanpassning, 2022). Since 2015, there has been an increase in the population density in urban areas, which is explained both by more people living in existing buildings and the construction of new buildings (SCB, 2020).

To meet the needs of a growing population, construction of new housing is necessary. Densification – rather than letting a city spread over a larger area – is often promoted because of its benefits for urban mobility, but also comes with disadvantages from a heat adaptation perspective as it means less vegetation and more hard surfaces (Folkhälsomyndigheten, 2019). In urban areas, about 52% of the population lives in multi-family residencies. In different parts of Sweden, this proportion ranges from 35 to 65% (SCB, 2020).

Meanwhile, Sweden is seeing an ageing population, with a projection that in 2050, roughly 30% of the population will be more than 60 years old (SCB, 2023), which in combination with urbanisation and increased temperatures are factors that are expected to contribute to increasing health consequences in Sweden (Folkhälsomyndigheten, 2024a).

2. Process and method

In this section, the project process and method will be described. First, an overview of the project approach and phases will be provided, followed by a more comprehensive account of the different activities and their specific methods.

2.1. General approach

A *practice-oriented design approach* was chosen because it was thought to contribute with an interesting perspective on climate adaptation on the household level. It has been suggested that impacts of climate change act as a stimulus for changes in households' everyday practices (Ferenčuhová, 2022). Meanwhile, a previous study has found that people believe that climate change effects will primarily impact far-away places, distant from everyday life in Sweden (Uhrqvist et al., 2021). Practice-oriented design was seen as a way to understand and address this gap. Additionally, the research project lead by RISE took a practice-oriented perspective, and it was seen as valuable to share a common frame of reference.

There are many household practices within and outside of the home where it has already been identified that challenges may arise due to disruptions in the energy system (Hasselqvist et al., 2022a). Related to this, the research project also used the term *household energy resilience*, defined in previous research to explore how to ensure a good life for households in the face of different energy-related disturbances (Hasselqvist et al., 2022b). Exploring what disruptions households could be expected to handle in the face of heat elaborated on these ideas. A focus on practices may also help redirect discussions to how more sustainable practices, both new and familiar, can emerge and fulfil needs differently in the future (Davies & Doyle, 2015), with everyday life as an important sphere for developing simple and environmentally friendly practices in response to climate change (Ferenčuhová, 2022).

The project also used a *research-through-design* approach, where design activities play a part in generating knowledge about a certain context. Typically, this involves the development of a prototype or artifact that opens up for interactions not possible before (Stappers & Giaccardi, 2014). Design-based speculation is an approach to re-imagining everyday life, often using of artefacts that are not developed as solutions with actual technical performance, rather as support for people to suspend disbelief and formulate stories (Broms et al., 2017). This was found to be suitable since the project was about a topic characterised by uncertainty (Nationella expertrådet för klimatanpassning, 2022) and investigating a possible future, not yet experienced by the participants. In general, also primarily focusing on gathering qualitative information, to give a more personal voice to the household perspective.

2.1.1. Main phases in the process

The practice-oriented design approach proposed by Kuijer (2014) was used as a framework for the project. The different slots in the proposed process were filled with activities aimed at answering the research questions and fulfilling the project-specific objectives, which will be outlined in this section. Notably, it was not defined at the start of the project what the practice to reconfigure was. Instead, this came as a result of an explorative and iterative process of gathering information, analysing and gradually narrowing down the scope. Therefore, some parts of the general practice-oriented design process were added once a clearer focus had been found. As seen in Figure 3, there were two main phases (Section 2.2 - 2.3 and Section 2.4 - 2.5 respectively), with the identified opportunities for desirable change as a key milestone.

The first objective was to explore how households' current ways of doing might be affected by increased temperatures and heatwaves. This part of the project consisted of a theoretical study of the effects of climate change on households – today, in previous extreme events, in other contexts with other climates, and projections of the future – and which factors contribute to households' adaptive capacity and vulnerability in extreme heat. Through this exploration, major delimitations in the project scope emerged, for example the focus on heatwaves and increased temperatures in urban contexts, primarily looking at people living in apartments and a younger target group. Furthermore, studying existing initiatives, promoted advice, and improvised strategies for coping with heatwaves, which was inspired by the phase Kuijer (2014) refers to as *taking practices as a unit of analysis*. To zoom in on the experiences of Swedish households, workshops were conducted, where participants contributed with their existing strategies for coping with heat as a *crisis of routine* in the past. The results were analysed, revealing patterns in how current everyday practices might change due to a hotter climate, and opportunities for new, sustainable practices to emerge. Additionally, an exploration of practices from alternative subcultures helped inspire the next part of the project.

The second objective was to suggest concepts aimed at households for adapting to heat, based on the identified opportunities for desirable change. The second phase revolved around generating ideas and concepts for new, sustainable ways of coping with the effects of extreme heat, inspired by the phase Kuijer (2014) refers to as *taking practices as a unit of design*. This was a process of alternating between diverging and converging the design space based on a set of evaluation criteria and additional findings about the current and target practice. In the end, two proto-practices that addressed household climate adaptation were developed and visualised to facilitate performances. A study with households was then conducted, with the proto-practices as a starting point for discussion about households' perceptions of everyday life in future summers and identifying "frictions" with promoted adaptation strategies. Finally, reflecting on whether the suggested reconfigurations have the potential to work and synthesising the project insights, as a part of a third objective of evaluating how the concepts could contribute to household climate adaptation. Throughout the project, also working with an overarching fourth objective of identifying needs of households in relation to adapting to heat.

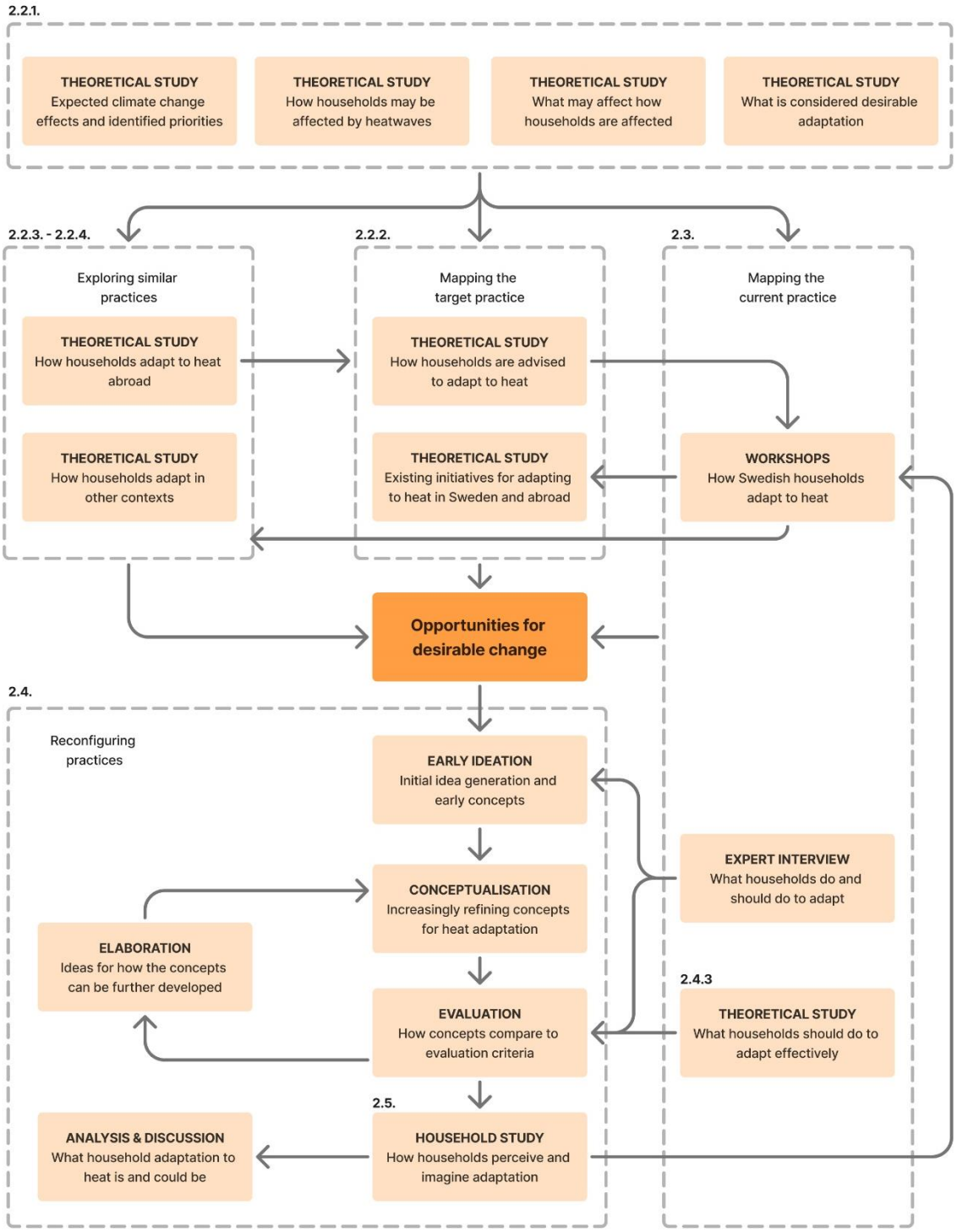


Figure 3: Overview of project process, phases and activities, inspired by the practice-oriented design process proposed by Kuijer (2014). Number references refer to subsections in section 2.

2.2. Exploring and analysing practices

In this section, the process and method of the initial theoretical parts of this study will be presented. It will start by describing the starting point of the project and then outline the steps of exploring and analysing practices of adaptation on a household level in different countries and contexts.

2.2.1. Finding a point of departure

To get situated in the topic of climate adaptation, the first part of the project was a theoretical pre-study of an explorative nature. This work consisted of reading through a range of publications from key stakeholders, on an international, national and regional level. For instance, reports from SMHI, MSB and Folkhälsomyndigheten, and in particular the report by the appointed Swedish national expert council for climate adaptation (Nationella expertrådet för klimatanpassning, 2022) and the national government action plan for climate adaptation (Regeringen, 2023).

From there, heatwaves and increased temperatures were identified as an area to focus on, having evident energy-related aspects and high relevance for the Swedish context. It was also seen as most closely related to understanding and improving the future everyday life of households, given that it acts as a more silent threat than other climate change effects (Zografos et al., 2016). This area was then explored further, aiming to answer four main questions:

1. What changes are expected in Sweden in terms of heatwaves and increased temperatures?
2. What direct and indirect effects could heatwaves and increased temperatures have for households?
3. What factors affect how households are impacted by heatwaves?
4. What can be considered desirable pathways for adapting to heat?

To answer these questions, a variety of sources were used, ranging from academic papers and government reports to more informal and journalistic sources such as books, podcasts and documentaries that discussed extreme heat. Key findings referred to previously experienced heatwaves in Europe, such as those of 2003 and 2018, but also life in countries where hot weather is part of the normal climate.

The informal sources were included as they were thought to act as means of getting more personal accounts of how heat affects everyday life. Although not a complete replacement for first-hand information in the form of interviews, this served to provide more close-to-life and emotionally charged insights of what it is like to live with extreme heat. On the other hand, the more scientific and academic sources, primarily located using Google Scholar, contributed to finding relevant terminology and concepts, as well as a more comprehensive and objective perspective. Specifically, the aim of the fourth question was to identify possible maladaptation and lock-in solutions to avoid in reconfigurations of practices. To get an overview, international and national reports and strategies were used, locating guiding principles, together with research on the consequences of different household adaptation measures.

2.2.2. Mapping the target practice

Having built a foundation of how heatwaves may impact everyday life, the next step was to understand the practices of coping with extreme temperatures, as adapted from Kuijer's (2014) suggestion to map the target practice. Although there have been experiences of extreme heat in Sweden, such as the summer of 2018 which gained much attention in the Swedish public discourse (Shehata et al., 2022), there are many examples of long-lasting heatwaves internationally with significant effects on society (MSB, 2014). Thereby, literature and other sources from other parts of the world were considered important. This part of the study had two main questions:

1. What are households advised to do in response to heatwaves?
2. What initiatives that support households to achieve this exist in Sweden and abroad?

At this point, the target group was still framed broadly, having found that direct and indirect effects of increased temperatures and heatwaves could affect practically all households to some extent (see Section 3.1). In some cases, as a direct threat to health, and in other cases more as an inconvenience. However, focusing on urban environments, as these were identified as especially susceptible to overheating (MSB, 2024).

Mapping behavioural heat advice aimed at households

For the first part, three countries, in addition to Sweden, were chosen, and the contents of recommendations aimed at households for coping with heat were collected. The idea was to understand the prioritised practices for wellbeing in hot weather. Both Australia and the UK were chosen as it was expected that the information provided to the public was in English, taking away the risk of misinterpretation in translation. However, for their attention in media for extreme temperatures (e.g. (Manieri, 2025)), Spain was also seen as interesting to include. Information which was in another language than Swedish or English was roughly translated using Google Translate, meaning the exact wording is not as in the original source, and therefore used sparingly. The analysis was later expanded to include more countries, such as the Netherlands and France, as they came up as examples in literature, and were discovered to have a low proportion of homes with air-conditioners (WHO Regional Office for Europe, 2021), implying that public advice could be centred around other means of staying cool.

The advice was collected in a digital workspace and sorted in a thematic analysis to reveal clusters. This way, patterns in what the public was asked to do in response to extreme temperatures, which was seen as one version of the target practice, were identified. However, given that the success of adaptation actions is dependent on the context they take place in (van Valkengoed & Steg, 2019), and that desirable practices are not directly transferrable to other settings (Kuijer, 2014), the target practice also needs to be defined locally. For example, some recommendations are dependent on the climate and not necessarily appropriate or effective everywhere, and thereby interventions should be tailored local conditions (WHO Regional Office for Europe, 2021). Furthermore, the advice was analysed from a practice-theoretical perspective, deconstructing them into images, skills and stuff. Some sources relating specifically to apartments were identified after it was decided to focus on this context and were therefore not part of the original analysis but included in the results. For the report, results were further summarised in table form (Table 5, p. 38), creating an overview of the various advice prescribed to households.

Mapping organised initiatives for adapting to heat

It was seen as beyond the scope to address political interventions and policy in this project. However, exploring and analysing existing adaptation actions and initiatives and what they ask from households, with the intent to inform design, was a key part of the process. An *initiative*, for this project, was seen as any means of reaching out to, involving and supporting households to prepare for, maintain or adapt everyday life in the heat. Thereby, initiatives represented the interaction between the societal and individual level. This partly overlapped with the activity described in the previous section of collecting behavioural advice. While that part focused on the target practice in terms of *what* behaviours were considered desirable, this part of the study focused on *how* different actors approach this.

In this phase, existing and planned initiatives for household heat adaptation, both in the Swedish context and abroad, were searched for to identify examples of what form it could take, how it reached households and the terms of participation. The search started by looking at initiatives in Sweden, to get an idea of the current state of heat action planning and what gaps there might be. Some initiatives with other target groups than general households were also looked at briefly. For example, related to contexts such as elderly care and social services.

As described previously, extreme heat is a relatively unfamiliar phenomenon in the Swedish context, so to broaden the perspective, a selection of other countries was considered. This also aligns with WHO (2021), who conclude that as a part of improving heat-health adaptation planning, best practice evidence and sharing of experiences is essential (WHO Regional Office for Europe, 2021). The countries included were primarily English-speaking, as initiatives in other languages were hard to find and ensure that they were correctly understood. However, some examples were found through references written in English. The results presented refer to initiatives from for example Australia, Spain, USA, Canada and Austria. The exploration was unstructured, but examples of search keywords included the topics “heat action plan”, “adapting to heat” and “heatwave response” and the target group “citizen”, “household” and “public”. The search was conducted on Google.

The identified initiatives were collected in an Excel spreadsheet, and described in terms of name, type, geographical region, function and contents. This was a living document, where new findings were added throughout the project. It is noteworthy that there was a screening process when documenting the initiatives, meaning that it does not comprehensively represent global heat action. The results were then summarised in a diagram (Figure 14, p. 42), grouping initiatives into broad categories to serve as inspiration for idea generation, as well as input for the discussion on household climate adaptation.

2.2.3. Exploring practices in other countries

Apart from the organised initiatives, improvised adaptations were also considered important for understanding the practices of coping with heat. These represent creative, spur of the moment reconfigurations of practices to unfamiliar situations (Kuijer, 2014) and have been found to reveal opportunities for managing heat without depending on electricity (Yáñez Serrano et al., 2023). This part of the process was adapted from Kuijer’s (2014) recommendation to explore similar practices and gain insight into less resource intensive varieties of practices. Experiences with heat in other countries were collected from both academic papers, as well as informal sources such as documentaries, blogs, websites, social media and podcasts. This range of impressions contributed to identifying and interpreting practice elements for the next phase of the project. The results in

Section 3.3.1 refers to four recent qualitative studies (Aghababaeian et al., 2024; Ferenčuhová, 2022; Robertson et al., 2024; Yáñez Serrano et al., 2023) situating the practices in a contemporary setting. The studies were from four countries in separate parts of the world and participants represented different demographics. Additionally, a non-fiction book (Rosengren, 2022) on encounters with heat in different countries was used, capturing the Swedish perspective. It is important to note that the descriptions should not be seen as a comprehensive and representative account of the practices of dealing with heat in a specific country, more as selected elements that sparked inspiration.

This part of the study partly overlapped with mapping the effects of heat, but here focused on what households do in response to the extreme temperatures and identifying the core elements of these practices. Indirectly, this part of the research also touched upon historic ways of doing, as a result of existing sources referring to past heat events and participants belonging to older generations. Tracing the historic career of a practice is another part of the proposed approach by Kuijer (2014), but it was only explored briefly and unsystematically in this project.

Some experiences of climate adaptation in other countries also resulted from the workshop, presented in Section 3.4.1, although these were unexpected and from a Swedish point of view. Among these impressions, some elements stood out as particularly promising for inspiring desirable reconfigurations of practices in the Swedish setting, based on the identified pathways for sustainable climate adaptation. These were later used as inspiration in the phase of suggesting and envisioning proto-practices.

2.2.4. Exploring practices in alternative subcultures

Apart from exploring desirable varieties of practices directly related to responding to heat, it was considered interesting to look for inspiration in ways of doing in alternative, contemporary subcultures, beyond the climate adaptation context. This part of the process was another form of exploration of similar practices, as inspired by Kuijer's (2014) proposed approach. To identify promising subcultures, a small sample of trend reports based in Sweden were collected and compared. Additionally, the workshop and previous research contributed to the outlook. Initially, four subcultures were included in the analysis: summer-housing lifestyles, outdoor lifestyles, lifestyles related to recreational vehicles, and the homesteading movement.

Kuijer (2014) suggests literature as the first source to look for information when investigating foreign or subcultures. These subcultures were therefore explored through different sources, both from relevant actors in the subcultures, such as websites and books, and academic literature that took a broader, external standpoint. Both practices in Sweden and internationally were part of this exploration. Findings were collected in a digital inspiration board. The subcultures and identified key practices were analysed from a practice-theoretical perspective. Thereby, extracting interesting images, skills and stuff that could be used as inspiration when reconfiguring current practices of adapting to heat. This was done in table form. Out of the four subcultures, two that seemed the most promising were picked out: summer-housing lifestyles and outdoor lifestyles. These were further explored using imageboards. Representations of the key practices and practice elements were collected from for example Pinterest. Quotes and additional information were gathered from academic literature, books, websites, blogs and documentaries, to deepen the understanding of images, skills and stuff to be inspired by in the upcoming ideation.

2.3. Mapping current everyday heat adaptation

This part of the project aimed to map ways in which Swedish households currently respond to hot weather conditions, which was defined as the current version of the target practice for this project. Kuijer (2014) suggests mapping the target practice to understand the relation between the configuration of practice elements and the practice's level of resource consumption. Based on this, the idea was to understand if, and in what way, heat triggered creative reconfiguration of elements and links in everyday practices, and what know-how existed that could be built on. The following questions were formulated for this part of the process:

1. How do Swedish households currently respond to heat?
2. What does this mean for everyday practices and resource consumption?
3. What opportunities for desirable change can be found in existing practices?
4. What factors can be found that contribute to households' adaptive capacity?

2.3.1. Workshops on heat in everyday life

As this part of the study was done in the late winter season, it was not possible to do in-context observations that informed about how households respond to heat. Instead, to collect a wide range of performances of adaptation practices, and identify their respective elements, a set of workshops were conducted. These framed past experiences of heat as *crises of routine*.

Participant recruitment and selection

For this study, participants were students recruited from the programs Industrial Design and Architecture at Chalmers, listed in Table 1 below. The participants were thought to be, in general, a group which has faced major lifestyle changes due to starting university recently. Thereby, possibly having experienced recently what Selvefors et al. (2023) refer to as naturally occurring crises of routines, which could contribute with interesting insights related to improvisations in practices. The competencies within product and service design and architectural features, respectively, were also considered potentially interesting perspectives on coping with heat. In total, three workshop sessions were conducted. Each session had 2 – 3 participants, as this was thought to grant each participant sufficient time to discuss the themes described in the next section, while also allowing the interviewer to be present to listen and ask follow-up questions.

Group	Participant	Age	Household size	Housing type
1	P1	23	1	Apartment
	P2	24	3	Apartment
	P3	26	2	Apartment
2	P4	21	4	Apartment
	P5	25	1	Apartment
	P6	19	4	Detached house
3	P7	26	2	Apartment
	P8	26	2	Apartment

Table 1: Overview of workshop participants

Study structure and content

For the participants, the study consisted of two main parts: a workbook and a workshop. A digital workbook was sent out prior to the workshop with the aim to sensitise the participants to the topic. Sensitising activities can play a part in reaching deeper levels of knowledge (Sanders & Stappers, 2012), which was seen as a way to support participants in thinking about their current summer life, outside of the summer season. A specific objective was to broaden the idea of what an

“adaptation” could be in everyday life, as it was suspected that the word would be perceived as technical or unfamiliar. For example, a study on household responses to climate change showed that households adopt various kinds of adaptations to climate change, without framing them as such (Ferenčuhová, 2022). This part of the study was also inspired by Kuijer (2014), who highlights that workbooks can be used to support empirical studies. Some of the workbooks were collected before the workshop, but they were not analysed specifically. The workbook contained tasks designed to be more engaging and mediating than just answering questions. The three tasks, also seen in Figure 4, were:

- Shopping list – related to thinking about relevant material objects and their use (4.1)
- Activity – related to thinking about skills, places and temporal aspects (4.2)
- Recipe – related to thinking about everyday practices and their relation to seasons (4.3)

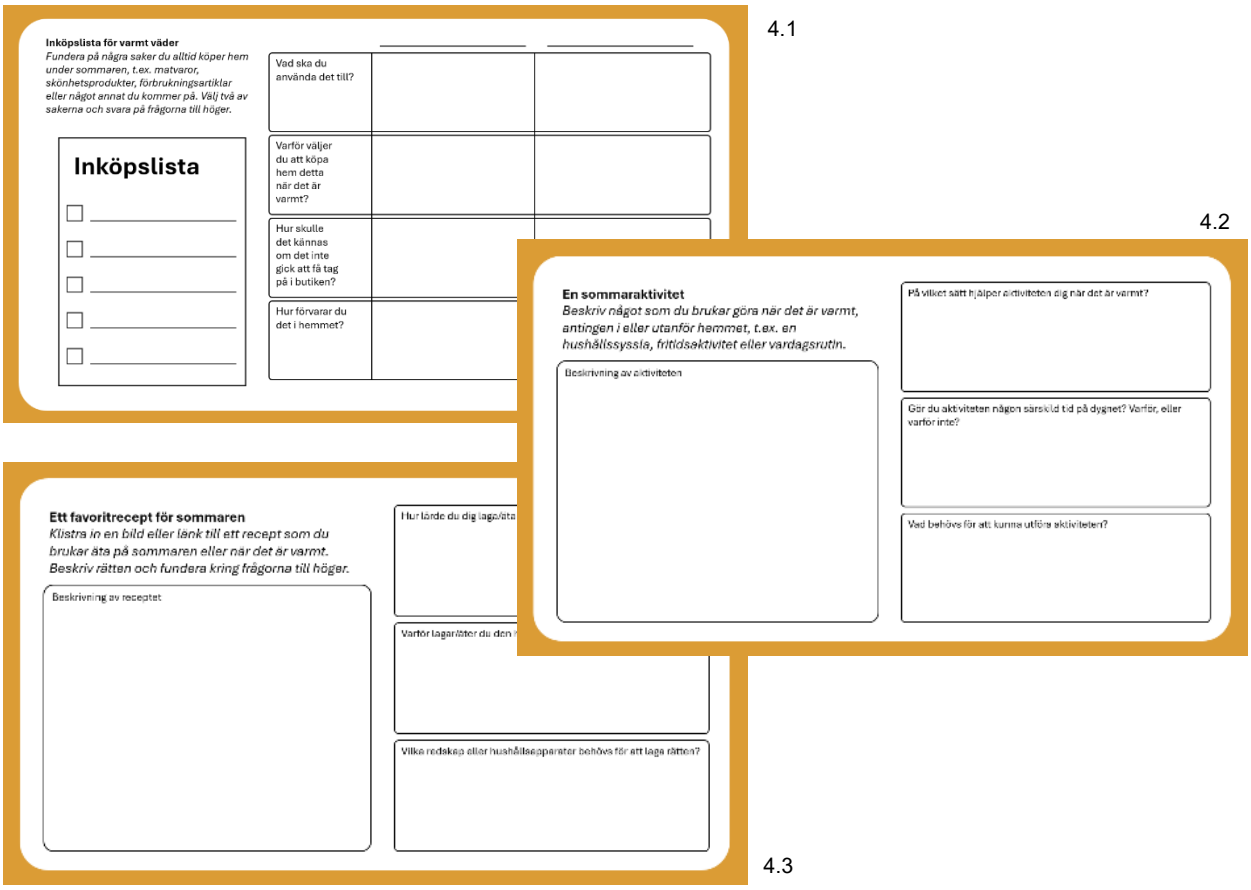


Figure 4: Workbook pages with the three preparation tasks

The workshop format was semi-structured, allowing room to adjust the timings and questions according to the discussions that emerged, as the aim was to collect rich qualitative information. However, all workshops followed a general structure, each lasting about an hour. At the beginning of each workshop, participants filled in a digital form with information such as age, educational program, household size and type of housing, as well as consent for using their data in the study. Results are partly presented in Table 1.

The main part of the study was alternating rounds of brainstorming and discussion. First, a warm-up round about general associations and emotions related to summer and hot weather. This was followed by seven rounds related to aspects of daily life in hotter weather:

- Keeping the home a comfortable temperature
- Keeping oneself a comfortable temperature
- Cooking, eating and drinking
- Sleeping well
- Changing routines around activities and chores
- Coping with power disturbances
- Other adaptation responses

These aspects were inspired by both the topics that behavioural heat advice addressed, and the theoretical study of experiences of heat in other countries. To probe participants and frame climate adaptation in a more relatable way, the above aspects were also shown as questions or prompts entered in an online search engine. Participants were given approximately 3 minutes for each topic to write their responses in a template with empty boxes, as illustrated in Figure 5. This approach was chosen to prompt the participants to describe a greater variety of performances, as well as make handling and documenting the responses easier. A pilot test had been carried out to test the wording and set a suitable timeframe for ideating on each topic. Following the pilot test, questions were adapted and the structure of the workshop finalized.

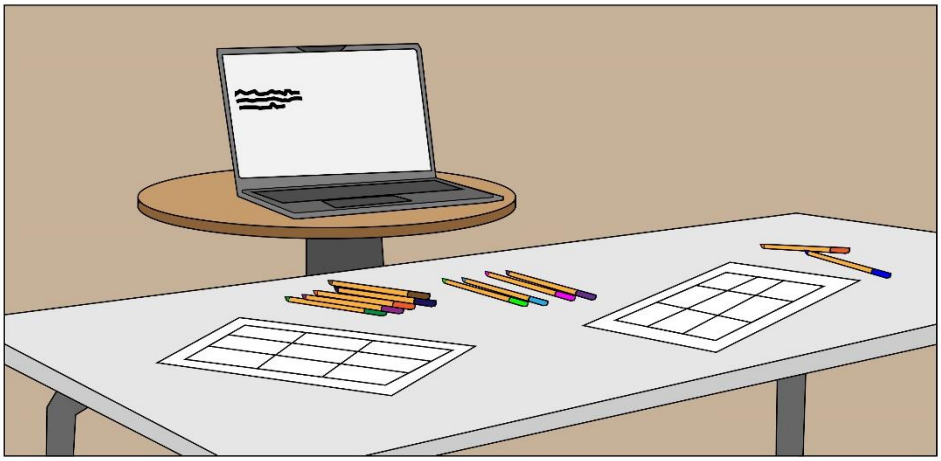


Figure 5: Illustration of workshop set-up and materials

Furthermore, for the discussion, the participants were asked to present a few of their solutions. In the first group, participants chose three ideas at the end of the workshop that they considered the most important. For the other two groups, this was modified to focus the discussion and ensure all the above aspects were addressed more equally. Therefore, asking participants to choose one solution to present in each round instead. Probing questions were asked to understand why the different strategies were used, in what ways they helped, and how the participants experienced living with these adaptations. Furthermore, encouraging participants to build on each other's stories and reflect on similar experiences of their own.

Analysis of the workshop

The workshops were recorded by audio and photography and later transcribed manually. The transcription was then read in detail and relevant quotes related to images, skills and stuff of various practices drawn out. The templates filled in by the participants were ordered and stapled, keeping track of who came up with what responses and related to which topic. Quotes and responses were transferred into a digital workspace and sorted through a thematic analysis, revealing clusters of strategies for coping with hot weather. The quotes from participants, provided in the results, have been translated from Swedish. The everyday practices and their relationships were also visualised in a diagram (Figure 17, p. 56).

These findings were then used to deconstruct households' practices into their elements, which was summarised in table form. Apart from the practice elements, the table included comments on the direct and indirect effects of heat on the practice, and any relevant changes in the summer not caused by heat. The most promising strategies of adaptation were marked as opportunities for desirable change. This analysis was based on previous findings about "desirable" climate adaptation, for example related to the concept of energy resilience and synergies with promoted behaviours from heat advice.

2.3.2. Expert interview

Having found that the type of dwelling – primarily apartment or house – could be important for households' adaptive capacity, it was decided to focus on apartments. For example, it was considered interesting that this target group in general may have less influence over the built environment, less space and limited access to outdoor spaces. Additionally, type of dwelling has been identified as important in analysing energy consumption in the home (Lindén, 2008).

To contribute with contextual knowledge about indoor thermal climate and energy matters related to housing in urban environments and apartments, a public housing company was contacted for an interview. An energy and environmental manager (P9) was interviewed in a digital, semi-structured interview of about one hour. An interview guide was prepared with questions mostly related to the following themes:

- Effects of summer heat on the indoor thermal climate in apartments
- Most important technological and behavioural interventions to maintain a comfortable indoor thermal climate in apartments
- Experiences of indoor overheating in apartments in previous extreme heat events
- Thoughts about current and future climate adaptation in apartment context

The interview was held in Swedish. It was recorded, and later transcribed and coded, focusing on insights related to the means of households in apartments to influence their indoor thermal climate, the adaptation gaps and opportunities to explore through design. Quotes in the result section (Section 3.4.2) have been translated. The material was analysed, compared with previous findings and key takeaways were summarised in written form. The findings were later used in the concept elimination process and as a support in developing the proto-practices.

2.4. Suggesting and envisioning practices

This section will describe the iterative process of developing increasingly refined concepts for reconfiguring households' everyday practices in response to heat. The insights from the previous parts of the study were used as a starting point for taking practices as a unit of design, as inspired by Kuijer's (2014) practice-oriented design process.

2.4.1. Evaluation criteria

As a foundation for the idea generation, a set of evaluation criteria were formulated, as seen in Figure 6. These related to three different dimensions:

- Project criteria – relating to the specific thesis project
- Solution criteria – relating the effectiveness of the concepts in the target context
- User criteria – relating to the acceptability of the concepts

Within these categories there were multiple criteria developed based on the objectives and approach of the project. For instance, aiming for using some form of prototype as part of the research process. The vision for the concepts was that they should mirror an unfamiliar, but not unthinkable, future and feel relatable for the household, yet spark discussion about current and future practices of everyday life.

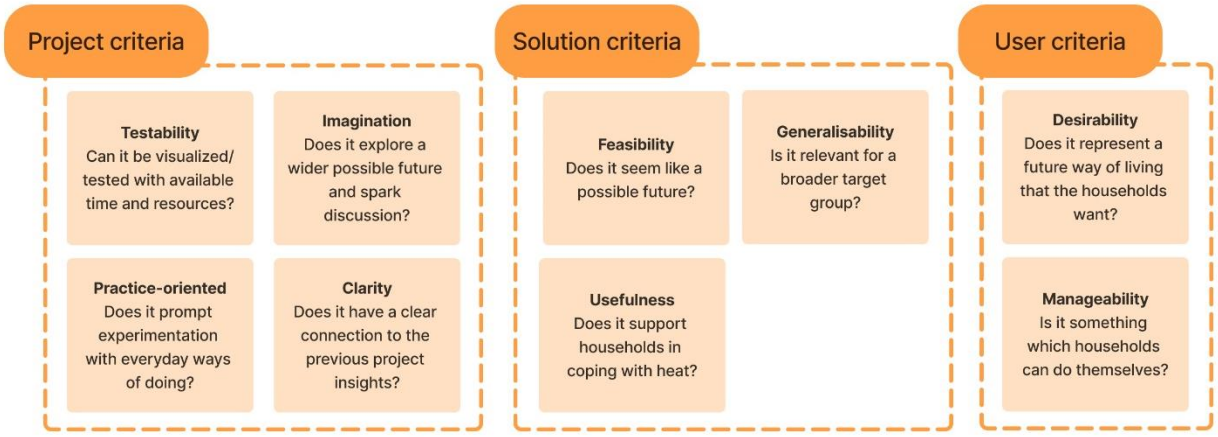


Figure 6: Evaluation criteria for concept development and elimination

These criteria were then used in different combinations for concept elimination in different stages of the ideation process, depending on what was most important to evaluate and what knowledge was available at the time. The method was a version of an elimination matrix where the concepts in question were ranked on a scale of 1-5 on the relevant criteria, and sums calculated. The results were then analysed and commented, resulting in a decision of eliminating or continuing with a certain concept, or incorporating elements of it in other concepts. As for the user criteria, these were not used in elimination, as users were not directly involved in this process, but served as an inspiration for the evaluation scales used in the household study (Table 4). However, such aspects were closely related to the solution criteria.

2.4.2. Ideation and conceptualisation

The next step was to explore ideas for reconfiguring household practices towards sustainable heat adaptation. The starting point for ideation was reconfiguring the practices of summer everyday life to tolerate more extreme temperatures, aiming to ensure good health and quality of life without creating a dependency on electricity, unsustainable technologies or lock-in solutions. This way, aligning with objectives of desirable climate adaptation, as described in Section 1.4.2 and 3.2.3. An overview of the ideation and conceptualisation process is provided in Figure 8.

The initial ideation was structured around the clusters of everyday practices identified in the workshop (Section 3.4.1) and the behavioural advice to the public (Section 3.2.1). Additionally, taking inspiration from the range of organised and improvised adaptations to heat in different settings and other promising elements from alternative subcultures. This was adapted from the suggestion that desirable practices "*can form a source of inspiration for how the practice can be configured differently*" (Kuijer, 2014, p. 61). Figure 7 below illustrates how these components were used to structure and inform ideation. The objective was to explore the design space as much as possible, to provide diverse perspectives on what household adaptation could be in apartment contexts. Specifically, it was considered interesting how people living in apartments could take a more active role in climate adaptation regardless of limitations in what could be changed about the built environment, and how behavioural advice could be made more contextualised, personalised and everyday-integrated.

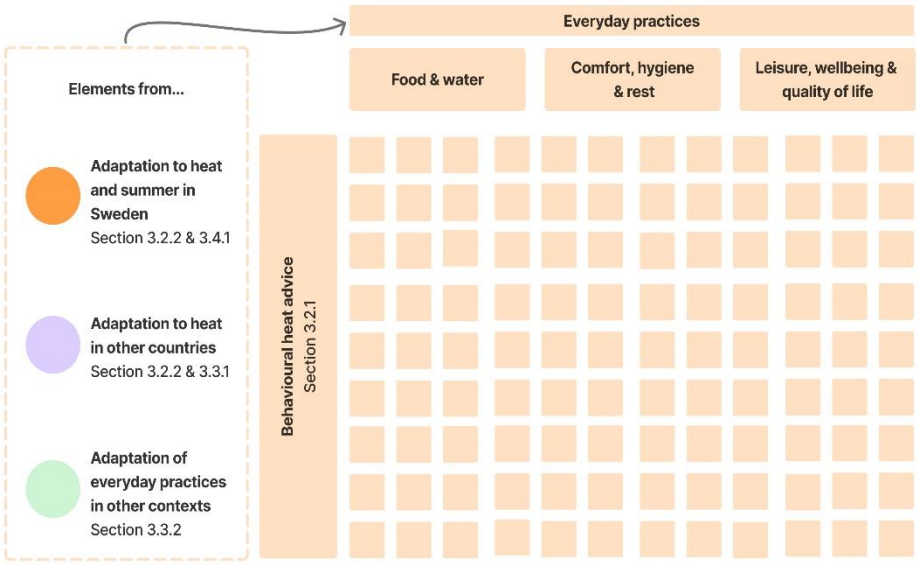


Figure 7: Illustration of structure for the initial idea generation

A large quantity of ideas was generated by a semi-structured brainstorming approach. Each topic was explored for a set period of time by writing ideas in the form of short phrases on paper. The next step was to transfer all ideas to a digital workspace, where the ideas were sorted and combined. Meanwhile, eliminating less promising concepts. In the first round of idea elimination, two main criteria were used: testability and imagination. The clusters of ideas were described as 16 early directions, at this point described in a few sentences. These were mapped in a matrix (Figure 18) to understand which design space had been explored and get an overview of possible

directions for the project to continue with. The dimensions of the matrix were derived from sorting and analysing the initial ideas and related to the focus and strategy of the adaptation, inspired by different existing categorisations of adaptive practices, such as that of Wamsler & Brink (2014b) and van Valkengoed & Steg (2019).

The early directions were evaluated against five criteria: testability, imagination, practice-orientation, feasibility and generalisability. These criteria were considered the most relevant at this stage, relating primarily to the suitability of the directions for the project and relevance for the future urban context impacted by climate change. In contrast, it was difficult to evaluate usefulness, manageability and desirability, both because users were not directly consulted here, and because of the high level of abstraction of the ideas. The directions were scored on a scale of 1-5 on these criteria and ranked in the order of their total scores. The eight directions that received the highest scores were kept, while the others were either eliminated or incorporated into the other concepts. These were called *opportunities for desirable change*, as inspired by the vocabulary used by Kuijer (2014), and summarised in a short description. They were also sorted as home-, household-, and neighbourhood-oriented, as will be described in Section 3.5.2.

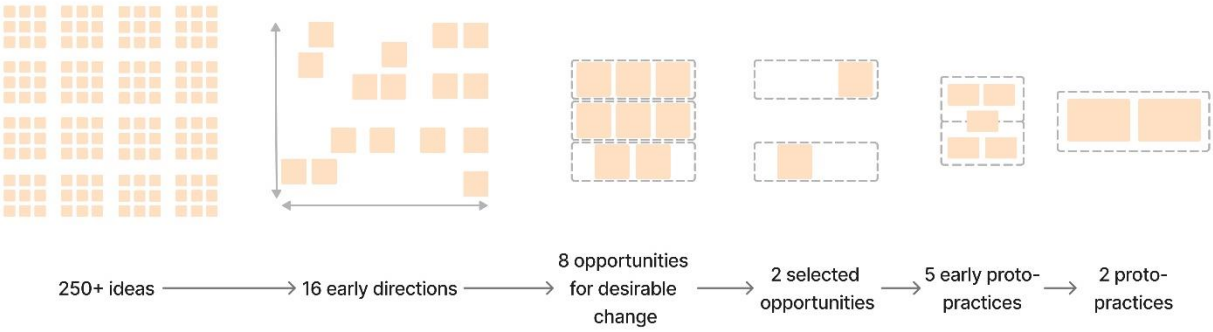


Figure 8: Overview of conceptualisation process, from initial ideation to final concepts

These opportunities were then the starting point for a second round of idea generation, where the goal was to elaborate the ideas. A set time was dedicated to sketch and describe each opportunity in terms of suggested reconfigurations of practices. Additionally, in this process, two main tools were used. Firstly, the reconfigurations were modelled as groupings of elements and links, inspired by the suggestion by Kuijer (2014) to visualise practices in this way. Secondly, imageboards (created from images collected on Pinterest) were used to quickly capture an idea of the opportunities, without being too concrete and limiting solutions. Literature suggests that design mood boards, consisting of visually stimulating images, can serve several purposes. For example, they allow designers to work on different abstraction levels, where keeping the discussion on a more abstract level welcomes new ideas to come up. It can also serve as a reminder and inspiration for future designs (Lucero, 2012).

Discussions in an interim presentation for the members of the research project lead by RISE included feedback on which directions were the most promising. The eight elaborated opportunities were also evaluated against the five criteria as in the previous round. Additionally, also evaluating clarity, by taking into account the insights from the interview with the energy and environment manager and additional theoretical research. The result was to continue with two opportunities of desirable change referred to as “Heat-conscious daily rhythm” and “Life beyond the apartment”.

2.4.3. Elaborating the proto-practices

In turn, these two opportunities were explored further with simple sketches describing a range of possible proto-practices and related elements for each. The goal was to make the ideas more concrete and relatable to everyday life. This part of the process was adapted from the *suggest and trigger* step in Kuijer's (2014) proposed approach, in which a proto-practice containing stuff, skills and images, is prepared for performance. Five proto-practices were selected and envisioned in imageboards and text, as illustrated in Figure 9, building on the representations from the previous part of the process. Books and other sources were used as sources to delve deeper into specific alternative practices from the outdoor and summer house lifestyles, as well as looking more closely for inspiration from heat adaptation initiatives from abroad.

Figure 9: Illustration of proto-practice imageboards and descriptions

The next step was to come up with ways to explore the proto-practices with participants in a household study. Part of this was focused on developing the *stuff* of the proto-practices, as these elements were the most straightforward to visualise. Different embodiments were explored through sketching. The proto-practices were then evaluated against the same six criteria as previously described, now considering the specific *stuff* developed.

Although it was acknowledged that investigating a range of proto-practices could help gain insight into more aspects of daily life, it was decided to focus on fewer proto-practices to be able to elaborate more on their respective elements and study more details about participants' imagined performances. However, it was decided to keep more than one concept to enable comparisons in the subsequent household study. The two proto-practices that were chosen were "Temperature watching" and "Sunrise watching", described in Section 3.6. The decision was partly based on the insight that practices of ventilation and using blinds were highlighted as the most impactful strategies for improving the indoor thermal climate, thereby having high usefulness. They were also considered less dependent on the specific infrastructure of the apartment building, making them more relevant to a broader target group. Other contextual factors, such as safety and current regulations, were also taken into account when selecting, although this only briefly. Finally, they were considered most realistic to test with the available time and resources of the project.

Finally, the elements of the two selected proto-practices were elaborated, balancing leaving room for experimentation with making them tangible and specific enough to evaluate. In a similar way as previously described, they were modelled in terms of the stuff, skills and images they suggested. Additional theoretical studies were done to support design, both related to finding more details about what practices are to be seen as desirable, and related projects that could be found inspiring. These results are presented in Section 3.5.5. Two main artefacts were designed and visualised through digital sketching in Adobe Illustrator, which became an explorative and iterative process of testing different embodiments. For example, experimenting with different forms, colours, icons and ways of presenting information.

To better understand how heat, fresh air and sunlight can interact with the apartment context, photos were taken in the authors' home during some sunny days. Insights were then brought into a shorter ideation session focused on possible performances of the proto-practices, exemplifying how they could be placed in the home and what situations they could be useful. The photos were then therefore used for creating contextual illustrations for the proto-practice representations (see Figure 23 and Figure 24). Meanwhile, evaluating the experience of staying in the apartment with blinds closed during sunny weather and following approximate schedules for opening them. These experiences also partly informed the planning of the household study content and structure, which is described in the next section.

2.5. Household study

A study with households was conducted towards the end of the project, to deepen the household perspective on the developed proto-practices and validate the findings of the study so far. This part of the process was adapted from the step *facilitate performances* in Kuijer's (2014) proposed process, in which a variety of performances of the proto-practice are generated. Specifically, the purpose was to invite households to explore their relationship with light, temperatures, comfort and a daily rhythm directed by heat. Thereby, the study aimed to answer the following questions:

1. How do people feel about keeping their blinds down, staying indoors and keeping windows closed when it is hot outside?
2. How do people feel about changing their daily rhythm to make use of the cooler hours of the day?
3. Could the two proto-practices support households in coping with extreme heat? In other words, are they reconfigurations that work?
4. What are the needs of households in relation to improving indoor thermal comfort and coping with extreme heat?

Table 3 provides an overview of what parts of the study primarily focused on each of the different questions. A note about the third question is that the project was still in a generative phase, seeking answers to how a practice could work, rather than evaluating how effective the proto-practices were for achieving an actual behaviour change, maintaining a cool indoor environment, or reducing the households' energy consumption compared to less preferable adaptation options.

2.5.1. Participant recruitment and selection

As identified in the earlier phases, practically everyone is affected by heat directly or indirectly, but many initiatives were found to focus on acute health risks, primarily among sensitive groups. Thereby, potentially missing out on other relevant household perspectives. This aligns with previous a study that points out that heat may seriously affect urban residents outside the "classic risk groups" in a way which current heat health planning may not address, and that those currently focused in policy action and research may not necessarily be most at risk (Sandholz et al., 2021). For example, living in apartments without access to cool spaces or possibility to make any major changes to the built environment. Therefore, interviewing a younger target group was seen as an opportunity to explore a gap in existing heat action planning, and be consistent with the target group of the workshops. Recruitment for the study was done directly through personal contacts. The main criteria for participation was to have experiences from living in apartments in Sweden during the summer months, preferably being available for an in-person interview within a limited timeframe. Table 2 provides an overview of the household study participants.

Participant	Format	Age	Occupation	Apartment	Years of stay	Household size
P10	Digital	26	Student	1 room/28 m^2	1,5	1
P11	On-site	26	Student	2 room/52 m^2	3	2
P12	Digital	27	Working	2 room/55 m^2	4	2
P13	On-site	23	Student	1 room/27 m^2	3	2
P14	On-site	25	Student	1 room/24 m^2	3,5	1
P15	On-site	24	Student	3 room/70 m^2	3,5	2

Table 2: Overview of household study participants

2.5.2. Representations of the proto-practices

A proto-practice can be more or less forceful depending on the level of fidelity. A high-fidelity prototype is more rich and detailed in its description of elements and links, whereas a low-fidelity prototype describes the reconfiguration more vaguely (Kuijer, 2014). In the household study, the proto-practices were represented as digitally illustrated images of new artefacts, together with annotations and simple illustrated images of the artefacts in generic apartment contexts. The intention was to have a lower-fidelity prototype, focusing more on the overall practice and how it relates to participants' current lives, and not details in the functionality of the suggested artefact. The representations were done in a way that was considered comparable between proto-practices, regarding the level of detail and elaboration.

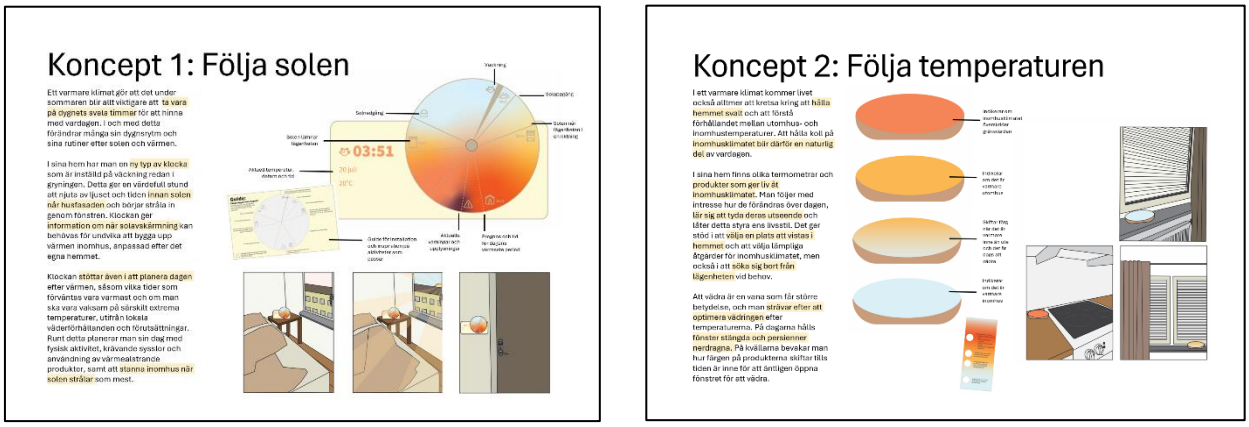


Figure 10: Representations of the proto-practices, similar to those used in the household study.

Each proto-practice was also accompanied by a written scenario with highlighted words, contextualising it in a future impacted by climate change, without being too explicit about how it impacts everyday life. The idea was to leave room for the participant to explore the proto-practice and how it would relate to or interfere with their current everyday practices. The aim was to have more open proto-practices, by providing less explicit instructions or rules (Kuijer, 2014). The descriptions were written to be neutral in terms of emotions towards a warming climate, and to the relationship with the sun and the outdoors, to reduce the risk of bias. The scenario was also included to present the proto-practice in a similar manner to different participants, being aware that how it is presented may steer the performance (Kuijer, 2014).

2.5.3. Study structure and content

The study consisted of two parts: (1) a preparation task workbook and (2) an interview.

	Workbook	**Semi-structured interview**		
Question	Preparation task	General questions	Proto-practice questions	Evaluation scales
1				
2				
3				
4				

Table 3: Overview of the study structure in relation to the specific questions

Similar as in the workshop, the study included a preparation task in the form of a workbook of tasks to fill in prior to the interview. Literature suggests that workbooks can serve to both support and supplement interviews, for example as they can be used as survey forms and ask participants to draw (Kuijer, 2014). The intention was to both sensitise the participant to the topic, but also to use the results as a mediating tool in the interview, for background information and for analysis. Apart from the background information presented in Table 2, information about which months of the year the participant had experienced their apartment was collected. Designing the workbook required multiple iterations, experimenting with different kinds of tasks and wording of exercises. A pilot test was carried out to estimate the required time and work out unclarities. In the end, the workbook consisted of four parts:

- General participant information
- 7-point Likert scale about heat and indoor thermal climate
- 2 timelines to describe the daily rhythm on a “normal” day (Figure 11) and a summer day
- Drawing of the apartment floor plan (Figure 12)

In most cases, the workbook was printed and handed to the participant in advance to fill in by hand and bring to the interview. However, when this was not possible due to practical reasons, a digital version of the same workbook was provided prior to the interview.

Primarily, interviews were held in-person, except for two digital interviews as this facilitated recruitment of more participants. As an unintended consequence, the sample represented a larger geographic area. In-person interviews were not held in participants’ homes, as this was thought to be overly intrusive. The interviews were held in Swedish and lasted for approximately 50 – 70 minutes each. An interview guide was prepared for a semi-structured interview format. The first half of the interview aimed to answer the first three questions described at the beginning of Section 2.5, by support of a set of prepared questions and follow-up questions asking for more detail. As suggested by Kuijer (2014), general questions to the participant can be a starting point for understanding bodily performances without directly observing them. The idea was to talk through the topics in relation to the current everyday life and past experiences of hot weather. For this, the workbook materials were used as a mediating tool. Particularly, using the timeline and highlighting certain parts of the day with a cut-out frame, and the drawing of the floorplan to let the participants point to what they were talking about.

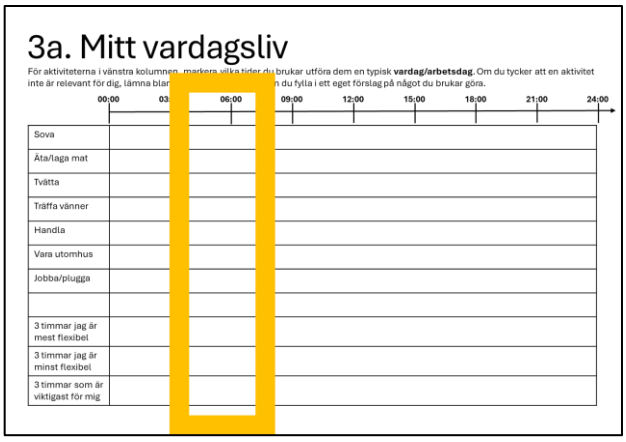


Figure 11: Workbook page (timeline and cut-out frame)

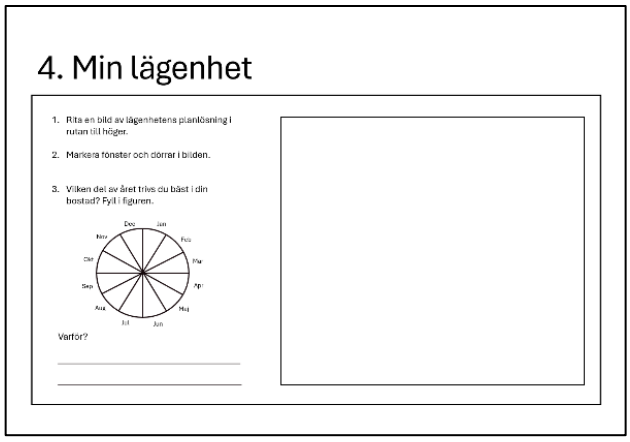


Figure 12: Workbook page (floorplan drawing)

The two proto-practices were presented one at a time to participants, using the previously descried representations seen in Figure 10. These were printed on A3 papers for the participants to refer to and reflect on. In this part of the interview, more proto-practice-specific and practice-oriented questions were asked, using the workbook timeline and apartment drawing as probes for relating the proto-practices to the participants' everyday lives. Instead of proto-practices, they were referred to as concepts for the participants, as this was thought to be a more accessible word.

After presenting and discussing each of the two proto-practices separately, the participant was asked to rate the concepts on the set of words in Table 4 using printed Likert scales with 7 points. The purpose of this part was to wrap up the discussion with an evaluation of the proto-practices. Both words and supporting question were provided in Swedish. The participant was also asked to "think aloud" while filling in the evaluation, as it was the thoughts sparked by the words and supporting questions that were primarily of interest rather than the ratings alone. The words were derived mostly from the evaluation criteria described in Section 2.4.1, but framed from a household perspective. Some participants preferred to rate one concept at a time, while others preferred to rate one word at a time. The resulting ratings were presented as a spider diagram and used as a framework for discussing whether the proto-practices are reconfigurations with potential to work.

Word	Translation	Supporting question (translated)
Önskvärd	Desirable	Does this solution seem like something you would want as part of your everyday life?
Intressant	Interesting	Does this solution spark your interest and curiosity about future ways of life?
Hanterbar	Manageable	Does this solution seem like something you and your household could do with the skills and resources you have?
Tänkbar	Feasible	Does this seem like a solution that could likely be a reality in the future?
Användbar	Useful	Does this seem like a solution that could effectively help you cope with hot weather?
Hoppfull	Hopeful	Does this solution give hope about living a good life in the future?
Intuitiv	Intuitive	Does this solution seem obvious in how and why it is used?
Rättvis	Fair	Does it seem fair that household should be responsible to install and use this solution?
Nostalgisk	Nostalgic	Does this solution spark thoughts and memories from past times?

Table 4: Words used in the household study evaluation scales

The interviews were recorded and transcribed manually. The transcripts were then analysed and coded, with key quotes being taken out and sorted thematically. For the results presented in this report in Section 3.7, quotes have been translated. Although based on a small sample of performances, the findings were also used to discuss whether the suggested reconfigurations have the potential to work, as inspired by the step *combine, evaluate and refine* in the process suggested by Kuijer (2014) but without evaluating against specified desired levels of resource consumption.

3. Results

In this section, the most important findings of the previously outlined process will be described. First, presenting the expected changes in extreme heat events in Sweden, and associated consequences for households. Then, describing different perspectives on adaptation, both based on the theoretical study and the workshops, which led to identifying opportunities for desirable change. Finally, presenting the proto-practices that were evaluated with households, and how these were received.

3.1. Past and future heatwaves in Sweden

Heatwaves, expected to become more common, intensive and longer-lasting, are the climate effect with the most significant impact on health in Europe (Folkhälsomyndigheten, 2019). There is no generally recognised definition of what a heatwave is, but it typically refers to a longer period of increased temperature conditions in a certain place, which differs between climate zones and countries (SMHI, 2011). One definition of heatwaves applied in Sweden is a prolonged period with a daily maximum temperature exceeding 25°C. Both the number of such *hot summer days* and the length of these periods, are increasing, particularly in the south (Sjökvist et al., 2025). The daily mean temperature is not necessarily the more important for health risks. Cool nights can be an important factor, meaning that the lowest daily temperature is also interesting to consider in heatwaves, along with the daily maximum temperature. Studies have also shown that the duration of the heatwave is important for its health impacts (SMHI, 2011). *Tropical nights* are another climate indicator, used to describe that the daily lowest temperature exceeds 20 degrees. In other words, particularly warm nights. This phenomenon has historically been very rare in Sweden, but is now increasing across the country (Sjökvist et al., 2025). Heat intensity and heat wave duration are other important factors that contribute to the risks (Rocklöv et al., 2014)

Research has found that extreme heat conditions which have now occurred every 20th year, may occur every third do fifth year by the end of the century. Temperatures of 40°C might be possible every 20th year (SMHI, 2011). However, as demonstrated by several studies, Sweden already experiences temperatures with a negative impact on health practically every summer (Socialstyrelsen, 2011). The summer of 2018 showcased extreme weather compared to what has been experienced in the last century, with prolonged periods of heat, numerous records in peak temperatures, low precipitation and widespread droughts. Studies of climate scenarios suggest that significantly warmer summers are expected in Sweden, and that the probability of summers similar to that of 2018 increases with increased climate impact (Sjökvist et al., 2019).

In Swedish and international studies, it has been shown that the effects of heat differ greatly between and within countries (Folkhälsomyndigheten, 2022b). Sweden has a long tradition of coping with extreme cold weather, and people in general are knowledgeable and well-equipped for this. However, most people are not familiar with coping with high temperatures over an extended period of time. This means that temperatures that are not associated with issues in other parts of the world have far more severe effects here, especially if the heat occurs in the early summer season (Socialstyrelsen, 2011). In the following sections, an overview of some main direct and indirect effects of heat on households will be described, summarised in Figure 13.

3.1.1. Direct effects of heat on households

Heat is sometimes referred to as acting “silently”, compared more spectacular climate change-related hazards that cause visible damage, that are normally perceived as more deadly (Zografos et al., 2016). However, increases in extreme heat events are a cause of human mortality and morbidity globally (Lee et al., 2023). The effects of heat on health are well-documented and range from relatively mild symptoms such as dehydration and decreased general condition to more serious consequences such as heat stroke and death (Folkhälsomyndigheten, 2022b). Furthermore, worsening for example cardiovascular and respiratory diseases (WHO Regional Office for Europe, 2021). It has been estimated that the extended period of extreme heat in the summer of 2018 was the cause of about 700 deaths in Sweden (Folkhälsomyndigheten, 2022a). Apart from the physical health, heat also affects wellbeing, work performance and life satisfaction (Bülow-Hübe et al., 2022). This also relates to expected economic losses due to missed workdays, accidents and reduced productivity due to overheating in the home and sleep deprivation (Zero Carbon Hub, 2015).

Problems with overheating can occur even at normal summer temperatures in many buildings (Folkhälsomyndigheten, 2024c). Overheating in buildings is pointed out as a cause of thermal discomfort, productivity loss and illness (Hamdy et al., 2017). High nighttime temperatures can keep indoor temperatures high, with effects on health (Heaviside et al., 2017). Research suggests a strong relationship between sleep and temperature regulation, with high ambient temperatures being disruptive for sleep (Altena et al., 2023), which can be particularly negative for individuals with mental health conditions (Lõhmus, 2018). A survey in Sweden following the extreme temperatures and heat records in the summer of 2022 showed that across the country, the most common symptoms related to heat were sleep difficulties, headaches, abnormal fatigue and exhaustion (Folkhälsomyndigheten, 2024b).

Meanwhile, the risks of heat on health are systematically underestimated by the both vulnerable individuals and the general population (WHO Regional Office for Europe, 2021). Increased awareness of the effects of heat on health could potentially contribute to changes in behaviour, in turn reducing the effects (Folkhälsomyndigheten, 2022b).

3.1.2. Indirect effects of heatwaves on households

Beyond the direct effects of heatwaves and increased temperatures, there are numerous indirect effects. From looking at these indirect effects, there were some aspects that stood out as particularly important for the project, although they were not all equally relevant for the end results:

- Effects on the energy system
- Effects on water supply and quality
- Effects on the environment and social context

An increasing temperature impacts various parts of the energy system. Disturbances in the energy system has consequences both for households and different functions of society, as there is a strong dependency on electricity (Nationella expertrådet för klimatanpassning, 2022). In Sweden, it is expected that the demand for electricity will increase during periods of hot weather, due to a growing need of cooling in the form of fans, air-conditioning and refrigeration (MSB, 2014). This aligns with the expectations that peak electricity demands are projected to increase all over Europe (European Environment Agency, 2019). However, whether this is an issue is to great extent determined by the ability to meet the demand with an increased production, keeping in mind

that energy production may already be reduced due to factors related to the hot weather (MSB, 2014). Extreme heat also affects electrical components, such as power lines and transformers, leading to overheating and power disruptions with effects on the energy distribution (Statens energimyndighet, 2009).

Higher temperatures may also impact water availability and quality. Although the groundwater system is relatively unaffected by heatwaves directly, long dry periods lead to reductions in the groundwater level. At the same time, the demand for water increases from households, companies and the public sector. Increased water temperatures can also lead to increased prevalence of different pests and viruses in water, as well as bacterial and algal growth, which poses health risks (MSB, 2015). In the summer of 2018, many municipalities had issued watering restrictions and encouraged careful use of drinking water (Krisinformation, 2025).

Furthermore, there are also effects related to the environment and social context that may have implications for households' everyday lives. For example, it has been reported that vandalism, theft, and littering increase during heatwaves, as well as increased disturbances in the rail traffic and problems with thermal comfort on public buses (SMHI, 2011). Higher temperatures is also associated with an increase of ground-level ozone, airborne particles, pollen and diseases (Folkhälsomyndigheten, 2019), as well as an increased risk of fires following a period of dry and warm weather (MSB, 2015).

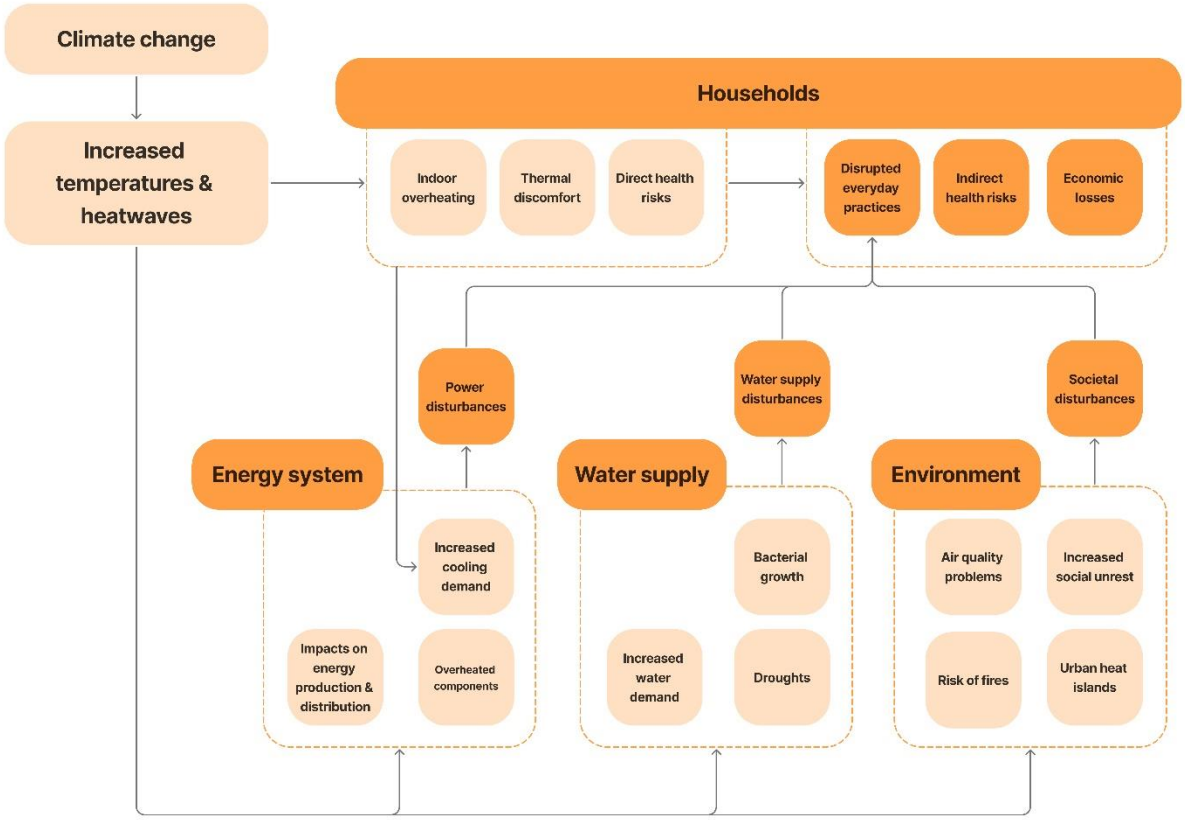


Figure 13: Diagram of direct and indirect effects of extreme heat on households

3.2. Organised household heat adaptation

For heat health action plans, WHO (2021) groups recommendations on reducing indoor heat exposure into four main categories: behavioural advice; access to cooling technologies, services or spaces; modifications of housing characteristics and buildings, with an emphasis on passive cooling; and urban landscape management (WHO Regional Office for Europe, 2021). Arguably, these are all relevant to household climate adaptation, but the first two points were considered particularly interesting, as they were more focused on household practices, less permanent, and had a shorter time frame.

In the following sections, the behavioural advice given to the public will be described, followed by initiatives aimed at supporting households to cope with heat, in Sweden and abroad. Furthermore, discussing sustainability of adaptation options.

3.2.1. Behavioural heat advice in Sweden and abroad

The search included a sample of Swedish and international sources, and it was found that the advice was relatively similar. However, the search was not exhaustive. To summarise, the behavioural advice aimed at households was found to revolve around the four themes seeking information, staying cool, supporting each other and staying hydrated. However, on a rather general level and with practically no guidance in prioritising advice based on relevance for the specific household. Table 5 shows the main strategies identified in the four themes, and a selection of the sources in which they are suggested, in this case focusing on the Swedish sources and the World Health Organization's recommendations (WHO, 2024).

Advice with the theme *seeking information* included knowing relevant sources of information, staying updated on weather forecasts and warnings and taking them seriously. This also connected to related information, such as wildfires, water restrictions, traffic disturbances and power outages. Furthermore, monitoring the indoor temperature and having knowledge of threshold values. Additionally, people were encouraged to learn about symptoms of heat-related illness and be attentive to bodily warning signals, especially with increased temperatures and issued warnings. Related to this, also being conscious of the effects of heat on the use of certain medications. Particularly emphasised was to store medications under proper conditions. Finally, a few advice related to food safety, for example storage and handling.

The theme *staying cool* was the broadest, addressing ways of achieving thermal comfort by cooling the home and body. Strategies for keeping the body cool included taking showers and adapting clothing. There were different suggestions for using water, ice and air to cool oneself, for example wrapping wet towels around the neck, using ice packs, taking foot baths, or drenching clothes. Other examples related to consuming cooling foods and drinks. Furthermore, other common strategies entailed a shift in when everyday practices are carried out, scheduling more physically straining tasks for cooler parts of the day and avoiding the outdoors during the daily peak temperatures. It was also promoted to slow down and reduce physical activity overall. Related advice was aimed at minimising sun exposure, for example by using covering clothing, sun protection and hats, as well as stay in the shade if going outside.

Theme	Strategy	(Kristianstads Kommun, 2023)	(Energimyndigheten, 2023)	(Svenska Röda Korset, n.d.)	(1177, 2025)	(Folkhälsomyndigheten, 2022a)	(MSB, n.d.)*	(Hyresgästföreningen, n.d.)*	(WHO, 2024)
Seeking information	Monitoring for heat-related illness	■		■	■	■	■		■
	Information related to medication	■				■	■		
	Monitoring forecasts, warnings & related risks					■	■		
	Monitoring indoor temperatures	■					■	■	■
	Food safety						■		
Staying cool	Ambient cooling (fans, air-conditioning etc)		■		■		■	■	■
	Blocking out the sun during the day	■	■	■	■		■	■	■
	Ventilation during the night	■	■	■		■	■	■	■
	Minimising indoor heat sources		■				■	■	■
	Cooling the body with water/ice/clothing	■		■	■	■	■	■	■
	Reducing physically demanding activities	■		■	■	■	■		■
	Scheduling according to temperatures	■		■	■	■	■		■
	Residing in cool places in/outside the home	■			■	■	■		■
	Staying sheltered from the sun			■	■				■
	Being prepared for energy disturbances						■		■
Supporting each other	Checking in on family, friends & neighbours			■	■				■
	Protecting & supporting risk groups	■		■	■	■	■		■
	Protecting pets			■					■
Staying hydrated	Ensuring sufficient water intake	■		■	■	■	■		■
	Limiting alcohol & sweet drinks	■		■			■		■
	Adjusting diet	■		■			■		

*Table 5: Overview of behavioural heat advice and the sources which mention them. Highlighted strategies represent those considered most promising to work with. *Source not included in original analysis.*

For keeping the home cool, there were three main strategies: minimising indoor heat generation, blocking out the sun, and cooling. To reduce indoor heat generation, it was suggested to turn off heat-generating appliances, minimise appliance use and shift to energy-efficient products that emit less heat. For example, reducing use of the oven in favour of smaller appliances, especially during the hottest hours of the day. Suggested methods for blocking out solar radiation were to use reflective films, blinds and curtains on windows, as well as external shading were possible. Keeping windows shut during the day was also mentioned widely. Cooling the home ranged from actively cooling with air-conditioning and fans, to using different passive methods, including window ventilation and greenery. There was a divide in whether air-conditioning was promoted depending on the target group, in general favouring less energy-intensive practices. A range of advice was also given for increasing the cooling effect of electric fans, for example by combining it with hanging a wet curtain or placing an ice bowl in front. In general, also suggesting residing in the coolest parts of the home, whether naturally or artificially cooled. As an alternative to keeping the own home cool, residing in cool places outside the home was promoted.

A third theme was advice related to *supporting each other*. Throughout information to the public, there was an emphasis on tending to those more vulnerable to heat. Risk factors were mentioned, along with specific advice both aimed at these groups, for example describing how pre-existing conditions may be affected by heat and promoting identifying available support. Furthermore, households in general were advised to check in regularly, offer help to those who might need support and pay close attention to those most vulnerable to heat risks. Specific information was also available for taking care of children and pets during a heatwave. In particular, emphasizing to not leave children or pets in parked vehicles.

Ensuring sufficient water intake was among the most common advice across the different sources. Although it is closely related to practices of keeping the body cool, for example by consuming water-rich and cooling food items, *staying hydrated* is here described as its own theme as it addresses the specific health risks associated with dehydration in hot weather. These recommendations generally also emphasized limiting consumption of alcohol and sweet drinks.

Advice related to *staying cool* suggested a wide range of practices to look into. These had clear connections to both effects on households' everyday lives and to the energy system and related to images of both health and thermal comfort. They were also seen as closely related to some strategies from the themes *seeking information* and *supporting each other*. The highlighted fields in Table 5 represent the strategies for coping with heat that were considered most promising to work with in this project, relevant for a broad target group and energy-related practices in everyday life. Being prepared for energy disturbances was not seen as a strategy in itself, rather an objective for any energy-resilient reconfiguration. With this background, other aspects, such as water intake, effects on medication, and food safety were thereby excluded. However, they also point to opportunities for design in configuring sustainable heat adaptation practices for households.

3.2.2. Initiatives for households to adapt to heat

The following sections will describe a selection of heat adaptation actions, including initiatives aimed at households from the Swedish context and internationally, which offered insights for analysis and interesting aspects to be inspired by.

General heat action planning in Sweden

Swedish adaptation to heat focuses on interventions within three areas: outdoor environment, indoor environment and specifically targeting risk groups (Nationella expertrådet för klimatanpassning, 2022). Most resources for heat action planning were found to be directed at higher levels of organisation, urban planning or specific settings such as within the healthcare system targeting vulnerable groups. This is consistent with the findings of a meta-evaluation of adaptation planning in Sweden, which concluded that little consideration is given to supporting citizens' adaptive capacities (Wamsler & Brink, 2014b).

Folkhälsomyndigheten (2022a) works proactively with the health impacts of heatwaves. Therefore, they were identified as an important actor in providing directives for coping with extreme temperatures with the general public in mind. They have published a guide to support municipalities, regions and private actors in developing action plans. In this guide, they suggest that action plans should include the phases preventing, preparing for, managing, recovering and learning. Such processes can be seen as a yearly cycle of actions. The guide also suggests identifying and specifying target groups so that communication can be tailored effectively (Folkhälsomyndigheten, 2022a). Literature suggests that advice which is tailored to a particular audience is better received than general advice (Lowe et al., 2011). The guide also promotes developing routines for evaluating the effectiveness of action plans, highlighting the importance of collecting experiences to further improve processes and information material (Folkhälsomyndigheten, 2022a). These aspects seemed interesting for the household context too.

Swedish municipalities are at different stages in their climate adaptation work (Sonnek et al., 2012). On their website, SMHI (2025) presents examples of climate adaptation for inspiration and sharing experiences. The municipality Kristiansstad was exemplified for its heat action plan, which was therefore studied more closely. The action plan is aimed at reducing heatwave mortality and illness, supplying effective and implementable actions for municipal actors, and planning for heat warning systems. For example, taking inventory of cool indoor and outdoor spaces where people can reside, managing communication with the public and vulnerable groups, having access to fans and practicing for heatwave scenarios. It also contains advice and checklists for before, during and after a heatwave, adapted to different audiences, primarily for those who work with vulnerable groups. The plan also highlighted the importance of understanding indoor temperatures and installing thermometers in housing with special services (Kristiansstads Kommun, 2023), identified as interesting for households' apartments in general.

As support for climate adaptation work, a service for showing the maximum ground temperatures measured across Sweden during the summer months 2017-2023 has also been developed. These heat maps can be used to identify areas exposed to high temperatures, which can support identifying vulnerabilities, prioritizing physical interventions and targeting information in risk areas. It can also help identifying areas with a cooling effect to which citizens can seek refuge from the heat (MSB, 2024). This was found to be a possible resource for household climate adaptation, as well as indicative that meteorological data could play a part in adapting to a hotter climate, particularly in urban environments.

Household heat adaptation initiatives in Sweden

Whether or not the municipality is taking action, individuals will need to take more responsibility for adapting their everyday lives and therefore need to be made aware of risks and adaptation measures (Sonnek et al., 2012). For households in general, it was found that communication of heat-related information was mostly limited to checklists and guides, available as downloadable documents or websites. Behind these initiatives were various actors, including municipalities, NGOs, care providers, property companies and insurance companies. Similar messages were repeated on a rather general level and often referenced other actors such as Folkhälsomyndigheten as a primary source. Their communication with the public takes the form of written guides, shorter pamphlets, animated short-films, a web-based training and a bank of images to illustrate the advice (Folkhälsomyndigheten, 2022a). In some cases, initiatives invite readers to further reading or actions. For example, guiding readers to find places to cool down in the city (Familjebostäder, 2024) or print the advice to have it visible in the home (Attendo, 2022).

General warnings for high temperatures are issued by SMHI. There are yellow and orange levels depending on the expected temperature, duration and consequences of the hot period. Yellow warnings are issued if the daily maximum temperature is expected to exceed 30 degrees 3-4 days in a row, and orange warnings are issued if the daily maximum temperature is expected to exceed 30 degrees 5 days in a row or 33 degrees at least 3 days in a row. Both levels are accompanied by general advice. In addition messages about high temperatures can be sent out at less extreme conditions, primarily targeting risk groups (SMHI, 2021). The initiative *ClimApp,* a smartphone app developed as part of a research project on climate services, addresses that effects of heat depend on various environmental and individual factors, and that personalised information can help people understand how to proceed in their everyday lives with given heat warnings. It combines human thermal models and local weather forecasts to give an idea of users' thermal stress, in relation to user information such as activity level, clothing and heat acclimatization. (Eggeling et al., 2022). This was seen as an interesting complement to general advice.

The search was initially focused on initiatives addressing heatwaves specifically. Finding the results quite limited, the search was broadened to indoor overheating in general. Thereby, discovering that in addition to heat risk initiatives, often related to health issues and protecting vulnerable groups, there were also initiatives aimed at informing households in general about actions for improving the indoor conditions. This suggested that there could be many initiatives that are climate adaptations in effect without intending to be. This was seen as interesting as it showed that know-how that can benefit households in climate adaptation might already exist. Specifically for people living in apartments, an example was that *Hyresgästföreningen* has a page on their website dedicated to maintaining a comfortable indoor climate. It include instructions on how to measure the indoor temperature, contact the landlord and manage periods of heat (Hyresgästföreningen, n.d.). The housing company Poseidon has published video instructions for things that the resident themselves can fix in the apartment, one relating to achieving good thermal comfort (Bostads AB Poseidon, 2018). Other identified platforms for accessing information were web pages for housing associations as well as member magazines. The communication between residents and property owners was mentioned in a few of the identified sources. For example, suggesting that property owners should inform about ways of keeping the apartment cool, establish an on-call service for reporting emergency cases and paying particular attention to properties housing vulnerable groups (Wyser, 2019). This was found interesting as it required interaction between households and other actors, implying a need of appropriate platforms and exchanges of knowledge.

Heat action initiatives in other countries and contexts

The section will describe a selection of heat action initiatives with citizens as the primary target group, from different contexts across the world. As showed in Figure 14, the identified initiatives were considered to split into three main categories: information, tools and community programs, with some overlapping elements. Overall, this showcases a wider range of initiative formats than what was found in Sweden.

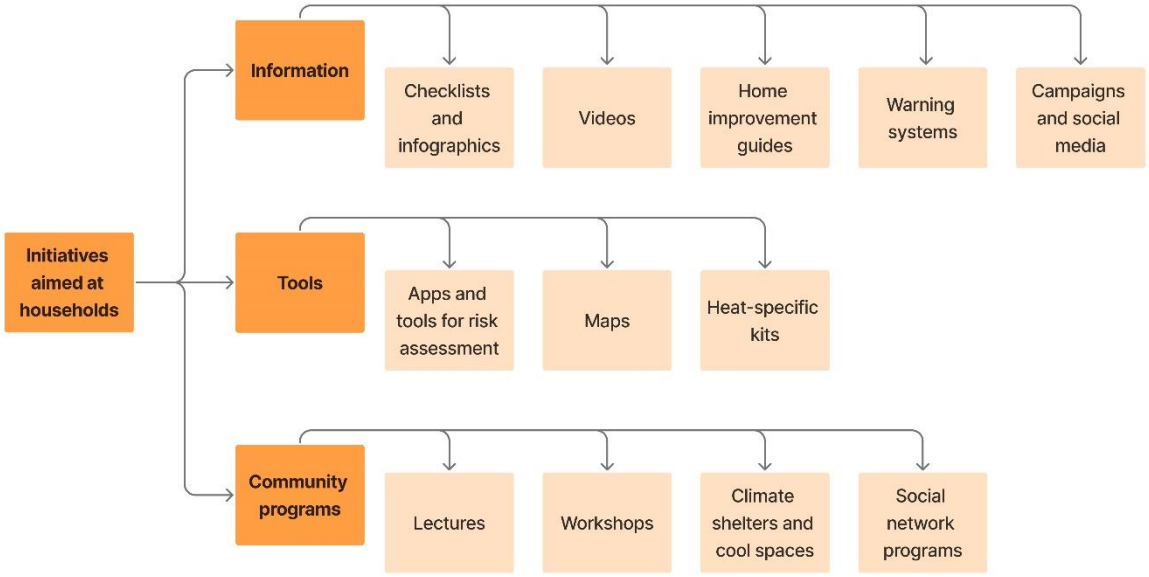


Figure 14: Overview of identified initiative types in three categories

Similar to the Swedish context, there were different kinds of written guides with information about heat risks and recommendations. For example, checklists and infographics, but also videos, such as *#KeepCool in the heat* (WHO European Region, 2021). There were also more comprehensive home improvement guides. For example, the British Red Cross has commissioned the *Overheating Adaptation Guide for Homes* to support both homeowners and renters in finding suitable measures of mitigating overheating in their homes. The guide presents measures in different categories such as shading and ventilation, and includes information about why to implement measures, measures' appropriateness for different building types, estimated cost of implementation, and illustrations (Shade the UK, n.d.). It was found interesting because it pointed to what information may be important for households in choosing adaptation options, and factors that may impact their adaptive capacity. A similar guide was *Your Resilient Home Guide* (Suburban Land Agency, 2022), which has a broader take on household resilience than just heat, including different risks side by side. The communicative style of the two above guides framed adaptation in a less threatening, brief and more approachable way, which was interesting for design. Similarly, another initiative was the *Coping Cookbook*, described as a "*crowd-sourced collection of DIY tactics to help renters keep cool in our homes during summer*" (Better Renting, n.d., Section Introduction), considered interesting as it focused specifically on comfort and agency for people renting their homes, based on contributions from renters themselves.

An initiative providing information is the *Heat Stress Toolkit* (Occupational Health Clinics for Ontario Workers Inc., n.d.). Although aimed at occupational settings, it was considered interesting, particularly two of the included infographics. The first was a *Heat Stress Response Plan*, guiding the participant in analysing a location based on factors that affect the indoor thermal climate and identifying appropriate responses from a chart (Occupational Health Clinics for Ontario Workers Inc., 2024a). Secondly, *Heat Stress Warning Signs*, an infographic, illustrating symptoms in relation to different parts of the body and different body temperatures, as well as guiding participants to suitable responses (Occupational Health Clinics for Ontario Workers Inc., 2024b). Both these were seen as interesting for their focus on developing skills and providing actionable information.

Another kind of initiative was to provide access to cool spaces outside the home, where people can come to escape the heat, also mentioned by WHO as a common component in heat-health strategies (WHO Regional Office for Europe, 2021). For example, the City of Melbourne, Australia, operates *Cool Places* in various locations across the city, offering cooled spaces, necessities and activities for everyone. For example, in community centres, libraries, cinemas, parks and shopping centres (City of Melbourne, n.d.-b). Similar initiatives are also present in Europe. In Vienna, Austria, public places called *Cooling zones* are planned to be adapted for use during heatwaves, specifically mentioning apartment residents as a target group (Berndorfer & Lutter, 2022). In Valencia, Spain, *Red de Refugios Climáticos* are a network of climate shelters across the city intended to not only reduce health risks and thermal discomfort, but also provide access to recreational programs and awareness-raising activities for different target groups (Covenant of Mayors Europe, 2024). This adaptation strategy was found interesting as it implies changes in practices and a mindset shift to creating opportunities out of crises.

Consequentially, there were initiatives that used maps to support households in the practice of going to cool places outside of the home. For example, *Cool Routes* is a web-based tool for choosing the route which best protects from sun and heat in Melbourne, Australia, at different parts of the day. This also extends to providing printable neighbour-specific maps in different languages (City of Melbourne, n.d.-b). Similar identified initiatives in the US include *Cool It! NYC*, which guides households to places with water features, drinking fountains and shade (City of New York, n.d.-b) and an interactive map of cooling locations, also featuring metro lines and information about opening hours (District of Columbia, n.d.). These were found to be interesting as they explored ways of inviting citizens to adapt their everyday lives in response to new needs that emerge in the heat, changing the way they see and use their neighbourhoods.

Another identified initiative is the *EXTREMA project*. It included implementation of a mobile application aimed at informing users about their real-time personal extreme temperature risk, based on the location and satellite thermal data. If the personalised risk is assessed as increased or high, offering advice based on WHO guidelines and directions to places nearby to take shelter from the heat (Keramitsolgou et al., 2019). This was considered interesting as it could be a way to make behavioural advice more accessible, personalised and contextualised for users, thereby possibly helping households to develop new skills related to practices of coping with heat. Furthermore, relating both to practices both within and outside the home, and being more interactive than the written guides.

There were also community-oriented initiatives such as workshops, lectures, awareness days, campaigns and adaptation action programs. For example, the City of Melbourne conducts open *Heat Smart Sessions* with information about cool places in the city, places to fill water bottles, and

staying cool without using air-conditioning. Furthermore, participants are also provided with different supplies for coping with heat (City of Melbourne, n.d.-a). Another example is *Cooltorise*, a project involving stakeholders and vulnerable households in four European countries, aimed at reducing summer energy poverty, improving indoor thermal conditions and reducing cooling needs (Cooltorise, 2025). In the project, agents are trained to conduct workshops with citizens to proactively raise awareness on mitigating summer overheating and optimizing household utility bills (Cooltorise, 2024). Examples of deliverables included an infographic of household heat sources and adaptive measures (Cooltorise, n.d.). This initiative was seen as interesting given its focus on both household energy consumption and heat adaptation, and citizen engagement. Another initiative which takes a slightly different approach is *The Adaptation Game*, which is a table-top game that simulates climate change in participants' local area, seen as an opportunity to engage the community in thinking about how to respond to heat risks (Donohoe et al., 2024).

Furthermore, there are initiatives aimed at establishing social networks that enable checking in on vulnerable groups. For example, *Be a Buddy NYC* aims to create buddy systems between social service and community organisations, volunteers and vulnerable citizens, for telephone or door-to-door contact in heat emergencies. It includes training on protective measures and assisting vulnerable adults, and models other established initiatives in the city (Cool Neighborhoods NYC: A Comprehensive Approach to Keep Communities Safe in Extreme Heat, n.d.). Particularly interesting was the approach that it claimed to see annual heat emergencies as near-certain opportunities to practice for climate impacts (City of New York, n.d.-a). Similarly, Sweltering Cities, an organisation working specifically with issues related to extreme heat in Australia, had a campaign called *Heatwave Check-In*. It featured instructions of how to check in with at risk individuals, heatwave tips in the form of downloadable images to send out to others and social media presence (Sweltering Cities, n.d.). These initiatives were found interesting as they related to the commonly given advice to check in on individuals at risk but making it more actionable by building on existing practices, changing social norms and promoting new heat-specific skills.

Another kind of initiative that was found interesting was kits of supplies for coping with heat. Common items include thermometers, towels to apply on the skin, spray bottles and water bottles. For example, the City of Vancouver promote putting together a kit of such items and provide information and instructions for their use in written (City of Vancouver, 2022) and video form (City of Vancouver, 2023). A similar approach has been undertaken by the City of Melbourne, where kits including water bottles, cooling towels and brochures, were distributed at public locations (Donohoe et al., 2024). In Europe, the City of Vienna suggest a *Heat Toolbox* specifically targeting people living in difficult socio-economic conditions. The kit includes heat advice, descriptions of outings to cool destinations, maps of cooler places, and a cookbook with summer recipes (Berndorfer & Lutter, 2022).

3.2.3. Maladaptation and sociotechnical lock-ins

Providing cooling is a complex problem requiring a range of solutions for achieving sustainability (Lundgren-Kownacki et al., 2018). This aligns with statements of the European Environment Agency, who highlight that there is no one-size-fits-all solution for sustainable cooling, but that passive cooling solutions such as shading, natural ventilation and low energy consumption options should be prioritised, along with targeted awareness raising, behavioural changes and climate justice as part of the approach (Quefelec, 2022). However, there may be issues with these kinds of approaches too. For example, effective window ventilation can be associated with risks of falling, break-ins, air pollution and outdoor noise (Bülow-Hübe et al., 2022). It also requires relatively high active involvement from residents, meaning that artificial cooling is often seen as the more low-effort alternative (Kuijer, 2021).

While there is a wide range of available technologies for active cooling, air-conditioning is becoming the standard for protection from overheating (WHO Regional Office for Europe, 2021). However, air-conditioning is a highly contested question in the context of heat adaptation. There are indications that it is important in protecting vulnerable groups in high temperatures but comes with many disadvantages that position it is an example of maladaptation. Air-conditioning increases electricity demand, produces waste heat emitted into the surrounding areas, and contributes to greenhouse gas emissions in different ways (WHO Regional Office for Europe, 2021). In Sweden, buildings and infrastructure are generally adapted to a cool climate (Folkhälsomyndigheten, 2018). Existing buildings are typically not equipped with active cooling systems, and it is typically difficult or impossible to install these to function in energy-efficiently (Bülow-Hübe et al., 2022). Heatwaves only represent a small portion of the year, meaning that while energy consumption could be periodically high at times, it might not become that high per year. However, it is hypothesised that once air-conditioning is installed, it will be used during other parts of the year as well (Viguié et al., 2020).

Additionally, increasing use of air-conditioning may create a dependency that impairs the ability to deal with high temperatures without it. On the individual level, this may inhibit natural heat acclimatisation and lead to systematic over-cooling (WHO Regional Office for Europe, 2021). Homes built for air-conditioning tend to leave out features that promote natural means of indoor climate control, thereby condemning households to an air-conditioned way of life (Shove, 2003). On the societal level, the population may find itself unprotected in the event of a grid overload or power outage, having lost traditional knowledge about dealing with heat (WHO Regional Office for Europe, 2021). Furthermore, active cooling may be associated with additional costs for households, especially in the event of increased electricity prices, raising the issue of summer energy poverty (Quefelec, 2022).

3.3. Inspiration from similar practices

This section will present the results from exploring desirable practices that could inspire solutions for supporting Swedish households to adapt to heatwaves and extreme temperatures.

3.3.1. Improvised heat adaptation in other countries

Studying how households improvise solutions to cope with extreme heat in other countries led to identifying a set of promising adaptations with elements to be inspired by. Figure 15 summarises the images, skills and stuff found most interesting to explore as elements in reconfiguring practices in the Swedish context, described in the following section. These illustrated the role of skills and images in heat adaptation, highlighting aspects that depend less on the built environment and access to active cooling technologies, and more on traditional knowledge and less energy-dependent strategies. Thereby being more relevant regardless of what the household can change about their home.

Figure 15: Overview of identified elements from practices in other countries

"Lay thermodynamics" and heat-conscious practices of staying cool

One identified theme in improvised heat adaptation was the development of "heat-conscious" routines for coping with heat and keeping the home cool. For example, a study from Australia described how experiences of heat contributed to an understanding of how heat accumulates and dissipates in the home. With this knowledge, in that case referred to as "lay thermodynamics" (Walker, 2021, as cited in Robertson et al., 2024), households were able to anticipate and intervene in the home's indoor thermal climate. Households developed "choreographies" for using their blinds, windows and doors in a way that engaged with seasonal and daily patterns of the sun, heat and air (Robertson et al., 2024). Similarly, a study in Czechia mentioned that adjustments to practices include "learning" ways of airing out and keeping the heat out (Ferenčuhová, 2022). Households put effort into changing the environmental conditions, for example by adjusting windows and blinds to keep apartments cool, relying on an individual perception of how hot it is, what comfort is, and the level of heat that can be coped with (Yáñez Serrano et al., 2023).

Literature suggested that many strategies that households use for coping with heat in urban contexts are simple and do not require significant increases in consumption resources such as water, energy and labour (Ferenčuhová, 2022). Examples were similar to the behavioural advice to the public, for example blocking out the sun and airing out the home, but a variety of practices related to cooling the home and body were identified. These seemed to build on an understanding of different thermodynamic principles, and had a resourceful character in terms of using simple materials of the home. For example, hanging wet fabrics in the home for evaporative cooling purposes and letting frozen water bottles melt in a room. Some of the practices originated from older generations and were brought back in response to the heat (Ferenčuhová, 2022). Practices of collective life (Aghababaeian et al., 2024) were also identified as potentially relevant for adaptation in apartment buildings, for reducing demanding and heat-generating activities and supporting each other.

Adjusting daily activities and accepting heat as a part of life

Other identified strategies entailed mindset shifts, which stood out from the general behavioural advice. For example, adaptations described as accepting heat as part of life and finding ways to endure heat. Other shifts in mindset included positive thinking, for example through seizing available opportunities, considering benefits of warmth, and thinking about bigger priorities (Aghababaeian et al., 2024). Getting used to it is also mentioned by Rosengren (2022), who reflects that this theme is frequently repeated in conversations with people about heat (Rosengren, 2022, p. 159). Similarly, it has been found that accepting the situation as unpleasant and reframing it as a positive experience made a difference for households' perceptions (Ferenčuhová, 2022). One study also suggested that in response to heat, households experienced a cycle of anticipation, preparation and waiting, and relief. It was claimed that most intense periods of summer heat were seen as temporary events to just get through as best as possible, with expectations and arrival of lower nighttime temperatures offering a source of relief (Robertson et al., 2024). From a practice perspective, these adaptations included both a change in image – changing norms surrounding heat – and skill – learning to do so. However, they were also seen as potentially conflicting with taking heat risks seriously, which was an aspect to consider if taking inspiration from them.

Similar to the recommendations to the public, several sources captured shifts in the daily schedule as a strategy to deal with heat. There were different stories of making more use of the cooler hours and reducing activity when the heat is most intense, both related to work and family life. For example, starting work earlier in the morning, postponing dinner, going to bed later (Rosengren, 2022, p. 118), working late and waking up earlier (Ferenčuhová, 2022). This also involved doing tough tasks in the cooler hours of the day and simplifying tasks (Aghababaeian et al., 2024). Using the cooler hours for getting a change of environment was identified as an essential strategy of coping with heat, being guided by heat in when to head back (Yáñez Serrano et al., 2023). In an interview with a young couple in Iran, it was described that the cooler hours at sunrise were important for coping with missing the sky and nature during the hottest months when spending more time indoors (Rosengren, 2022, p. 131).

There were also adaptations of practices related to changes in location, making use of cooler spaces for everyday tasks. An example was to bring all daily necessities to cool basement structures and adapting routines to live together in these spaces (Aghababaeian et al., 2024). Other examples included relocating to air-conditioned spaces beyond the home, such as friends' houses and shopping centres, in search of temporary relief (Robertson et al., 2024).

3.3.2. Inspiration from outdoor lifestyles

The two subcultures identified as most promising for finding inspiration for desirable reconfiguration of heat adaptation practices were outdoor and summer-housing lifestyles. The reason was that both these included forms of adaptations to seasonal variations and limited resources. This also aligned with the findings from previous research, where leisure activities and cabin life have been identified as important in equipping households to deal with power disturbances (Heidenstrøm & Kvarnlöf, 2018). It was seen as interesting to expand on this in the context of climate adaptation given the aims of the research project led by RISE. Furthermore, these subcultures were interpreted to have positive themes, creating an interesting contrast against the general discourse around climate adaptation, found to be dystopian and serious. In a study on visual imagery in climate change communications, it was found that fearful messages can frame climate change as a distant issue in time and space, associated with individuals feeling overwhelmed or helpless, and potentially also invulnerable (O'Neill & Nicholson-Cole, 2009). Thereby, possibly contributing to adaptation options being perceived as more relatable and actionable.

While it might be considered counterintuitive to be inspired by outdoor lifestyles when behavioural advice promotes staying indoors, sheltered from the sun, there were many elements of these practices that related to awareness of and adaptation to unfamiliar or varied conditions, as well as images of leisure and quality of life. In this section, some practices and elements from outdoor lifestyles that were found inspiring, summarised in Figure 16 below, will be discussed. As for the inspiration from summerhouse lifestyles, most insights were gained from the workshops and presented accordingly (Section 3.4.1).

Figure 16: Overview of identified elements from practices in outdoor lifestyles

Naturvårdsverket defines *friluftsliv* (literally translated to "free-air life") as a practice of residing in outdoor landscapes for wellbeing and experiences of nature, without competitive elements (Naturvårdsverket, 2024). It is described as an important component in the Swedish cultural tradition and national identity, and for many people a key element in achieving good health and quality of life (Vara i naturen, 2008). Many experience that spending time in nature leads to insights about the interplays of nature and feeling like a part of it. Reasons for participating in outdoor practices differ slightly between everyday life, weekends and longer vacations, but include relaxation, closeness to nature and spending time with friends and family (Vara i naturen, 2008).

Accepting discomfort as part of the experience

One article argues that *friluftsliv* is about unconditional encounters with nature, where things like bad weather or difficult terrain are not seen as reasons for discomfort, rather as fully natural conditions and accepted as a part of the experience. Harmonising with nature, without disturbing or destroying (Gelter, 2000) was found to be another important skill. A blog post describes that learning to embrace different kinds of weather is a way to improve your skills and face a range of experiences (Australian Hiker, n.d.-b). This was seen as interesting in relation to mindset shifts and reframing temporary discomfort.

Outdoor lifestyles were also seen as interesting for their material simplicity and natural experiences, described as core elements of *friluftsliv* (Emmelin et al., 2005). Performing different everyday practices, such as cooking and sleeping, with limited resources and away from the home, had possible links to behavioural advice related to heat. For example, in minimising heat-generation in the apartment and making do while residing in other places than the own home. For example, eating non-perishable foods, preparing food by soaking in water, using portable kitchens, and aiming for short cooking time (Karlin, 2022; Tornblad, 2021), offered inspiration for heat-conscious everyday practices. Similarly, practices of sleeping outdoors seemed promising to look into, given that sleep was identified as greatly affected by heat and many already seeking alternative sleeping spaces. Practices of setting up temporary shelter during daytime were also seen as interesting, also resonating with behavioural advice. There was a range of initiatives for learning and being inspired to participate in these practices. For example, videos, guidebooks, blogs and courses from various stakeholders, both directly linked to outdoor lifestyles, for example influencers or companies that sell equipment, and those that already play a role in households' everyday lives, such as grocery stores. This illustrated that a range of stakeholders could be relevant when inviting households to experiment with everyday practices.

Planning according to outdoor conditions

Another practice from outdoor lifestyles is planning to be outdoors, such as for a hike. For example, this includes planning, preparing and packing food, which is even argued to extend the experience of the excursion (Tornblad, 2021). The planning element was considered promising due to the similarities with preparedness and behavioural advice. Like heatwaves, an outdoor excursion means having to cope with conditions of lower comfort and convenience depending on weather conditions. For hiking in heat, blogs recommended checking the weather before heading out to adapt to expected conditions. For example, dressing accordingly and choosing appropriate routes. It also related to scheduling based on the weather, for example leaving longer days of hiking to cooler days, taking midday breaks and making use of the cooler hours of the day. The advantage of rising with the sun or hiking at night was also highlighted (Australian Hiker, n.d.-a), which was considered interesting for framing adaptation in a positive way. It was expressed that spending time in nature leads to a feeling of harmonising with the landscape and natural rhythms, for example that of the sun, light and season, in contrast to the artificial rhythms of urban life (Gelter, 2000). This was also seen as interesting for climate adaptation in the urban context. From the outdoor lifestyles, there were different resources for planning, such as blogs, guidebooks and planning tools. Many apps were found, such as *Naturkartan*, providing an overview of relevant guiding information and accessibility features on local maps (Naturkartan, n.d.) and *HittaUt,* revolving around finding checkpoints in different areas, also highlighting aspects of social inclusion and engagement (Svenska Orienteringsförbundet, n.d.).

Finding adventure in the mundane

Adventure can be a central part of *friluftsliv*, although some claimed that it is not about actively looking for it (Gelter, 2000). A term used by adventurer Humphreys (2022) is *microadventure*, describing short and simple ways to find and fit adventures in everyday life. The idea is that it captures the learning experiences, excitement and escapism of larger adventures (Humphreys, 2022). This was seen as having promising elements to borrow: making "mundane" practices more enjoyable, experimenting with new forms of leisure, adventure and summer activities that match a heat-conscious lifestyle, and practicing forms of adaptation in everyday life.

Another identified theme was an appreciation for ordinary natural phenomena. Literature describes that one orientation towards nature can be to see it as a "museum" which is visited without affecting it, involving appreciating activities such as bird watching and looking for flowers (Kaltenborn et al., 2001). *Allemansrätten* [right to public access] is a fundamental part of *friluftsliv*, providing people the right to move and stay in nature. It requires interpretation of topography, season and the condition of the ground to act appropriately in nature, which is a skill best learnt through family, school or outdoor-oriented organisations (Kaltenborn et al., 2001). Enjoying the aesthetic value of nature, slowing down and reflecting (Gelter, 2000) are described as other elements of *friluftsliv*. Practices of navigating by natural elements, such as the sun, stars or the natural environment were also encountered. Sunrises and sunsets, occurring daily, can still be seen as reasons to spend time in nature at that time of the day. For example, practices of night and sunrise hiking, described in a blog as giving "a whole new perspective on a familiar place" and having benefits such as avoiding midday heat (Hahnel, 2021). These findings were thought to be interesting elements, as they could connect to the behavioural advice of taking a slower pace and being more attentive to signals in the environment. For example, noticing symptoms of heat-related illness and monitoring temperatures, but also finding opportunities to appreciate summer without exposing oneself to heat risks.

3.4. Current everyday heat adaptation

In this section, current practices of household heat adaptation will be described, outlining how heat affects everyday life and how households are currently responding to this. First, highlighting the experiences of households, and then presenting another stakeholder perspective on indoor thermal comfort and household heat adaptation in apartment buildings.

3.4.1. Workshops on heat in everyday life

From the workshops, different ways of coping with hot weather were brought up, relating to various everyday practices and corresponding well with the advice from authorities. The prompts allowed participants to recall memories of hot weather, drawing from experiences of living, travelling, and studying abroad, past heatwaves in Sweden and summer in general. In this section, findings related to changes in everyday practices and households' adaptive capacities are presented.

Summer as a limited resource

From the discussions it was found that the return of the heat after the winter was well anticipated. The summer season was seen as an enjoyable time in itself, with phrases such as "passa på" (loosely translated to "take the opportunity to") suggesting that it is viewed as limited and that there is a kind of stress about wasting it. There were perceived social expectations to spend more time outdoors during the summer season: "*generally there is a norm I experience that many want to spend a lot of time outdoors when it is sunny and hot, which I can feel is hard to try and explain to people that it's not something I appreciate" (P7)*. This was both explicitly discussed and suggested by the kind of activities and environments that people sought in the summer. Participants mentioned changes in leisure practices in the hot weather, often with thermal comfort as a central image. For example: *"you can take the opportunity to do things that the weather allows, like swimming, eating ice cream and such. It's about changing your routines to do fun things too" (P1)*. Other examples included residing at outdoor cafés or taking a boat trip, which required thinking about for example using sun protection and packing necessities such as water. Participants described an ambivalence, where spending time outdoors could first be very positive, but then associated with negative emotions once the heat eventually got to them.

Related to this is that summer was seen as a time for both staying active and taking rest. This seemed to create a conflict as sitting around doing nothing was regarded as a waste of precious summertime: *"It is not always that you want to go out for a swim or something like that, so then you have to find something else to do because you can't just stay home and loaf all day"* (P6). Several participants mentioned using summer for outdoor home renovations that are difficult to do other parts of the year. For example: "*we just have to get to it and do things because at least it's not raining so you can paint. And then you do it*" (P8). However, participants acknowledged that it can be tiring in the heat, and that it is important to also schedule proper rest: "*when you rest, when you actually do rest, then you should rest and not be walking around and running around*" (P1).

Adaptations were typically discussed as important in other climates, but not relevant in Sweden: "*I'm thinking in Sweden maybe it doesn't matter that much, I normally feel, but if you're in hot countries then it can make a big difference*" (P2). For example, related to taking the temperature into consideration when scheduling activities or going outside. This tendency also affected the choice of adaptation methods, as participants favoured simple behavioural adaptations such as drinking water and dressing appropriately, "*because it feels like, or it's not that often that it's that hot in Sweden, and often it helps to do these things to feel comfortable*" (P3).

However, drought came up as an important part of some participants' previous experiences of extreme heat, having made climate change feel more tangible. Although the stories were not primarily from urban environments, they seemed to have made participants more aware of both their resource consumption and the effects of climate change. One participant described that "*I understand that it is climate change and so on, but it is kind of beautiful sometimes. But you also get a bit stricken by it, when it's really dead. Then it gets very dystopian*" (P8), which also illustrated that a situation that comes across as negative can be framed differently. Related changes in everyday practices, such as limiting watering of gardens and taking short showers, were also described. For example, "*many think more about where the water for the garden comes from […] A lot of water tanks out and people who are careful about putting the lid on during the day so it doesn't evaporate*" (P7). In this example, without an explicit water shortage. Another interesting point concerned the changed images of these practices: "*And it is not that you are good or so, but because you have to. And maybe that how it should be for everyone then, that you have to*" (P8).

Keeping the home cool in the city

High temperatures in the urban environment gave rise to negative emotions, both because of the effects on thermal comfort and the limited means of addressing it. Many described that it becomes very hot indoors and that they had limited options for escaping the home. Avoiding the city altogether was often preferred: "*That would be Nordstan in that case as an alternative. So, in general, I try to avoid city environments in the summer*" (P7). In lack of alternatives, accepting and enduring the heat played a role in participants' coping strategies: "*It gets too hot […] so, we haven't adapted, we have just learnt to live with it […] But what to do? Everyone is in the same boat*" (P8).

Humidity in general was seen to worsen the experience of heat: "*Sweaty and hot. It doesn't matter that much if it is hot, but if it is humid I think it is troublesome*" (P2) and "*such a 'greenhouse situation'*" (P3). This was consistent with the fact that high air humidity makes the perceived temperature higher than the meteorological (SMHI, 2011). Sweating was also perceived as negative. Participants returned to descriptions of feeling "sticky" and motivated various adaptations by wanting to avoid sweating. This conflicts with sweating being a physiological response by which the human body naturally regulates its temperature (Havenith, 2002). Adaptations related to clothing were mentioned by all participants, described as "*one of the simplest and most effective things you can do*" (P1). These included dressing in light, airy clothing, choosing certain materials or garments and reducing the amount of clothing. Feelings of freshness and freedom were described, interpreted as quite literal responses to the negative sensations associated with sweating and hot indoor temperatures.

Another perceived friction in extreme heat was that daylight was viewed as precious. While participants described their performances of blocking out the sun as effective, there was a clear hesitation towards it. For example, a participant described: **"***I'm not overjoyed by it, but it's very effective. I think it makes the home rather unpleasant to have it dark, so it's not very nice to be indoors, but then, maybe it is even less nice to be outdoors in the heat*" (P7). Although effective, it was mostly seen as a temporary solution: "*doing it over time, yes, that would be a bit dull since it gets dark in the apartment*" (P1). It could also be common to forget to close the blinds, causing issues later: "*It is only if I forget it, and then it can be very troubling even if I have a fan and air out the room later*" (P3). This suggested that material adaptation was not sufficient for engaging in the promoted practice. Conversely, even without proper shading devices, participants had improvised effective means of blocking out the sun: "*we were just moved in, so they didn't have any blinds or so. […] had to simply take blankets to cover the windows, and it worked well*" (P1).

Airing out the home was another important practice for maintaining indoor thermal comfort in hot weather. It was associated with "*a feeling of freedom to finally get to open the windows*" (P7), especially due to the dislike for keeping blinds closed. Participants described different performances of night ventilation, either opening for a short time or keeping windows ajar through the night. Often in a manner which related to other everyday practices, such as having dinner, or in combination with practices of blocking out the sun. However, one participant mentioned odours and noise as issues with keeping windows open. Some practices depended more on knowledge about the direction of windows in relation to the sun: "*Close to rooms that face south, and open rooms that face the shaded side*" (P7). In general, resembling the heat-conscious daily rhythms described in Section 3.3.1. For example, "*open the windows at night when it is cool, sort of let the cool air in"* (P6) and "*you air out before you go to bed but close before you fall asleep, so you don't get in hot air inside then in the morning*" (P8). The extended daylight hours of the summer, together with practices of keeping windows open, was found to impact the daily rhythm and sleeping patterns: "*I keep my windows open all night, and don't cover them either, so I wake up with the sun in the morning*" (P7).

Actively cooling the home also came up as a topic. Most of the participants suggested fans as means of managing the heat. Participants described a variety of performances that involved different skills and stuff, such as combining the fans with cold showers, ice buckets or open windows to enhance the cooling effect. Air-conditioning was also mentioned as a solution. In general, however, there was a hesitation towards air-conditioning, which was seen as wasteful because heatwaves are still relatively rare, short and mild in Sweden. For example, one participant described that "*it's a full on waste. I would be happy to buy one of those for my great grandmother who is in a vulnerable situation. But really, I get uncomfortable by the heat, but it's not like I will die from it*" (P7). Some even suggested it would be perceived as a weakness of character: "*I would see it as a defeat if we bought one of those AC:s […] it feels puny, and it is, it is about a week a year really*" (P8). Furthermore, financial and environmental aspects also came up as important.

Temporary lifestyle shifts and improvisations to cope with heat

In general, participants associated summer with different temporary lifestyle shifts, regardless of the temperature and the occurrence of heatwaves. For example, one participant mentioned they "*almost always share a room in the summer, which is a bit of a change for me, I never do that otherwise*" (P8) and another that "*I don't live with my family all the time, it is mostly in the summer, so it's a change regardless*" (P7). Temperature and thermal comfort seemed to be central, affecting where and when things are done. There were different examples of temporarily residing in a summer house in the countryside, travelling, or moving in with the family or relatives for a limited time. Related to this was an acceptance for lower levels of comfort and convenience, but also images of escape, leisure and nostalgia: "*I think it is such beautiful environments […] and you go home there and maybe you ignore that you don't have the best comfort […] My grandmother's summer house, that they have always rented, when they built it, they didn't have electricity, they didn't have a phone, they didn't have a fridge, so my father thinks all of these things are frills […]. It shouldn't be too comfortable in the countryside*" (P8).

Some of these temporary lifestyle shifts emerged as responses to endure the heat. Participants described looking for places that are naturally cooler, both in and outside the home. This highlighted the difference between a house with access to different spaces and being confined to an apartment, as well as between the urban environment and the countryside. For example, in homes with multiple floors, participants sought the cooler ground floor: "*my room is on the second*

floor, I never go up there in the summer because it gets so hot" (P6). This affected different everyday practices, such as sleeping and socialising. For example, choosing alternative spaces to sleep, such as the floor or basement: "*it is very nice to sleep in basements if you have access to it. It doesn't heat up the same way as the rest of the house as it is underground*" (P4) and "*it gets too hot and then you have to sleep on the bottom floor*" (P8). Sleeping outdoors also came up: "*It has also happened that I have slept outdoors, laid down in the hammock instead*" (P7). Although these were described as desperate "*worst case*" (P2) measures, there were also elements of the practices that were appreciated. For example, serving as opportunities for leisure or providing a sense of inventiveness, leading to the practices living on: "*It was just a coincidence that we came up with it, and then we continued doing it because it was a little fun*" (P7). In general, participants seemed to enjoyed talking about their creative solutions and memories of adapting to extreme conditions: "*funny solution but it helps […] It is a kind of unusual solution I think*" (P5). One participant described their routine of freezing and using ice packs during the night, exemplifying a creative improvisation involving both skills and stuff. Showering cold before bedtime was another common adaptation. There were also many examples of using water and ice to cool down the body, for example wetting the hair or cooling wrists with tap water.

Practices of making the bed were also adapted in response to heat. For example, improvisations included sleeping in only the duvet covers, changing linen more frequently or, as one participant described: "*putting the pillow or duvet in the freezer […] it's usually more of an emergency solution, but I would be happy to do it more often if I had the space for it*" (P4). This aligned well with another theme, which was the importance of sleep. Consistent with the literature findings, sleep came up as a practice highly affected by heat. Participants described strong negative emotions related to difficulties falling asleep, such as an expression of hopelessness: "*then you just lie and twist and turn […] it's hard to sleep when it is actually too cold, but that's easier to compensate for […] but when it gets too hot, then comes the panic and frustration in 'what should you do?*'" (P5).

A group of strategies related to staying in spaces with active cooling, when the own home does not, similar to the cooling shelter initiatives abroad (Section 3.2.2). Several participants talked about using air-conditioned cars as a temporary escape from the heat and looking for reasons to go out for a ride: "*This might be inconsiderate of me, but taking the car, and take on some missions from the family, like shopping*" (P7) and "*we have actually gone out and sat in the car for like a quarter of an hour with the AC on full blast*" (P6). Other strategies included going to air-conditioned public spaces, such as grocery stores or other shops: "*in grocery stores in the cold and frozen sections it is very pleasant*" (P4) and "*if it is a really nice day, then I probably either stay home because it is too hot or I go down to the city and kind of stay inside shops*" (P5).

Cooking and eating were identified as central to households' everyday lives, with a tradition of seasonal adaptation. For example, shifting to cooking outdoors on a grill was a common practice among many participants, partly motivated by minimising indoor heat: "*if you cook it outdoors it doesn't get as hot indoors*" (P6). It is also described as a solution when there is no access to electricity. Various suggested adaptations related to using kitchen appliances, for example avoiding using the stove and oven as it was thought to "*increase the temperature of the room, or the home in general"* (P5). Eating food that does not require cooking was also perceived to have cooling properties, and people desire cool, water-rich and refreshing foods such as ice cream and salads. There is a tendency to favour simple lunches, such as sandwiches and "*breakfast for lunch*" (P8), and then potentially using the grill or oven in the evening.

Other adaptations of cooking relate to the timing. In general, eating later in the evening: "*all kinds of intensive work needs to be done when it is 'okay' hot outside, so either late at night, so it is often later dinners*" (P8). Participants also suggested cooking less often and in larger quantities: "*doing so properly when you actually do it, so you don't have to do it all of the time*" (P1). Changes in scheduling also applied to other physical or demanding tasks as well, preferred either early in the morning or late at night. For example, "*making a morning round of it rather than running at one o'clock*" (P1) or "*I usually do things in the evening, afternoon, when the sun has started to go down so it is not as hot outside*" (P6). Similarly, one participant suggested "*going to school or work before the heat strikes, if possible*" (P1). Shifting the timing of daily practices matches both behavioural advice to the public (Section 3.2.1) and the improvised practices abroad (Section 3.3.1).

There was also a perception that it is important to consider food safety and manage leftovers and waste properly during "rötmånaderna" [months known for fast rotting of food]. These aspects were also central in handling power disturbances in the heat. Cool-keeping was the most discussed aspect, with important skills including keeping the fridge and freezers closed. In the countryside and houses, there were alternative storing spaces for food, such as "*root cellars […] that we use quite frequently in daily life. So we are not dependent on the refrigerator at all. We even have it turned off sometimes in the summers*" (P8). However, there was limited capacity for alternative cold storage in the apartments. Another practice was to invite neighbours to avoid wasting food.

There was a divide between participants in previous experiences of power disturbances. For example, the expectations of how long it would last and having developed skills to cope with heat without electricity. It was not surprising that power disturbances were not seen as a direct consequence of heat, given the limited experiences of problems related to energy distribution during hot periods in Sweden (MSB, 2014). A participant with experiences of longer power outages abroad exemplified adapting practices of coping with heat accordingly. For example, staying on the lower floors and closing blinds, but also taking the car for a drive to "*find someplace with power and sort of walk around a store for a few hours where they have AC and where it is cold*" (P6).

Heat as a part of (summer) everyday life

Overheating in urban environments was found to give rise to strong emotions related to experiences of thermal discomfort, illustrating aspects that could be relevant in address heatwaves as more than a threat to health. Periods of extreme heat coincide with the summer season, which created friction in relation to norms around being outdoors, staying active and enjoying oneself. There were also temporary lifestyle shifts, often associated with an acceptance of lower levels of comfort or alternative, traditional ways of doing that offer opportunities for desirable reconfiguration of adaptation practices.

Figure 17 illustrates some broad everyday practices, with the dotted boxes representing bundles of practices with particularly strong links based on occurring together in many performances described by workshop participants. These were food and water; comfort, hygiene and rest; and leisure, wellbeing and quality of life. In general, sleeping, laundry, cooking and leisure were featured many adaptations. Cooling emerged as a practice in the form of cooling the home, other spaces and the body, which introduced new skills, stuff and images into everyday practices. There were also reconfigurations related to scheduling, reducing heat generation and staying sheltered from direct sun. There was a close resemblance between the adaptations mentioned in the workshop and the behavioural advice offered by authorities, although aspects such as protecting risk groups and checking in on others were not as evident. The identified adaptation practices showed potential for energy resilient adaptation, offering many opportunities to build on.

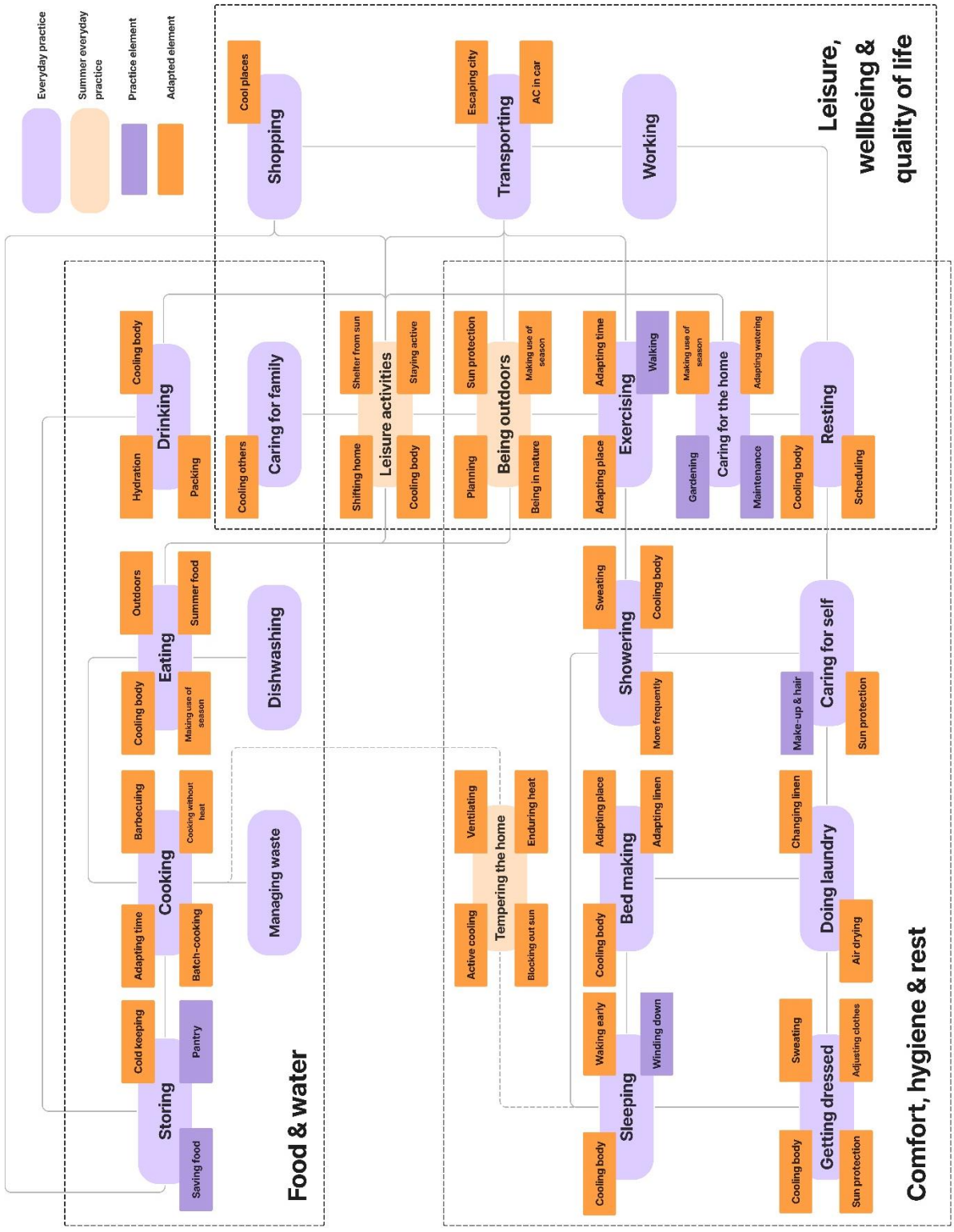


Figure 17: Overview of bundles of everyday practice, based on the workshop

3.4.2. Indoor thermal comfort in apartments

This section will present the insights related to indoor thermal comfort and measures that households living in apartments can take to cope with overheating, based on the interview with the energy and environmental manager at a public housing company.

It was found that the preconditions for the indoor climate are mostly set when the house is built: "*given what the houses look like, we have very little control in it. It is what it is, and that is the difficulty usually*" (P9). Therefore, there can be differences between old and new houses, where the latter is generally more at risk for overheating. Many architectural and technological factors, such as the apartment location in the building, window design and type of mechanical ventilation system, also affect the preconditions: "*in most cases, it has to do with how the apartment is situated in the house and so on*" (P9). From this, it was concluded that households are affected by heat to different extents, suggesting that it might be relevant to tailor information. However, although many factors contribute to the preconditions, the interviewee argued that, with some exceptions, it is enough with general recommendations. It is described, for example, that in the summer of 2018, there was overheating in almost every house.

There are requirements and guidelines to maintain certain indoor temperatures. Therefore, there are thermometers installed in all their apartments, registering the mean indoor temperature. However, they do not capture effects of direct sunlight and extreme temperature events. This suggests opportunities for improving the understanding of the indoor thermal climate in the apartments. Additionally, exploring how the information could be communicated to residents for taking appropriate action. There were also currently no measurements for common facilities such as basements and laundry rooms, but the interviewee's perception was that they are generally cooler. This is interpreted as the rooms being thought of only as for temporary use, implying a need for investigating the feasibility of using these spaces as shelters from heat.

Resident behaviour was also highlighted as an important factor for the indoor thermal climate. It was pointed out that there is a lot to be done about communicating behavioural advice to residents, which offered an opportunity for design with high potential for impact. Residents could report issues through an app, a web-based system or by calling customer service. The app currently provided mainly general information but was identified as a possible platform for behavioural advice. They described the provided information on their website as rather hard to find. This followed the same issue as identified with the general behavioural advice (Section 3.2.1). The main behavioural aspects discussed were opening windows to air out and blocking out the sun, consistent with previous findings.

Although the ideal behaviours were described as quite straightforward, other aspects seemed to affect households' ability and willingness to adopt them: "*it is hard to get all the tenants on board with that*" (P9). In the case of airing out the apartment, there were misconceptions of the purpose of opening windows, believed to be closely related to a lack of knowledge: "*one wants to keep it open all the time […] it is a feeling that you ventilate, and that you get, so to speak, as people tend to say 'oxygen'"* (P9). The interviewee also suggested that the experience of the indoor thermal climate is about more than just the temperature, with poor perceived air quality contributing to a feeling of being trapped: *"it is probably more that it feels trapped and that it is too hot and so on, that makes it feel like you have to open regardless of the outdoor temperature*" (P9).

It was suggested that good outdoor environments in the proximity can help mitigate this feeling. Increasing greenery was argued to have both a significant effect on reducing temperatures, consistent with national reports (Folkhälsomyndigheten, 2019), but also important for the perception of heat and availability of shade. However, "*it is no quick and easy solution, it takes time*" (P9) and there are different limitations to establishing such spaces in the city.

Secondly, blocking out sunlight was described as an important measure to reduce overheating: "*you should have a closed window and blinds shut if you have those. It is the best way to reduce heating in the apartment summertime*" (P9). Using indoor curtains was another solution that had been tested large scale. Even in some cases when interventions had not generated an actual decrease in temperature, the residents' experiences of the indoor thermal climate had improved. Sun protective films were seen as promising but had not been explored widely due to technical uncertainties. However, in general, the interviewee expected that different shading measures will require more attention in the future.

Functioning ventilation was a third factor mentioned as important for a good indoor climate. For example, some systems are not intended to be altered by residents, whereas other can be opened and shut temporarily. In general, it was implied that residents have limited understanding of how their actions relate to heat and the indoor climate. This was considered interesting as it seemed closely related to the unfamiliarity that households in general have with heat, possibly applicable to other adaptation measures that have to do with the indoor thermal climate.

Heat generation in the home was not seen as a major contributor to the thermal climate. Some older appliances generated quite a lot of residual heat but what was referred to as "normal" behaviour only had minimal impact on the temperature: "*it is an impact, but it is […] probably not crucial*" (P9). This suggested that other measures are more important to focus on, although other sources suggested that the heat gains from activities and appliances can be significant (Folkhälsomyndigheten, 2024c; Zero Carbon Hub, 2015). Another point was that people themselves generate heat, so the more people in an apartment, the higher the constant heat generation.

Air-conditioning, in the context of general apartments, was only seen as a last resort due to its negative economic and environmental impacts. It was also said to add a significant workload in the form of inspections and maintenance. However, in the future, it might be necessary with larger technological interventions to keep indoor temperatures down, but behavioural interventions were seen as a way to possibly postpone the need for it. The interviewee highlighted that there is a lot of uncertainty involved. Additionally, alongside overheating, there are other climate risks to address. In Gothenburg, mainly related to heavy rainfall and flooding.

In summary, pointing to the relevance of addressing indoor overheating in apartments and promoting effective behavioural adaptations, although it is a complex issue relating both to technical knowledge, residents' perceptions and awareness of heat, and societal level considerations.

3.5. Identified opportunities for desirable change

To sum up, the previous parts have mapped adaptations and improvisations in response to heat, on an individual and societal level, in Sweden and abroad. Along the way, this exploration has accumulated a range of elements found from other practices, directly related to heat or not, that were seen as possible sources of inspiration. The next phase encompassed experimentation, first with how practices could be reconfigured using these elements, to support adaptation, and then how these reconfigurations were perceived by households.

3.5.1. Early ideas for household heat adaptation

The initial ideation resulted in a large quantity of ideas with different levels of abstraction, encompassing different kinds of initiatives that incorporated the previously described elements in practices of Swedish households' everyday lives to promote desirable adaptation to heatwaves and increased temperatures. The ideas included different kinds of physical products, such as consumables, appliances, greenery, packaging and kits; services, such as memberships, counselling, meal planning, transport and sharing systems; digital tools such as apps, planning tools, maps and games; inspirational initiatives such as lifestyle magazines, activity guides, challenges, reflections and recipe books; campaigns, events, community programs and calendars; social initiatives such as organisations, volunteer networks and assignment of roles. Among these ideas, involving a wide range of actors as potential stakeholders in household climate adaptation.

In sorting the ideas, they were found to address heat either by preparing for it, mitigating the situation, or escaping it. They were also found to have different focus, either the neighbourhood, the home or the household. This was the base for a categorisation which was later used to map the ideas in a matrix, as seen in Figure 18, to understand different opportunities for desirable change. Based on clustering the many initial ideas, 16 directions for household heat adaptation came to be. In the elimination process, it became clear that many of the concepts were still very undefined and ambiguous, with possibilities to contain a lot of different components. Nonetheless, some directions stood out as more promising in relation to the evaluation criteria, whereas others were eliminated or incorporated into other ideas. For example, favouring the directions that were more closely related to everyday practices and behavioural adaptations, relevant for a broad group of households and less dependent on professional installation and permanent physical interventions.

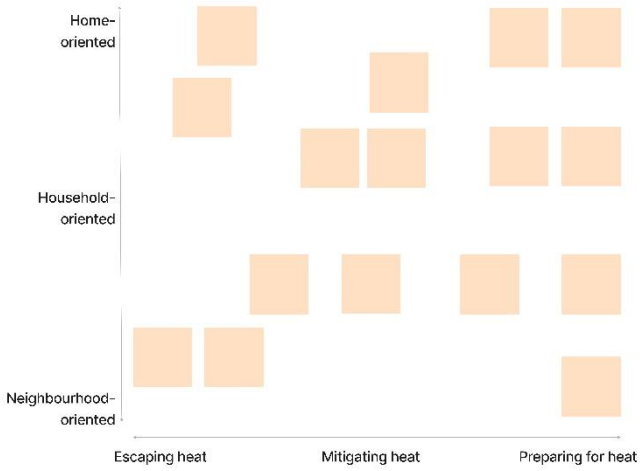


Figure 18: Matrix illustrating the explored design space, with squares representing the 16 directions.

3.5.2. Eight opportunities for desirable change

Following the process above, eight promising opportunities for desirable change remained, mapped in Figure 19 according to their focus. These addressed household adaptation to increased temperatures and heatwaves in different, partly overlapping, ways. Figure 20 illustrates how each opportunity, following the numbering of Figure 19, relates to the adaptation strategies derived from general behavioural advice.

Home-oriented opportunities related the closest to the indoor thermal climate of the own apartment. The first opportunity was about guiding households in identifying heat sources in their homes, thereby making it more tangible in relation to the own home. For example, heat generating appliances and windows, which households may not consciously think about as contributing to the indoor thermal climate, and how these relate to current configurations of everyday practices such as cooking and entertainment. Another opportunity was to suggest ways of improving the indoor thermal climate by alternative means, such as by introducing new products that build on blocking out the sun, night ventilation and other less energy-intensive methods than for example air-conditioning. Thirdly, an opportunity related to making temperature more tangible in everyday life by inviting households to a new daily rhythm structured around behavioural advice and promoting effective practices of night ventilation, appliance use and taking shelter indoors.

Household-oriented opportunities related to the household occupying an apartment. One opportunity targeted household cooking and eating practices, as there are many aspects related to heat and energy consumption, but also strong seasonal variations, which could make it interesting to explore how this could be reconfigured with heat-consciousness as an image. For example, related to the temperature of the food, the kind of food products consumed, and the methods used. Another opportunity related to alternative ways of keeping the body cool to endure the heat, introducing a kit of different products that make use of existing know-how. A third opportunity identified involved taking a more proactive approach, inviting households to reflect on household-specific risks and adaptive capacity based on their own yearly cycle.

Neighbourhood-oriented opportunities related to the relationships between households, their neighbours and their neighbourhoods, focusing on reframing the preconditions for dealing with heatwaves. For instance, by inviting households to extend their everyday practices beyond the own apartment. This could include spaces such as stairways, basements and laundry rooms, but also yards, parks and cool indoor public places, as part of household heat adaptation. Finally, the last identified opportunity related to integrating a climate adaptation perspective in how we view different living conditions. For example, working with ratings for indoor thermal comfort, heat preparedness and access to cool places and support.

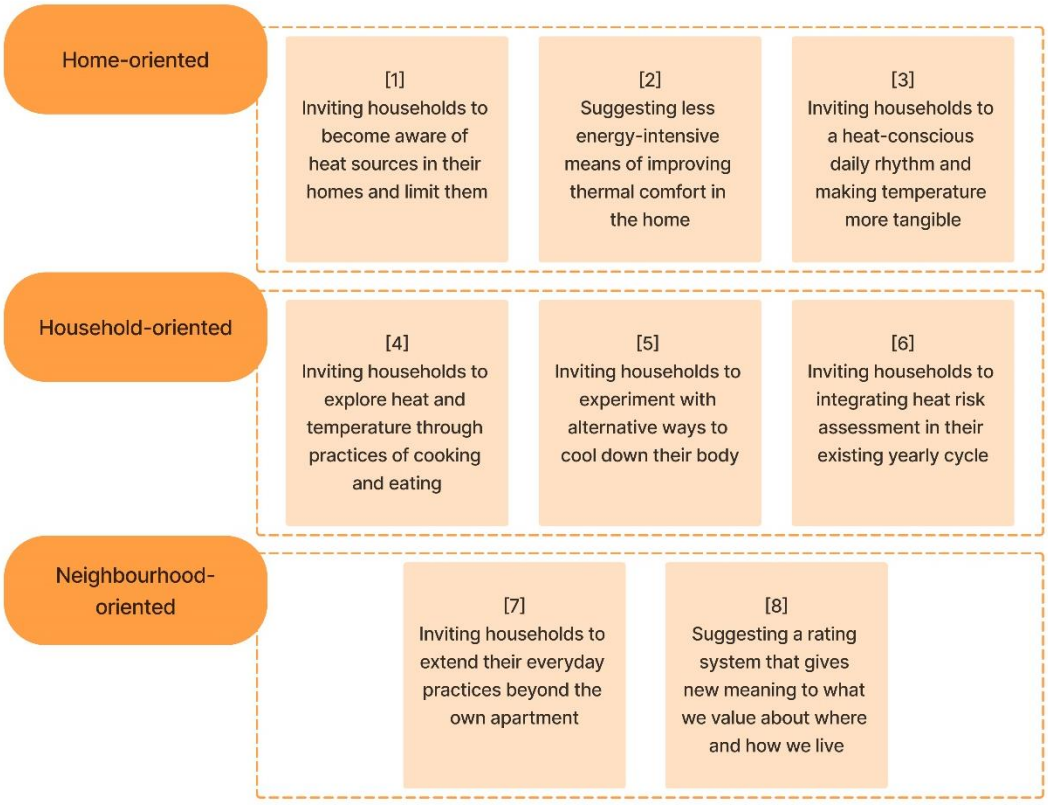


Figure 19: Overview of eight identified opportunities for desirable change

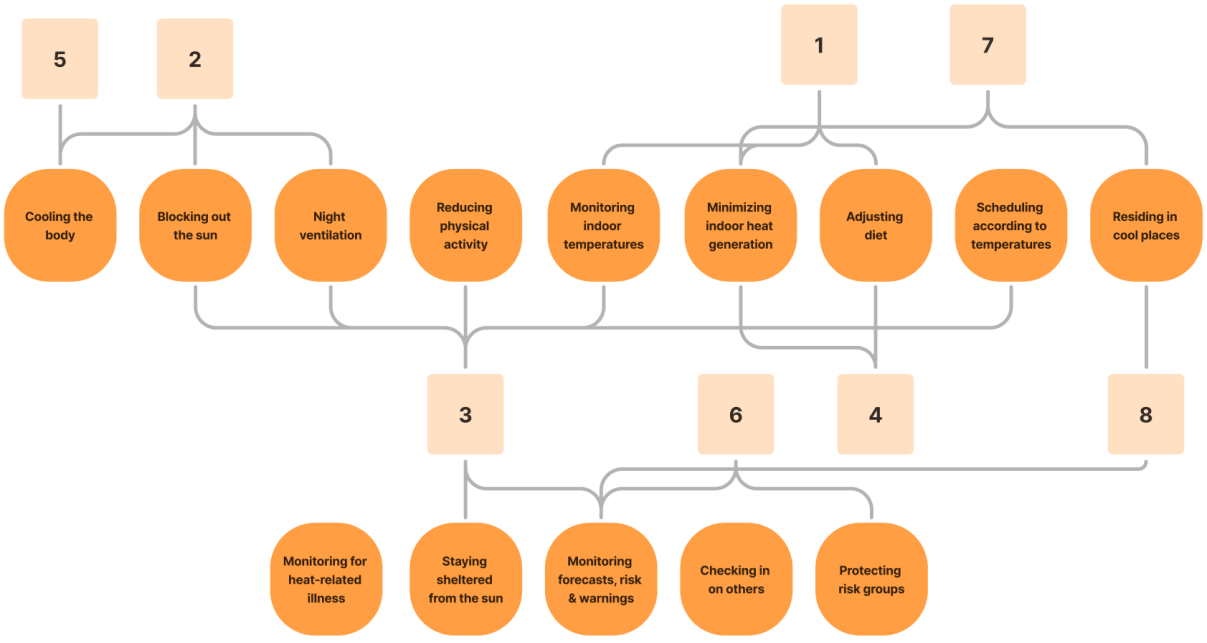


Figure 20: Overview of how the different opportunities related to the general behavioural heat advice

3.5.3. Conceptualisation

In deciding which opportunities to proceed with, the following reflections were important:

- Rather than suggesting new products for passive cooling, as in [2], it was found more interesting to focus on behaviours related to existing infrastructure for shading and ventilation, from a practice-oriented and climate justice perspective.
- [4] and [5] had strong connections to everyday practices and thermal comfort, but were more dependent on physiological responses and bodily experiences, considered beyond the scope of this project to investigate.
- The cyclic and seasonally-bound learning process of [6] was kept as it was found interesting for engaging households in evaluating their own adaptive capacity.
- The chosen directions had the strongest connections to households' everyday lives and the adaptations identified in the workshops.
- The aspect from [1] of identifying heat in the home was found interesting in relation to making temperature a more tangible concept and supporting household energy resilience.
- Based on the insights from the expert interview, it was also decided to not focus primarily on limiting indoor heat gains, such as by [1], as other passive measures of keeping the home cool may have a more significant impact.

Resulting from elimination process described above, the design space was narrowed down to two opportunities for desirable change: "Heat-conscious daily rhythm" [3] and "Life beyond the apartment" [7]. In conceptualising proto-practices related to these opportunities, it was found that the two could be seen as two sides of the same coin, being closely interrelated but revolving around different types of changes. The first direction focused on experimenting with structuring the day according to temperature variations and norms of how time is allocated. The other direction focused on experimenting with where everyday practices are carried out, blurring the lines between the private and the public. In the face of heat, and different households having different preconditions, they might be complementary solutions to be explored in parallel. Out of a larger set of proto-practices suggested, five were selected, as seen in Figure 21.

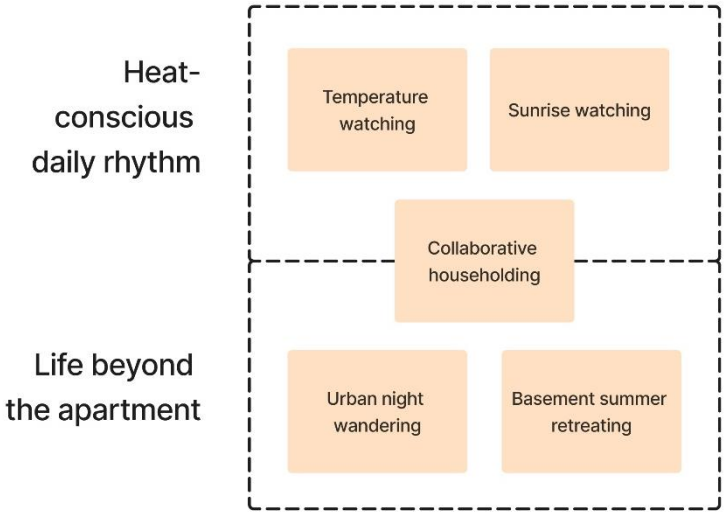


Figure 21: The selected five proto-practices

3.5.4. Descriptions of early proto-practices

In this section, the five selected proto-practices will be described briefly in terms of their elements and what previous findings they were inspired by. Figure 22 below shows the five proto-practices in relation to which heat adaptation strategies they were based on.

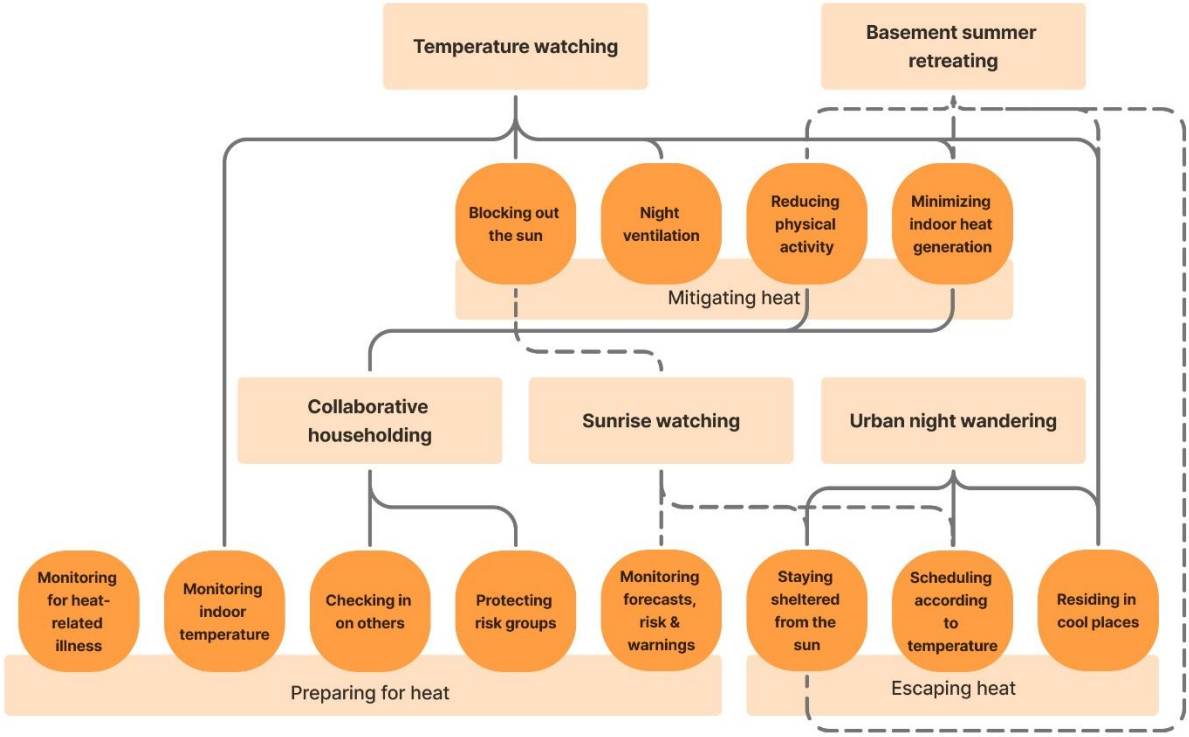


Figure 22: Overview of the strategies of heat adaptation used in the different proto-practices

Temperature watching

This proto-practice invited participants to an everyday life centred around keeping the home cool and understanding temperature variations over the day, including the relationship between indoor and outdoor temperatures. The early idea revolved around adding some kind of device that could be observed and interpreted by the household to better understand the indoor climate. Households would experiment with being guided by it in practices of night ventilation, blocking out the sun and limiting use of heat-generating appliances. Thereby, supporting participants to develop new routines for improving the indoor thermal climate, based on becoming more conscious of heat as an element in everyday life. It was primarily inspired by a skill of “lay thermodynamics” developed in response to extreme heat in other countries (Walker, 2021, as cited in Robertson et al., 2024), as well as a skill of interpreting surroundings and acting appropriately in the outdoors.

Sunrise watching

This proto-practice invited participants to a daily rhythm that follows the sunlight. The early ideas revolved around experimenting with ways to make use of the cooler hours of the day and appreciate the time before the heat strikes. Households would be guided in waking up with the sunrise and aligning their everyday schedules according to that of the sun and heat. For example,

appreciating letting sunlight into their apartment before it ought to be blocked out. This was inspired by practices from outdoor lifestyles of viewing seemingly mundane things such as a sunset as a highlight of an excursion, and by psychological adaptations to heat such as positive thinking and seizing available opportunities (e.g. (Aghababaeian et al., 2024)). Furthermore, supporting the households in planning their days around expected temperatures and warnings, for example by slowing down and staying indoors midday, also resembling planning and risk assessment practices from outdoor lifestyles.

Collaborative householding

This proto-practice invited participants to a way of life based on organising chores between households and collaborating in practices like cooking, laundry and dishwashing. The intention was to both minimise demanding activities and indoor heat-generation, as well as check in on how neighbours are managing and help those in need. The ideas involved some kind of system for signing up for chores and matching with other households, and for sharing facilities and appliances. Furthermore, also looking into common preparations for heatwaves, such as water storage, shade availability and spaces for escaping the heat. It was inspired both by the initiatives for heat adaptation based on establishing social networks in so-called buddy systems and common cool places (see Section 3.2.2) and the image from outdoor lifestyles of spending time with friends and family (Vara i naturen, 2008).

Urban night wandering

This proto-practice invited participants to an everyday life where it is common practice to leave the home in search of a cool place to sleep. Based on the insight that sleep is highly impacted by heat, while being held highly valuable, households would be guided in taking a nightly stroll away from the own apartment. At the same time, welcoming new ways of making use of the limited summertime and connecting to the outdoors after taking shelter from the heat indoors during the day, inspired by *microadventures* from outdoor lifestyles (Humphreys, 2022) and scheduling outdoor activities to cooler parts of the day (e.g. (Rosengren, 2022; Yáñez Serrano et al., 2023)). The early ideas revolved around products for temporarily setting up for sleeping in different spaces beyond the apartment – from balconies, to yards and parks, to green roofs or to friends' homes – with possible synergies with urban planning actions of increasing greenery in the cities. Additionally, taking elements from the organised initiatives of public cool places and maps to locate those, as well as the improvised practices described in the workshop and literature about seeking cooler areas in response to heat.

Basement summer retreating

This proto-practice invited participants to spend time in naturally cool indoor spaces within their apartment buildings. In this case, creatively re-imagining their own basement storage units or shared underground facilities as summer retreats. The idea was based on the concept of summerhouses or outdoor excursions, where a lower level of comfort seems acceptable in exchange for a shift in environment and a *microadventure* (Humphreys, 2022). Elements in the proto-practice included a range of products for enabling everyday practices under simple circumstances beyond the own apartment, for example related to cooking, resting, working and socialising. It was also partly inspired by the stories of seeking refuge in underground spaces, cellars or other cool places during hot periods, both found in previous studies on adaptation to extreme heat (e.g. (Aghababaeian et al., 2024)) and in the workshop.

3.5.5. Pre-conditions for design

Exploring interventions for mitigating the situation in households' own homes was seen as the preferable course of action, given that it might be less disruptive for household practices. Thereby, potentially making it easier to relate to everyday life, rather than a crisis, even if it takes place in an imagined future. For this reason, it was decided to focus on adapting the daily rhythm, and the two proto-practices *Sunrise watching* and *Temperature watching*. The other direction, extending practices beyond the own home, was deemed an actionable alternative should this not be achievable. The results of the additional theoretical research about indoor thermal comfort, effective passive cooling, and the natural daily rhythms of light and temperature, are presented below. Furthermore, describing related projects aimed at making abstract phenomena tangible to households.

Guidelines and perceptions of indoor thermal comfort

Thermal comfort can be described as when a person is satisfied with the experience of temperature. This can vary between individuals (Folkhälsomyndigheten, 2024c), but generally depends on parameters such as the air temperature and air movement. Additionally, factors including activity level, experienced control, clothing, acclimatisation and gender may contribute (Bülow-Hübe et al., 2022). Literature also suggests that ideas of comfort are greatly affected by culture and convention. General expectations of comfort have gone through significant changes in the recent decades, with a trend of growing increasingly accustomed to having the same indoor conditions everywhere (Chappells & Shove, 2005).

Three main factors contribute to indoor overheating: solar radiation; heat generation from people, equipment and lighting; and the outdoor temperature (Bülow-Hübe et al., 2022). Overheating and its consequences in apartments is widely researched (Beckmann et al., 2021). However, a problem which often gains media attention during heatwaves is the lack of regulations for high indoor temperatures (SMHI, 2011). Different countries and climatic regions have different temperature thresholds to indicate levels associated with reduced comfort and negative health impacts (Beckmann et al., 2021). In Sweden, the indoor air temperature should not exceed 26°C in the summer. It can be acceptable with slightly higher temperatures daytime, but not nighttime and not for sensitive groups (Folkhälsomyndigheten, 2024c). It s also advised to check the room temperature between 8:00 and 10:00, at 13:00 and after 22:00 (WHO, 2024).

Efficient practices of airing and blocking out the sun

In general, it was difficult to find straightforward descriptions of the optimal ways of airing out and blocking out solar radiation, even more so specific to the Swedish context and apartments, which in itself could be an implication for further research. Airing out the home by opening windows is an important passive method of managing the indoor temperature. Particularly, nighttime ventilation is important for improving sleeping conditions (Folkhälsomyndigheten, 2024c). Practices of airing out are often the only means for a resident to cool their home (Bülow-Hübe et al., 2022). However, the effectiveness depends on occupants' behaviours (Sukanen et al., 2023). In general, it was found that timing, duration and direction were the most important factors.

The basic principles of effective airing are described below:

- To achieve cooling effects, it needs to be cooler outdoors than indoors when windows are opened (Folkhälsomyndigheten, 2024c). Otherwise, opening windows contributes to heating the rooms instead (Bülow-Hübe et al., 2022)
- Some studies show that the ideal solution is to open windows as soon as the outside temperature is below that of the indoors, although a difficulty with this can be to get the exact timing right (Rosenfelder et al., 2016)
- Meteorological conditions such as tropical nights and the duration of the heat wave impacts how effective window ventilation is for passive cooling (Schünemann et al., 2021)
- Keeping windows fully opened throughout the night is the most effective way to keep heat load low, and keeping windows closed at all times is associated with the most intense heat strain (Rosenfelder et al., 2016).
- Cross ventilation has been shown to be more effective for achieving a comfortable thermal environment than single-side ventilation (Omrani et al., 2017)
- The façade direction can be important to take into account when choosing what windows to use for ventilation at different parts of the day (Kuijer, 2023). Preferably, ventilating on the shaded side of the apartment (Bexell Hoffmann, 2025)
- There might be various reasons for not being able or willing to open windows (Sukanen et al., 2023) including noise, pollution and safety risks (Folkhälsomyndigheten, 2024c).

Similarly, some basic principles of window shading are outlined below, as this is another important strategy to mitigate overheating in buildings (Bülow-Hübe et al., 2022):

- When sunlight hits a window, part of the solar radiation will affect the room in the form of heat. Shading works regardless of the outdoor temperature (Bülow-Hübe et al., 2022).
- If a building has large window areas oriented to the east, south or west, there is more sun and an increased need for shading or sun protection (Folkhälsomyndigheten, 2019)
- In general, external shading is more effective as it blocks the sun radiation before it hits the window, but integrated in-glass blinds can also be effective given that they are closed as long as the sun is strong. (Bülow-Hübe et al., 2022)
- It is generally advised to use shading as soon as there is sun on the window, taking note that this can differ between façade directions (Kuijer, 2023)

Finally, in relation to both temperatures and sunlight, some basic knowledge of meteorological parameters were collected.

- In the summer in Sweden, the daily maximum temperature usually occurs between 14-15, and the daily minimum temperature slightly before or at sunrise (SMHI, n.d.-b)
- A breeze can feel cooler than it actually is, meaning that sensing the outdoor temperature with the body may be deceptive (Kuijer, 2023)
- Relevant meteorological variables that contribute to heat stress are maximum and minimum temperatures, humidity, wind speed and solar radiation, recommended to be taken into account in heat warning systems (Casanueva et al., 2019)
- For an approximation of sunrise, culmination and sunset timings during the summer in Sweden, the web-based tool SunCalc was used (SunCalc, n.d.)
- Before the sun rises and after it sets, it is not entirely dark. In the summer time, large parts of Sweden never gets dark nighttime (SMHI, n.d.-a).

Related work on household behaviour and feedback devices

Literature suggests that feedback is a key element in effective learning, not only in the context of domestic energy use (Darby, 2001). There has been a development towards installing electricity meters and displays in homes, with the intention to support households in reducing their electricity consumption (Broms et al., 2010). It has been found that energy awareness artefacts, such as the Energy AWARE Clock, can draw households' attention to their electricity use and become a natural part of everyday life. It was demonstrated that the mere presence of an artefact could make consumption more directly visible and contribute to increased awareness (Broms et al., 2010). Assuming that temperatures and heat are also "abstract" concepts to monitor and understand, a potential was spotted in exploring how a similar artefact could be developed to support heat awareness in the home.

Functioning and adequately placed fire alarms are acknowledged as important for alerting and protecting households in the event of a fire, and it is recommended to have at least one in the home and to check it at regular intervals. It is also emphasised that residents in multi-family homes should be informed about fire safety and their related responsibilities, and to report identified deficiencies (MSB, 2021a). Smart home devices, such as smart thermostats, have been demonstrated as a potentially useful tool for heatwave monitoring. A study identified that such technology could build on existing public health heat adaptation interventions, with the purpose to understand how citizens are affected by heat (Oetomo et al., 2022). Immediacy and accessibility of feedback data, as well as clear household-specific information, are key factors in the effectiveness of feedback projects (Darby, 2001). A related initiative identified as relevant was *Klimatvarnaren* [The Climate Alarm], driven by the insurance company If. It combines real-time weather data with information about the specific property and local surroundings to provide warnings of approaching extreme weather and tailored recommendations for minimising damage. The initiative is centred around a prototype of a device which is being evaluated with a test family (If, n.d.). It stood out as it focused on introducing a new kind of artefact to help households monitor extreme weather and protect the specific home. It was seen as interesting to expand on these ideas of introducing artefacts that help households become aware of conditions in the apartment context. Meanwhile, exploring how to integrate feedback based on behavioural heat advice for the household to improve the indoor thermal climate, protect themselves from potential health risks and improve quality of life during extreme heat.

A study which has many similarities to this project is *Feeling the Heat: Uncomfortable Design Fictions for Alternative Forms of Summer Comfort*. It also takes a practice-oriented perspective, employing critical design fictions to explore an uncomfortable future of summer comfort for households, but in a Dutch setting (Kuijer & De Koning, 2024). Working with narratives and visuals to discuss current ideals was found as an inspiration for the concept representation in the household study, as well as provided relevant insights related to practices of coping with heat in a European context, some of which mentioned in the overview above. Closely related to this project is also a paper on effective shading and ventilation practices (Kuijer, 2023), which informed some of the preconditions for design described in this section.

3.6. Two selected proto-practices

In the following section, the two proto-practices, “Sunrise watching” and “Temperature watching” will be described. For each, first explaining important elements and functions and how these were inspired by the findings of the previous parts of the study, and then presenting it with illustrations and a translated version of the description presented to household participants. Both proto-practices revolve around making behavioural advice more contextualised and personalised, supporting a process of developing new routines based on an understanding of heat, and restructuring the daily rhythm to accommodate heat as a part of everyday life.

3.6.1. Sunrise watching

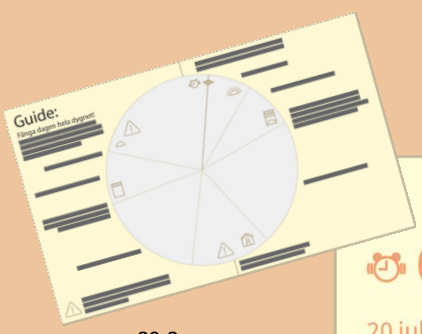
This proto-practice, presented in Figure 23, invited participants to be guided by the sunlight in their routines to make better use of the hours of the day when it is the coolest outside. Thereby, proposing an alternative time to perform physically demanding or heat-generating household practices, similar to both the everyday adaptations suggested by workshop participants and the behavioural advice, as previously described. This relates to the direction that Chappells and Shove (2005) suggest for the future of thermal comfort, where instead of focusing on maintaining standardised indoor temperatures and thereby gradually narrowing the concept of comfort, exploring the meanings of comfort and associated ways of life.

An important element was the clock-like artefact (Figure 23.1). A main feature of it was a dynamic wake-up alarm set before sunrise, when it has started to lighten outside, building on the seasonal shifts in daily rhythm mentioned in the workshops. Although it might not be entirely realistic (or desirable from different points of view) to expect households to wake up at that time, it was considered a relatable aspect of everyday life which would lead to insights about how households structure their day, prioritise their time and the flexibility to adapt. An alarm clock was also thought to have nostalgic associations to it, especially in relation to waking up with the sun. A study on temporal distance of climate change suggests evoking nostalgia could be positive for climate change engagement (Huang et al., 2024). The clock also provided information about actual and expected temperatures, personalised for the individual household by taking aspects such as floor number, apartment orientation and window directions into account, as these had been identified to affect heat exposure (see Section 1.4.3). The idea was to make recommendations related to shading, staying indoors and scheduling according to the temperature both more specific, concrete and easily available in the everyday environment. This way, aiming to support households in planning their time around risks and warnings, borrowing elements from planning and risk assessment practices from outdoor lifestyles.

Finally, another tentative element was the guide “Fånga dagen hela dygnet” [Catch the day all day] (Figure 23.2) with inspiration for leisure activities other times of the day than the hours of most intense heat, framing behavioural advice in a way that highlights benefits for the individual. For example, to increase appreciation for the morning hours before the heat strikes and the sun ought to be blocked out. This was based on the finding that among households, summer was seen as a time to make the most of, staying active and outdoors. Abroad, it was identified that adaptations such as positive thinking could be helpful (Aghababaeian et al., 2024; Ferenčuhová, 2022). This was seen as having links to practices of outdoor lifestyles, where the sunrise could for example be seen as a highlight of an excursion, which was seen as an element that could be explored as an opportunity in the urban context. However, the format and contents of the guide were not described in detail, and thereby not aspects evaluated in the household study.

A warmer climate makes it more important to make the most out of the cooler hours to have time for everyday life. Because of this, many change their daily rhythm and their routines to follow that of the sun and the heat. In their homes, people have a new kind of clock which is set for waking you up in the early dawn hours. This gives a valuable moment to enjoy the light before the sun reaches the house façade and starts to shine in through the windows. The clock gives information about when sun shading can be necessary to avoid indoor heat build-up, adjusted to the own home.

The clock supports in planning the day according to the heat, such as what times are expected to be the hottest and when you should be particularly vigilant for extreme temperatures, based on local weather conditions and housing characteristics. Around this, you plan your day with physical activity, demanding chores and use of heat-generating appliances, as well as staying indoors when the sun is the most intense.



23.2

23.1

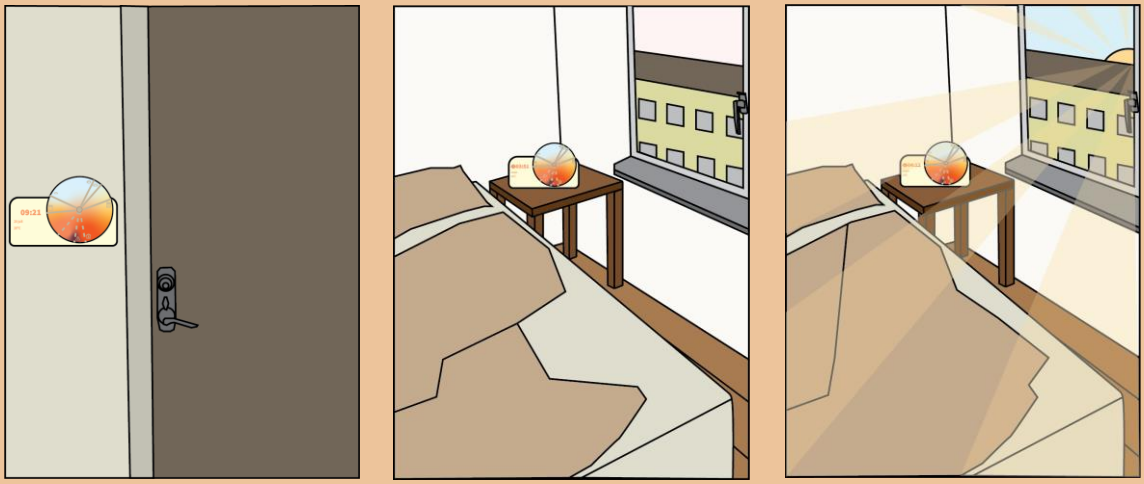


Figure 23: Elements and representations of the proto-practice Sunrise watching

3.6.2. Temperature watching

This proto-practice, presented in Figure 24, built on supporting households in routines of improving the indoor thermal climate, directed by actual temperatures in the home. A starting point was that temperatures felt like a rather abstract concept, especially in relation to unfamiliar conditions brought by climate change. Inspired by the concept of “lay thermodynamics” (Walker, 2021, as cited in Robertson et al., 2024), the aim was to engage households in developing an understanding of dynamics of heat in their home in the summertime, corresponding to that which households in general are already equipped for in the winter months (Socialstyrelsen, 2011). Thereby, bridging a possible gap between behavioural advice and everyday life.

A main element was imagined to be a device that measured parameters related to the thermal climate and provided visual feedback to the household. This built on the recommendation to have thermometers in different rooms to be able to monitor the indoor thermal climate (Kristiansstads Kommun, 2023) and compare to relevant thresholds and target values (Folkhälsomyndigheten, 2024c). Thereby, bringing behavioural advice into the context of use. It used different coloured lights to indicate the relationship between indoor and outdoor temperatures in real-time. This way, providing guidance in following the principles of effective ventilation and shading in terms of timing, duration and direction. For example, based on the guideline that opening windows is only effective if it is cooler outdoors than indoors (e.g. (Folkhälsomyndigheten, 2024c)), which was thought to be difficult to tell intuitively. In this case, the indicator would be yellow (Figure 24.3) or blue (Figure 24.4) for when it is hotter and cooler outdoors than indoors, respectively, and red (Figure 24.1) when exceeding defined temperature thresholds.

The intention was to explore if having a course of action recommended based on local conditions, similar to the warning apps and the initiative *Klimatvarnaren* (If, n.d.) previously described, could be perceived as more actionable than general advice. The idea also partially emerged from the daily rhythm of anticipation, preparation, waiting and relief, identified in research on heat adaptation in other countries (Robertson et al., 2024). In this case, anticipating the moment of finally opening the window and blinds in the evening as a highlight of the day. For example, visualising the transition from one colour to the other (Figure 24.2) as a reassurance that it is better to wait. It was also inspired by the processes of observing, interpreting and respecting one’s surroundings, identified in outdoor lifestyles. The idea was to bring more liveliness into temperature indicators than in a classic thermometer. This way, making monitoring the indoor climate more engaging, analogous to watching wildlife or appreciating dynamic natural phenomena. At one point, even resembling birds or fireflies, although this was later changed to a more conventional alarm form to not distract from the purpose of the artefact in the proto-practice.

A second artefact in the proto-practice was a printed interpretation guide (Figure 24.5), with holes for matching the colour to that of the temperature indicator and getting relevant behavioural advice accordingly. For example, related to different means of mitigating heat, such as effective window ventilation, blocking out the sun and limiting use of heat-generating appliances based on the observed status of the temperature indicator. This way, intending to make behavioural advice more contextualised and, over time, build a better understanding of how behaviour influences the indoor thermal climate. It could also indicate when temperatures reach levels that pose a risk to health, based on regulations for the indoor thermal climate, and suggest relevant actions. Although this guide was not designed in detail, there is a lot of potential for exploring how it could be done in a way which is personalised to different target groups and specific apartment buildings, and what actors could be involved in providing such support.

In a future affected by climate change, everyday life becomes increasingly centred around keeping the home cool and understanding the relationship between indoor and outdoor temperatures. To monitor the indoor climate therefore becomes a natural part of everyday life. Thermometers and indicators bring temperatures to life in the home, and people keenly follow changes over the day, learn to interpret their appearance and let the observations direct their lifestyles. It provides support for choosing a place to reside in the home and for taking appropriate action to improve the indoor climate, but also to seek refuge away from the apartment if necessary.

Airing out the apartment is a practice that gains importance, and there is a desire to optimise ventilation after temperatures. During the days, windows and blinds are kept closed. Every evening, people watch how the colours change until time is finally right for opening the window, a moment which is truly special.

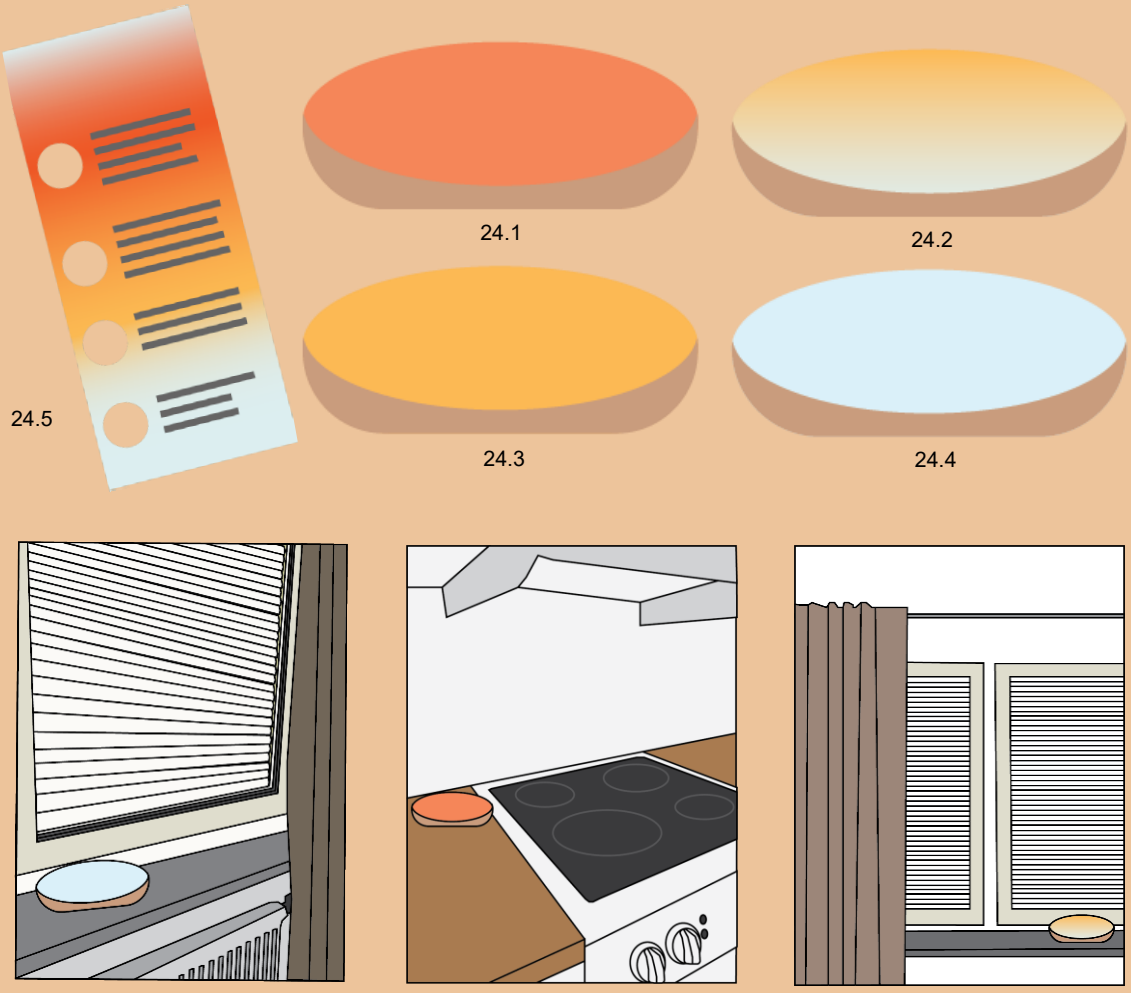


Figure 24: Elements and representations of the proto-practice Temperature watching

3.7. Reconfigured practices of heat adaptation

The following section will describe the results from the household study interviews. These themes relate to previous findings, new insights and concrete feedback on the proto-practices, and questions for future research. The proto-practices Sunrise watching and Temperature watching, and their elements, are denoted as [1] and [2] respectively in the following sections.

3.7.1. Perceptions of heat in urban environments

Participants described varying experiences of indoor overheating in the summer season, ranging from negligible to "*catastrophic*" (P10). Indoor heat was seen as an inconvenience and discomfort but currently found manageable with different strategies: "*it is far too hot to be comfortable, but I don't have any major issues from it. There are ways to handle it*" (P11). This illustrated that, beyond direct health risks, extreme temperatures and indoor overheating can reduce households' quality of life. Similarly, about the need for [1], a participant described that: "*now I don't think heat is that big of an issue, or at least I have methods that work in the climate we have today*" (P14).

The interviews substantiated that culturally bound images may affect how behavioural advice is followed. Especially concerning actions that challenge the relationship that households have with the sun, hot weather and daylight. The interviews supported the view of summer as a limited resource, describing for example that "*the general approach is to take advantage of all the light and all the heat you can get because we get so little of it*" (P12) and that "*you have to make the most of the hot weather, maximise it a little bit*" (P14). It was described that this image is "*quite ingrained in […] the mindset and in the culture, that if you are out of office and it is hot, then you should be outside*" (P12) and that it would take extreme temperatures to change behaviours. Participants also framed it as a lack of knowledge of heat mitigating behaviours: "*I only think about blocking out the light because it bothers you […] It feels like the heat is sort of a consequence that you don't think about in the moment […] Maybe you just think that it is the outdoor temperature that gives heat*" (P15) and "*I have not reflected so much about that it would not work that way […] there is an instinct that 'it is hot indoors, I open a window', even if that's not always the solution*" (P12). This supported working with what was called heat-consciousness in this project.

While some participants expressed a strong desire to schedule activities outdoors during the summer, others described an abundance of options for staying busy indoors: "*For me it's more something to do sometimes, but I survive if it is very hot and I sort of need to stay inside*" (P10). It also has to do with the duration of the extreme heat event: "*If it is limited to a few hours, no problem, I can go out at night […] It is nice to get a break at home, to have an excuse for that is perfect, but if it would be all day, then it would get very boring*" (P13). The interviews thereby indicated that, for a younger target group, leisure could be important in adaptation initiatives.

Participants suggested additional parameters, such as pollen levels, air pollution and UV index, as relevant to monitor. These may create unfamiliar conditions for households' everyday life and barriers to energy resilient means of keeping the home cool. For example, "*it makes it more difficult to air out in the summer […] then you have to make sure to ventilate as much as possible in mornings and evenings, when the pollen levels are the lowest*" (P10). These aspects are discussed as potential health issues for groups that are not in general seen as directly at-risk in heat: "*at least in this age, it [sun burn] feels like the biggest health risk*" (P12). Additionally, the participants identified characteristics of the urban environment to take into consideration when recommending household behaviours, for example noise and safety.

3.7.2. Ability and willingness to adapt in apartments

Another theme were some potential differences between living in an apartment and in a house, which came up as of many participants having experiences from both. In general, these were related to a smaller size and limitations of the built environment. Naturally, this is not generalisable for all apartments, but points to a need to map the preconditions for adaptation in apartments, and positions people living in apartments as a potential target group for tailored adaptation initiatives.

Participants described that means of mitigating heat were more limited in apartments: "*in the house you have greater opportunities to handle, or to affect it [heat], than in the apartment where it is just as hot everywhere and I don't have that good means of airing*" (P11). Interestingly, one participant even described that practices perceived as effective in the house context were not brought along to the apartment context: "*we open everything up early in the morning before the sun gets up properly, and then when the sun is up more we close everything before it gets hot to kind of keep the coolness inside better […] but now there is not so much to open in my apartment*" (P14). This exemplified the kind of practices that could be resurrected for household climate adaptation, and a task for design could be to help households to not underestimate the value of such skills. Related to this, a participant even commented that [1] could reveal existing skills: "*you get a bit of help with what you might already do quite unconsciously. Both in the summer and in the winter, but in the winter you might do it but the other way around"* (P13).

The interviews also showed how much preconditions can vary between different apartments, which affected the relevance of different behavioural advice. For example, the sun exposure of the apartment and the available means of shading and cross-ventilation. Participants found that tailored recommendations could be useful: "*SMHI doesn't care about the orientation my apartment is facing. It feels like something that this product [1] can do. It is more adjustable for the individual and for the specific household*" (P10) and "*This one [2] checks more how it actually is, and in this apartment, and outside and so, so I think it is more effective*" (P15). Therefore, it could be interesting to study how advice could be personalised and how to best present such information.

Apart from the ability to influence the thermal climate, the relatively small living space impacted the willingness to adopt heat mitigating behaviours. Consistent with the workshop findings, participants were negative towards practices of blocking out the sun, often related to the perceived size of the apartment. It was partly explained by the lack of natural light in itself: "*it is duller because it gets darker*" (P11) and "*it is nice to sort of get a bit of light in. It feels more inviting, more open space*" (P10). Other aspects related to feeling confined, secluded or missing out on the view. For example, "*I have blinds, but very rarely use them […] It gets a bit trapped*" (P14), "*it just becomes a black wall instead of a window you can see things through, so it feels like the apartment is smaller when they are closed*" (P10) and "*to see out gives a bit of an illusion that I am in a larger environment than I actually am"* (P13). These feelings illustrated a need for developing means of minimising solar heat gains while maintaining a positive experience of staying in the apartment.

Staleness of air was brought up as important for the perceived need to open windows: "*it gets a bit stuffy and it increases the feeling of living in a shoebox*" (P12) and "*it is a very big improvement I would say. Even if it is still hot, at least you get a bit of a breeze and you get some circulation in the air*" (P13). Balconies, depending on the orientation, were also seen as a relief: "*it doesn't really affect the temperature indoors, but we have a little balcony which is nice to hang out on*" (P15). Related to this could be the perceived separation from nature, another difference pointed out between apartments and houses. Opening windows and blinds contributed to a feeling of being

closer to nature, which was a welcome relief from the artificialness of the apartment environment: "*it feels like you get closer to the outdoors […] you let something in that has to do with nature and the outdoors*" (P12), "*there is a lot of things happening outside […] you see the birds, you hear them sing, it contributes a lot to your environment*" (P13) and "*if you're not outdoors, then you can at least pretend if there is a bit of movement in the air*" (P14). This could be interpreted as in favour of more greenery and other natural solutions in household climate adaptation. It could also be interesting to explore how a similar experience can be achieved through design, making it easier to adhere to behavioural advice of keeping windows closed at certain times.

In apartments, it was also found more difficult to escape from the heat, both in terms of moving to another room, and to outdoor cool spaces: "*you don't have a lot of spaces to go […] it is more a struggle to have an apartment and not a house with a garden so you have a bit more access to the outdoors*" (P14). This seemed particularly problematic in one-room apartments: "*it is a little more difficult when you only sort of have one room to be in, not like in a house*" (P10). This could explain why [2] was found less relevant in a smaller home: "*it is more or less the same [temperature] in the whole apartment […] but at home in the house with my parents […] we can move between rooms depending on how hot and cold it is*" (P11). Although the participants' households consisted of two persons at most, this sometimes came with increased challenges in maintaining a comfortable indoor climate: "*we are also two living in 27 square meters, so it can really need airing out sometimes*" (P13). Participants described having to compromise within the household due to having different preferences: "*we don't have black-out curtains on both windows because that is a compromise we have done at home*" (P12). In relation to the visual indication of thresholds and temperatures in [2], one participant expressed: "*that is surely a bit individual also. We are two in my household, and me and my boyfriend definitely have different ideas of when it is too hot and when it is too cold*" (P13). Similar aspects were mentioned related to [1], as "*you definitely have to agree within the household, it becomes really inconvenient if you are to sleep in the same bed and then one person is to wake up at four in the morning*" (P12). Exploring how to take the perspectives and needs of multiple household members into account, especially when confined to a smaller space such as in an apartment, could be interesting for further studies.

There was a considerable difference in the extent to which participants stated that they kept track of indoor and outdoor temperatures respectively. In general, participants had limited awareness of their indoor temperatures, most having no means of measuring or monitoring it: "*It is also a little on feeling, as I said, because I don't have any thermometer or similar*" (P10) and "*not exact temperatures, I guess I go a bit on feeling*" (P15). Only one participant mentioned having a functioning thermometer that they use regularly. This could suggest that households currently see no reason to monitor it. It could have to do with the perceived agency, for example related to the form of tenancy: "*I don't think it would have changed that much for me because I live in a student apartment so I can't affect the temperature that much*" (P15). Without thermometers, participants relied on their own intuition, which posed a challenge for following the principles of effective airing, as in Section 3.5.5. For example, when discussing the function of [2] of indicating the relationship between the indoor and outdoor temperature: "*that is relevant because it is something I currently think about. […] Because if it is just indicated somewhere it is very handy"* (P11). The awareness of these principles varied between participants, with some already thinking about aspects such as timing of ventilation. Measuring was also seen as a way to validate subjective experiences of indoor temperature: "*if could be kind of good to know, like is it actually cold or is it just a feeling?*" (P14). This illustrates how technology can play a role in establishing norms around thermal comfort, which could be relevant to consider when setting general thresholds for heat.

3.7.3. The role of technology in adaptation

A theme that came up in several interviews is automation, which was found interesting in relation to household energy resilience. The potential for smart home solutions, such as "*some form of home automation system*" (P11) generated interest. Participants also described a sluggishness that resulted from heat: "*if it is a very hot day I think you can get a bit 'knocked out' by it*" (P13) and "*It becomes very hard to come up with things to do, you really turn to siesta or just survival mode and just take it slow*" (P10). Meanwhile, mitigating the situation required extra effort: "*if you have an everyday life that just goes on as usual and then there is friction – it gets hotter – then you get more sluggish and less inclined to do things, but there is a greater need to do things"* (P11). This could be interpreted as a need for that solutions for mitigating heat that require minimal effort and trouble. Manual solutions were by some perceived as "*very troublesome, get stuck a lot, fall down and so on, so I usually don't bother with using them*" (P13). This suggested that introducing automation into passive measures could position them as more desirable alternatives to "effortless" solutions such as air-conditioning: "*if it closes [blinds] automatically […] then it is just one less thing to care about*" (P10) and "*I think you can increase quality of life if things are done automatically*" (P11). On the other hand, more manual control was preferred for adjusting windows, for example motivated as: "*there could be problems from a safety perspective if the house starts unlocking itself*" (P11). However, in such solutions, it is important to consider the dependency on electricity, both from an environmental impact and household energy resilience point of view.

On the other hand, as one participant expressed, "*if it is really hot it would've been nice because it [2] feels like you are actively doing something to reduce the temperatur*e" (P15), suggesting that automation could take away some of the perceived agency of mitigating the situation. Participants described engaging in different practices of coping with hot weather. It was positively acknowledged that technology could play a part in developing and optimising behaviours. One participant, comparing monitoring the temperature to monitoring the energy price, argued that "*when you have the technology to really adjust things around dynamic situations it is really good to be able to do so*" (P10). For example, as validation that actions are done in an effective way: "*it [2] can indicate quite well if you are doing it right […] or if you can change it to get it [temperature] down*" (P13). This also built on trust to the provider of the product: "*there is some person with a good idea of how heat build-up works […] who guides you, whereas the product is just an indicator*" (P12). Providing too trivial or general advice could evoke negative emotions: "*it [2] says 'open the window', and yes, thanks, I got that. So, it needs to be solved in a way so it becomes an aid rather than just extra information*" (P11). Participants described developing knowledge over time of how heat behaves in their home, such as "*you get to know your house and know that it is cooler in the north room on a sunny afternoon*" (P11), pointing to people more recently moved into their homes as a possible target group.

Practices of passive cooling seemed to not yet be integrated with everyday routines and thereby easy to forget, especially in the early parts of summer: "*it is very easy to forget to maybe pull down shading, blinds […] in the beginning of summer when you have had the bigger part of a year when it is cold, when you haven't even had to think about it*" (P15). Therefore, expressing that it could be useful to be reminded, for example with notifications: "*a little 'ping' in my phone that says 'hello, have you closed your window?'*" (P14) or "*information to the phone, just 'bop': now is a good time to open*" (P15). However, also stating that "*you don't want it to be pushy. You want it more to, like, recommend*" (P13). Another suggestion was a centralised display: "*even more convenient if you could have a panel […] so you wouldn't have to go around to each room to look*" (P11).

3.7.4. Proactive and long-term adaptation

Proactiveness was identified as another key aspect, perceived as a difference in how well the two proto-practices support households. The ability to influence the indoor thermal climate was already prioritised by some: "*I thought when I chose this apartment that I wanted to have a corner apartment so I have windows on sort of, two different walls so that I actually can get a flow through*" (P10). This suggested that households were to some extent – perhaps unintentionally – already proactively engaging in climate adaptation. Checking the weather was also already a part of everyday routines, and there was a familiarity with meteorological parameters that impact decisions in daily life. However, higher temperatures were currently more closely linked to taking advantage of the nice weather: "*if I notice that it is nice weather […] you sort of take the chances of enjoying the weather a bit more*" (P10) and "*those boring things such as laundry, shopping, cooking, working and so on, that you really want to do outside of the best hours*" (P13). Among participants, there were also hints of trying to be proactive based on the forecast: "*I saw it would be hot and a bit sunny, so now I have the blinds and black-out curtains closed too. Not that it will reach extreme temperatures, but it will be more comfortable when you get home*" (P11).

Visual indications could make it easier to engage in practices of ventilation and shading, but adjusting reactively to real-time indications could interfere with routines, making it difficult to follow them. For example, related to cooking without a stove: "*it [2] would've said 'now it is too hot' but if I then say 'now I am hungry' then I prepare food anyways because I don't know how long it will last or so […] I like the feeling of predictability and being informed*" (P14). A participant also commented that you need to be physically present in order not to miss any important information: "*you need to look at it [2] to know when to open and close [windows] […] it is very dependent on you seeing it at the right moment*" (P15). To avoid excessive notifications, one participant imagined that "*if it is a two-week heatwave then maybe you can turn on a function to more actively tell you to 'close, open'*" (P15). This could be valuable for making heat warning systems more closely related to the home. On the other hand, [1] was seen as particularly useful for its proactive nature: "*because it indicates how it will change […] and it feels good because then you can proactively make changes*" (P10) and "*instead of checking the weather forecast I can just catch a glimpse of the watch and see okay, I should pull down the curtain. I see it as a very good complement related to the little heat adaptation that I do myself*" (P11). Especially, in combining heat mitigation with work life: "*if you go to work and so on, then you aren't home anyways, and then I think it can help you to remember to […] cover up the sun, and then it is nicer when you get home*" (P15).

However, participants also envisioned possibilities for [2] to aid in long-term proactive adaptation, especially in houses with more alternative spaces: "*if you notice that it is significantly better temperature in the basement, then maybe you can invest in fixing spaces down there to be in, in case of extreme heat […] it can really be an incentive*" (P10). Typically, participants imagined placing the indicators where they spent the most time, but also suggested using them to explore the thermal conditions in different parts of the apartment as a way to plan the interior: "*move them around a little and see where in the rooms and the apartment in general the temperatures will be the highest, and maybe if it is very hot in the apartment you furnish a little bit based on that"* (P12) and "*you can use it to get a deeper understanding and make more informed and active decisions*" (P10). The potential of collecting data over time was generally seen as an engaging and motivating practice element that enables being proactive in a more long-term way: "*it would have been interesting to see statistics of it […] so you can think about how it will be, and to sort of prepare for thinking about the following year or following season*" (P10).

3.7.5. The need for adaptation on different levels

Another interesting theme that came up was the level of change, indicating that household climate adaptation may require both individual and societal levels of action. For example, the restructuring of the daily rhythm proposed by [1] sparked discussion on the feasibility to adapt individually: "*the question is if the concept is put on a societal level, so that work and school are also adapted, or if it is only you alone who does it*" (P11). Participants identified different systemic barriers to change, often more significant than the effort involved in the change itself: "*partly, I would personally have to adjust, but it would also require that society around me also adjusts*" (P13). Major societal shifts were also linked to a perception of climate adaptation as dystopian: "*I see that the only way for it to work is to restructure society as a whole based on it […] and that feels dystopian*" (P12).

A recurring topic was the dependency on schedules beyond one's own control: "*Right now I'm a lot more bound to things having specific times that I can't control"* (P13). Work and school set seemingly inflexible frames to everyday life: "*say that you work from eight to five, then you are quite limited in […] when you wake up and when you go to bed*" (P13) and "*it [1] fits very well for weekends and holiday times […] for the average person who is going to school or study or work, it is very hard to adjust the everyday life that much*" (P15). Heat could also create challenges for upholding current expectations of productivity: "*when it is very hot I think it is hard to focus, so then you could've planned when you think you have the best focus*" (P13). While heatwaves coincide with the summer holiday season, it could be important to consider that households may have to combine heat adaptation with ordinary schedules. The role of employers and workplaces could therefore be an aspect to investigate further.

Household practices were also affected by operating hours of stores and other services, limiting the ability and willingness to adapt their daily rhythm. Participants referred to experiences from abroad of how change on a societal level normalised adaptation: "*it became very natural because everything closed from 14-18 or so […] it is easier when it's a thing in society […] When you got used to it, it wasn't a problem*" (P14). Furthermore, there were informal schedules related to how and when households socialise and engage in leisure activities. While often perceived as easier to adjust, these affected the willingness of households to adapt. For example, a participant described that "*there is a lot of things you do in everyday life that you do with others […] It is hard to adjust routines, it is easier if everyone else does so too*" (P14). In relation to [2], it was expressed that following its behavioural advice meticulously could clash with individual priorities: "*You have to let your life be controlled a lot by it […] It completely changes what freedom you have to reschedule things and what you can do. And especially, leisure and things you do outside your work for feeling good, like exercise, is what you sacrifice*" (P13).

Whether the changes should be done on an individual or societal level also relate to responsibility. For example, participants imagined higher levels of organisation providing or recommending use: "*It [1] is a concept that the authorities could come out and recommend*" (P11) and "*they [landlord] are responsible for ventilation, they are responsible for fire alarms, it feels really reasonable that they should be responsible for this [2] as well?*" (P13). It was also discussed that the severity of climate change could affect responsibility: "*if it becomes a major health risk for everyone then maybe it is a question of […] should this be a part of public health, should this be a part of social welfare, but if it is just […] a bit hot outside, not super dangerous but a bit unpleasant, then I think it is more something for the household*" (P13). These aspects point to opportunities for the role of design in bridging political interventions and adaptation through behaviour change and technology, as well as a need to discuss responsibility of households and other actors respectively.

3.7.6. Is it a reconfiguration that works?

As intended, the proto-practices sparked discussions on adaptations in everyday life, including comparisons between the two. The following section will summarise the perceptions of the proto-practices, highlight relevant quotes from the interviews and present the evaluation scale results (see Figure 25). As discussed by participants, this could simply depend on individual preferences, which suggests that providing choice in different adaptation options could be important.

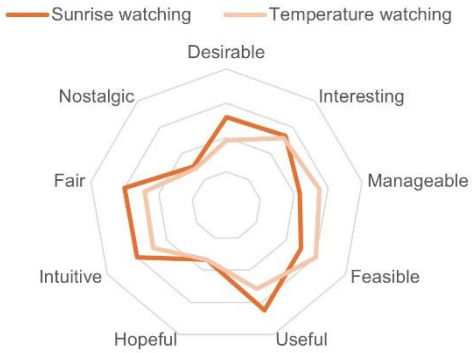


Figure 25: Mean values of household study evaluation scale ratings

Proto-practice 1: Sunrise watching

Participants had varied reactions to the idea of waking up earlier than the current norm. Overall, this proto-practice was perceived as more desirable, which is reflected in participants expressing curiosity towards this new way of life, seeing benefits to extending the morning hours and taking advantage of this relatively undefined period of the day for leisurely purposes. For example: "*it would have been a really nice moment in the morning. Seeing the sunrise and have time, when it is light and not that hot*" (P11) and "*stress levels in general are lower if you have the extra time in the morning to really make sure everything gets to take its time*" (P10). Participants also acknowledged that "*it feels very natural in a way to let the sun control your daily rhythm*" (P13), which reflects the intended positive framing of adaptation.

Others seemed more hesitant to such a radical change, preferring [2] because "*it feels like it means a smaller change for the user […] not trying to restructure one's whole daily rhythm. I think that the resistance is quite tough*" (P12). This could explain that it was rated as less manageable. Concerns were, unsurprisingly, primarily related to disrupted sleep, but also the work and school schedules described in the previous section. For example, expressing that "*people work night shifts and so on, and it works out, but yeah it feels like it is hard*" (P12). However, the ability to be proactive was important in the perceived usefulness of engaging in the practice: "*I think this one I would've had the most use of*" (P10) and *"I would've needed a warning before. In that way, the clock is a better way"* (P14).

In conclusion, there is potential for some elements of the proto-practice to work, such as the proactiveness and predictability that enable households to plan their everyday lives around new "frictions" induced by climate change, and to find adaptation options that offer new opportunities to enhance quality of life. However, in its current form it relies on extensive reconfiguration of everyday practices that may create conflict with expectations of leisure, comfort and convenience, and on involving actors on different levels of society.

Proto-practice 2: Temperature watching

This proto-practice was appreciated for its simplicity, which could explain why it was rated as more feasible: "*not that much is needed to be able to do it, and it still feels like a thing that helps […] it definitely feels like a realisable product*" (P10). Another reason could be that acquiring a product felt easier than changing the daily rhythm, which the interviews suggested to be a core element in many everyday practices. In general, the contextualised guidance from the product is perceived as helpful and actionable. For example: "*it is more information for action, which is good to affect the indoor temperature*" (P15) and "*I don't think I would've seen the product as something which guides me and tells me what to do, rather as a kind of indicator that tells me that now it is hotter outdoors or not it is cooler indoors*" (P12).

However, several participants also questioned whether they would engage in the suggested practice of following behavioural advice based on the temperature: "*I don't know how much I would listen to the product, it would probably have been more of a fun home decoration"* (P14) and "*I don't think I would've changed habits very much, rather that it would've facilitated, stream-lined […] everyday life*" (P10). As discussed, partly related to the perceived lack of predictability and proactiveness in responding to real-time information, creating conflicts with everyday routines such as cooking and exercising. For example, related to the availability of alternatives: "*I don't know if I always have alternative cold food at home, and then it is difficult*" (P14). This could explain the lower rating on usefulness and desirability. The guidance could also be perceived as intrusive and bothersome, even giving rise to negative emotions. For example: "*It is supressing in some way. […] I would think it was quite stressful to have to stand and look at that puck all the time*" (P13) and "*if it tells you you can't […] and you want to do it, then maybe it can put you in a bad mood […] even if it doesn't actually force you it can feel that way*" (P15). The above suggested that households value being able to make more informed decisions based on an understanding of the intention of the advice, but may prefer being able to choose if and how they respond. This could explain that it was rated as more manageable.

Participants also expressed that urgency of addressing the situation can affect: "*If I was desperate to cool my apartment, I would probably have done it. […] I think that the larger I experienced the problem of the indoor temperature, the more likely it is that I would've followed it*" (P12) and "*I think it can be both positive and negative depending a bit on how much you feel like you need to get the temperature down*" (P15). This suggested that with more extreme conditions, difficult to imagine at the moment, the proto-practice could be more relevant. As discussed, there is also potential as a practice for being proactive in a more long-term perspective, possibly contributing to being perceived as a feasible solution for the future.

In conclusion, there is potential for elements of this proto-practice to work, being perceived as suggesting a realisable product to have in the home. It could potentially enhance and contextualise the understanding of heat and improve the effectiveness of seemingly simple, but potentially impactful, passive cooling behaviours. However, it may require a stronger sense of urgency of adaptation to get people to follow its behavioural advice.

Ten questions for the future

The household study and other parts of this project served to answer some questions about young households' current perceptions of summer everyday life in urban environments. Simultaneously, new questions related to the proto-practices, adaptation to heat, and climate adaptation in general, were raised. Based on the findings presented in the previous sections, the following questions can be considered opportunities for further research and design:

1. What **additional parameters**, climate risks and seasonal risks, and combined effects of these, are relevant for the households to monitor over a yearly cycle in everyday life?
2. How can the presented behavioural advice be **further personalised** to the own apartment and personal preferences, while relating to general extreme weather warning systems?
3. How can the respective guides, and **additional practice elements**, be further developed to complement the designed artefacts and frame the suggested ways of life as desirable and interesting?
4. What are the **actual optimal behaviours** to be promoted, backed by scientific evidence, and what effect would the proto-practices have on the indoor thermal climate?
5. How can **technology** enhance households' adaptive capacity, while avoiding creating a dependency on it?
6. How can **data** be collected and presented to households over time to enable more long-term and proactive adaptation?
7. What performances emerge for households with **different compositions**, stages of life and factors of vulnerability?
8. How can artefacts invite households to **collaborate** in monitoring the indoor thermal climate remotely, identifying heat risks and supporting each other?
9. Who promotes the proto-practices and what does that mean for **households' trust** and acceptance of engaging in it?
10. How can **other stakeholders** benefit from the collected data for understanding households' and neighbourhoods' adaptive capacity, related to mapping and addressing heat exposure and vulnerability?

In a way, these questions can be seen as invitations to further explore the areas of the design space mapped out by the matrix described previously, as illustrated in Figure 26. Especially, this expands on the interaction between households and other households or stakeholders.

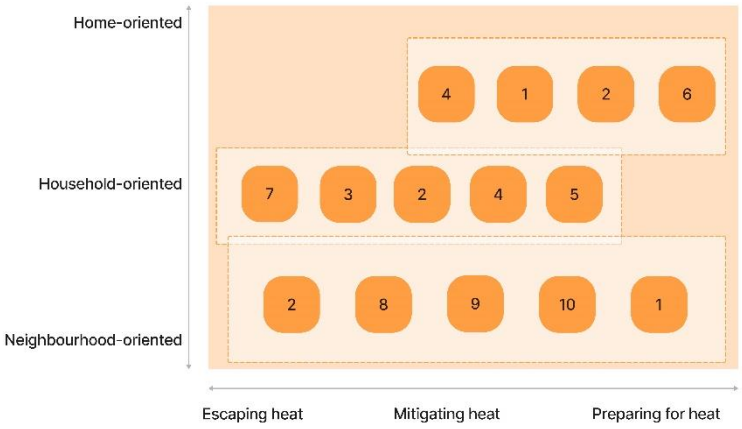


Figure 26: Illustration of areas to be explored further through the new questions

4. Discussion

In this section, the results will be discussed in relation to the research questions, while commenting on limitations and pointing to opportunities for further studies. The discussion is split into two parts, with the first reflecting on what it means for households to adapt to heat and a changing climate, and the second part discussing the role of design in supporting households to do so.

4.1. Household climate adaptation

This section will discuss how heat adaptation fits in the larger picture of climate adaptation, while also highlighting aspects related to households as a target group and the Swedish context. Thereby, presenting some reflections about what climate adaptation is, and could be, from a Swedish household perspective, as was the aim of this thesis.

4.1.1. A piece in the climate adaptation puzzle

This master thesis initially set out on an exploration of household climate adaptation. An insight from this project is that it is a complex and massive topic and that narrowing down the scope was essential to be able to contribute with more specific results. As Figure 27 illustrates, this project only addressed a small part, with various opportunities remaining for further research and design to explore and elaborate on.

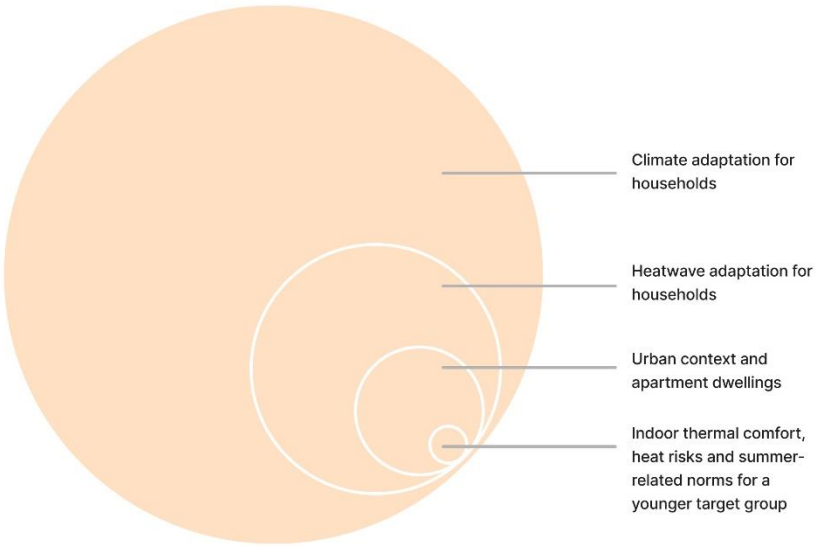


Figure 27: Illustration of gradually narrowing down the project scope

This project focused on adaptation to increased temperatures and heatwaves in urban environments, framing heat as an unfamiliar element that creates *crises of routine* in the Swedish context. More specifically, the project zoomed in on the issue of indoor overheating, addressing households' increased exposure to high temperatures attributed to the urban heat island effect. While this area was found to have been widely studied from an urban planning perspective and in other parts of the world, this thesis expands on the perspective of young Swedish households in apartments, their adaptive capacity and opportunities for supporting sustainable behaviours.

An important finding, although it may sound trivial, was that hot weather was closely interlinked with summer. It can be argued that this relationship is likely to become stronger as heatwaves become more frequent, intensive and longer-lasting. This study showed that households are already used to facing other weather and schedules compared to the rest of the year, and adapting practices accordingly for different reasons. Notably, this complicated studying how households are affected by extreme heat specifically, as there are many other seasonal lifestyle changes that separate *everyday* life from *summer* everyday life. Previous studies encourage finding ways to

utilise existing disturbances to develop energy resilience (Hasselqvist et al., 2022a), and in a sense, summer can be seen as an existing disturbance, given that everyday practices are already being reconfigured annually during this time of the year.

Changes in climate extremes are the primary way that climate change is experienced by most people (Berg et al., 2019). As climate change introduces unfamiliar elements into practices of the summer season, this existing process of seasonal reconfiguration increasingly recruits elements of climate adaptation, as exemplified in this study. Along these lines, Socialstyrelsen (2011) has proposed a shift to viewing heatwaves not as rare crises, but integrated parts of the yearly cycle, alongside other seasonal events such as the flu, which society is prepared to handle (Socialstyrelsen, 2011). In general, climate change is currently seen as distant and focused on large matters rather than everyday events (MSB, 2023). Arguably, seasons play a role in how climate change becomes tangible and relatable to households. This study exemplified how the season can affect the ability and willingness of households to adapt. This could be important to consider for climate adaptation initiatives in general, so they are organised in a way that matches the seasonal shifts built into households' everyday life.

This project focused specifically on extreme heat, and more research is needed to present a full picture of household climate adaptation and solutions that are mutually supportive. Only related to heatwaves there are many direct and indirect effects to give more attention, such as what increased water shortages, risks of fire, and food safety risks, mean for households' everyday practices and identifying synergies and conflicts with general heat advice. Widening the perspective from the summer season and seeing what challenges increased temperatures could pose throughout the year, could offer yet another closely related research area. Related to this, there are also opportunities for further research to investigate the synergies and conflicts between practices of keeping cool and keeping warm, and what changes in practice means for the energy system. Furthermore, future studies could also address other key challenges identified in the national climate adaptation strategy, such as floods and increased pests and diseases (Nationella expertrådet för klimatanpassning, 2022).

The starting point of this project was the three fields climate adaptation, crisis preparedness and sustainable energy transitions. While it was not the intention of this study to theorise about the relationship between these fields for the household level, some general reflections emerged. In short, relating to proactiveness, collaboration and social networks, and the ability to adapt everyday life to different "frictions" or disruptions. Climate adaptation can be framed as preparedness for an expected increase in frequency and severity of crises induced by climate change, in this case extreme heat. Therefore, arguably growing in relevance as a part of crisis preparedness. However, the question of what constitutes a crisis is constantly being debated. Already, practically every summer features temperatures with negative health effects for certain risk groups (Socialstyrelsen, 2011). This study contributed with household perspectives on indoor overheating, exploring how effects of climate change become diffused in practices of daily life. Moreover, climate mitigation and climate adaptation were already closely related. Most prevalent in the discourse surrounding heat adaptation was the matter of energy-intensive cooling measures as a potential maladaptation, which will be discussed more in upcoming sections. Other identified synergies between heat adaptation and sustainable energy transitions include those between minimising indoor heat-generation and reducing energy consumption; learning to monitor and respond the daily rhythm to dynamic conditions, whether it is the temperature or energy availability; and utilising shared resources and spaces.

4.1.2. Households as a target group

In the same way that heat only represents one of many climate change challenges, the results of this study only represent the perspectives of a very small portion of the household population. The household participants in this study all belonged to a relatively young user group, aged 19 – 27 years old and almost exclusively students, which shaped the findings in different ways. The study also had a relatively small sample size, making the results sensitive to individual variations. While it was possible to derive the themes described in this report, there was no clear point of saturation from the studies with households. Conducting more workshops and/or interviews would likely have generated a wider variety of performances and more insights. In other words, the sample is not by far representative of Swedish households, and results can therefore not be used for general conclusions. A previous study even encourages research to stay away from drawing broad conclusions about the impacts of "climate change" on "the public" (Cornes & Cook, 2018). Previous studies argue, for example, that different socioeconomic groups are at risk of urban heat stress, although it differs how much and for what reasons (Sandholz et al., 2021). From the start of this project, there has been an awareness that "households" represent a very wide group, encompassing many different needs and desires. As the project progressed, it has become even more clear that further research is needed to understand more dimensions of household climate adaptation, to avoid reducing households to a homogeneous group.

However, between the participants, there was a range of experiences of heat from different countries and parts of Sweden, much due to their status as students. For example, going on exchanges abroad or moving home during the summer season. A study on adaptation to extreme weather, with international exchange students as participants, concluded that exposure to varied weather conditions may benefit adaptive response, and therefore promoted further research with mobile populations (Strengers & Maller, 2017). It was found interesting that participants generally had a frame of reference that included several different types and arrangements of living. An unexpected result was that this led to identifying aspects that may differ between houses and apartments, between different apartments and between living alone and with a family. Thereby, offering more insights about households' needs in climate adaptation. On the other hand, participants from older generations may have contributed just as well, having more life experiences to draw from. Additionally, literature points out that older households tend to have more energy-efficient habits in place (Lindén, 2008), and intergenerational learning was identified as a theme in literature on household adaptation to heat abroad (Aghababaeian et al., 2024; Ferenčuhová, 2022; Yáñez Serrano et al., 2023). Thereby, this would strengthen the exploration of historic practices of coping with heat and adapting to extreme conditions in the Swedish context.

While the sample was partly a result of the participant recruitment approach, it was a conscious decision to focus on a target group that has received less attention in heat adaptation initiatives. It is understandable that previous research and implemented actions are dominated by a focus on elderly, as they are often identified as most vulnerable to heat (Folkhälsomyndigheten, 2022b), and ensuring health and wellbeing of this group will arguably remain critical to just climate adaptation. However, in achieving climate resilient development, focusing on people other than those most sensitive to heat could also be important to offer desirable alternatives to "unnecessary" adoption of unsustainable technologies. Furthermore, as described in Section 1.4.3, and pointed out in the national climate adaptation strategy (Regeringen, 2023), many factors can contribute to increased vulnerability. For example, a study on urban heat stress, across socioeconomic groups in Germany, suggested that students and young professionals had a

relatively high exposure to heat. This was related to living in top floor apartments, lacking access to green space and other cooling features, along with limited ability to adapt due to rental status and relatively low financial means (Sandholz et al., 2021). A study on heatwave adaptive capacity in low-income communities emphasises the need to consider factors related to financial, cultural and social vulnerability (Zografos et al., 2016). Aspects such as geographical location, form of tenancy, living area, household composition, and change of residence were only mentioned unexpectedly in this project, and not a part of the participant recruitment criteria. These could be interesting to study more systematically and representatively to understand how it affects households' vulnerability and adaptive capacity. Additionally, acknowledged risk factors such as pregnancy, disabilities, and reduced physical or mental health (Folkhälsomyndigheten, 2022b) are not unlikely to appear in a younger target group, but were not represented or addressed in this project. People on parental leave could be yet another target group to focus on in further studies, as it could mean both spending more time in the home and having infants to care for, who are typically considered a vulnerable group (Folkhälsomyndigheten, 2022b). For example, a study in Australia highlighted the wide range of health authority advice and parent know-how related to infant care in hot weather, concluding that this offers an opportunity for integrating objectives of the health and energy sectors (Nicholls & Strengers, 2018).

It is notable that many of the participants had the option to leave the urban environment for the summer, either by going to the countryside, vacation or on boating trips. Additionally, some having access to an air-conditioned car, both as a cooling experience in itself, and as means to get around without relying on public transport, where high temperatures are a reported issue in heatwaves (MSB, 2015; SMHI, 2011). A study in Germany pointed out younger groups as more frequent users of public transport, pointed out as a sustainable behaviour, which contributes to high exposure to heat stress (Sandholz et al., 2021), which in itself reveals a conflict with climate mitigation action. The means of temporary escape from the apartment privileges likely shaped the experiences of heat, pointing to another limitation in the representativeness of the sample. Future studies could focus on participants who stay more permanently in their apartments over the summer season, as well as be more conscious about taking factors of heat exposure into consideration in participant recruitment and interview questions. Thereby, expanding on the climate justice perspective. Nonetheless, the fact that heat was experienced as an inconvenience even with means of escape highlights the relevance of future research on urban indoor overheating in Sweden.

4.1.3. Heat-conscious practices in the Swedish context

An iterative process of exploring the design space led to the term *heat-consciousness*, which has here been used to describe households' understanding of heat as a part of everyday life. It resulted in a focus on a daily rhythm which structures routines around daily temperature variations and integrates passive cooling measures. While this could be a desirable pathway for coping with heat, avoiding the drawbacks associated with widespread implementation of air-conditioning, this study identified some contextual aspects in households' everyday lives that may impact the adoption of such solutions. A main takeaway for heat adaptation in Sweden relates to the unfamiliar image of heat as a threat to health and quality of life. Previous studies suggest that perceptions, beliefs, traditions and cultural identities impact individuals' adaptive capacity (Zografos et al., 2016). In this study, it was described as "*very very Swedish*" (P13) to see heat as something positive and a limited resource to make the most of, which is consistent with other sources. For example, national reports mention a tendency to trivialise or ignore heat risks (Folkhälsomyndigheten, 2022a) and in a book about encounters with extreme heat it is claimed that Swedes have only experienced

heat when it is found pleasurable, and therefore do not understand its dangers (Rosengren, 2022, p. 193). On the other hand, this also extends to European visual communication, as heatwaves tend to be depicted with positively charged pictures, often of outdoor spaces and spending time in the sunshine while expressing happiness and enjoyment (O'Neill et al., 2022).

It has previously been observed that even if individuals are aware that their actions are associated with a certain risk, the perceived benefits may be valued more highly for their decision to adapt or not (MSB, 2023). For example, a study on changes in practices after droughts in Australia points out that gardens were highly prioritised as they were important for peoples' understanding of a "good life" (Lindsay & Supski, 2017). Arguably, sunlight and heat seem to be held highly for Swedish households' perceptions of a "good life" during summer, and this image seems to be important in their willingness to adapt. A study in the Netherlands found a similar cultural friction in the shift of having to view the sun as an "enemy" rather than a "friend", and that this relationship may inhibit development of effective practices of shading and ventilation (Kuijer, 2021). Similarly, a study in the UK suggested that positive affect about hot weather could undermine implementation of heat protection behaviours (Lefevre et al., 2015). Previous studies have shown that material elements could be more influential than images and skills alone to achieve change, but for change to be durable the elements need to support each other (Lindsay & Supski, 2017). This underlines that household climate adaptation requires initiatives that aim to change multiple practice elements. For some groups, leisure and quality of life may be important elements to consider for engaging people in adapting.

Meanwhile, this study showed that, at least for the participants of this study, sleep is affected by heat in a way that generally challenges this positive image, giving rise to emotions of frustration and powerlessness. This is consistent with previous studies in Sweden which showed sleeping difficulties as the most commonly reported health issue in heat (Folkhälsomyndigheten, 2024b). Similarly, a study in Germany found lethargy, sleeping difficulties and trouble concentrating as the most reported health effects of heat, also pointing out that this might accumulate long-term risks in all age groups, necessary to consider in adaptation planning (Sandholz 2021). However, the general behavioural advice identified in this study did not widely address sleep. The proto-practices in this study began to explore how both heat and measures of adaptation may interfere with sleeping patterns. Further studies could specify sleep as the target practice, to learn more about the effects on health and everyday life, and how households of all ages can be supported to cope with high nighttime temperatures in cities.

Other contextual factors relate to the built environment, given that Sweden is adapted to shelter from the cold (Folkhälsomyndigheten, 2018). Globally, air-conditioning is increasingly being seen as a prerequisite for everyday life, gradually becoming embedded as integral elements in different practices (Shove et al., 2014). In Sweden, it can be argued that we are standing at cross-roads where air-conditioning is not yet taken for granted in everyday life, meaning different courses of action can be considered. While it is not the point of this study to take a stance against air-conditioning, it follows up on the suggestions from literature to understand alternative adaptation measures (Viguié et al., 2020), to foster ways of doing daily living that are not dependent on such resource-intensive technologies (Shove et al., 2014) and not lose sight of more productive and sustainable solutions by positioning it as inevitable and necessary (Strengers & Maller, 2017).

The above aspects relate to what de Vet (2014) refers to as a problematic comfort/discomfort dichotomy in public, building and research discourses, as opposed to allowing a range of experiences as manageable or tolerable (de Vet, 2014). This study has found that many

households already have energy-efficient strategies of handling current summer heat in apartments, in some cases associated with a sense of inventiveness and forming memories of making do. While it might not achieve the same level of thermal comfort as an air-conditioner, building on these strategies and the concept of heat-consciousness, such as with the proto-practices in this study, could provide households with a sense of agency in handling shorter periods of elevated temperatures. This elaborates on ideas of household energy resilience, which strives to ensure a good life in spite of disturbances (Hasselqvist et al., 2022a). This points to a task of creating an image of heat which accurately reflects the risks for a specific household. At the same time, identifying situations that are in fact hazardous to health, and prioritising more energy-intensive solutions where necessary. Previous studies also conclude that adaptation can include diverse experiences with weather, without disregarding the fact that it can be dangerous and uncomfortable (Strengers & Maller, 2017).

A limitation was that the study was not conducted in the summer season, meaning that participants relied on memories of hot weather instead of a mediating context. A participant even commented on this: "*maybe I would change my opinion if we had the interview in the middle of July*" (P15). Although the study effectively prompted stories related to coping with heat, it is possible that less top-of-mind perspectives were not brought up and that opinions might not be representative. Literature explains that giving accounts of mundane performances is not an easy task to begin with, partly because it is done without deliberate attention (Kuijer, 2014). A study on household climate adaptation also showed that Swedish households rarely adapt consciously (Wamsler & Brink, 2014a), indicating that there might be additional measures not identified in the study. Therefore, to capture households' adaptations more accurately, it might be beneficial to conduct further studies when people are experiencing overheating. On the other hand, the seasonal differences are a characteristic of the Swedish climate that could affect how new practices are adopted. For example, having time to forget routines during the cooler parts of the year, is an aspect that may have appeared more clearly in anticipation of the summer season.

As stated, there is a resemblance between the adaptations mentioned by households and the general behavioural advice, with one major exception. This study identified that checking in on others, particularly risk groups, was a key message for the public both in Sweden and abroad. For example, Folkhälsomyndigheten (2022a) bring up that awareness of heat risks extends to changes in behaviour on a societal level about what can be done for others (Folkhälsomyndigheten, 2022a). However, this aspect was largely absent in the households' recollections of coping with heat, with only one participant explicitly mentioning a concern for older relatives. Similarly, households seemed a bit surprised when asked how they had helped others or been helped to cope with heat. This could be a result of the study sample, method or timing, but it is interesting to consider what this says about current heat awareness and preparedness in Sweden. Further research can look into how to facilitate the promoted practices of supporting each other, thereby positioning adaptation to heat as relevant for larger parts of the population. With this, also elaborating on ideas for building community energy resilience, exploring ways of encouraging collaboration rather than individualism (Hasselqvist et al., 2022a).

4.2. The role of design in climate adaptation

Part of the aim of this project was to contribute with a perspective on the role of design in household climate adaptation. Throughout this report, various opportunities for design have been pointed out, and in the below section, some main reflections are discussed.

4.2.1. Design for an uncertain future

Climate change in general is characterised by uncertainty, both in how fast and how much change is expected, and in what consequences this has for society and natural environments (Regeringen, 2023). Consequentially, climate adaptation also has attributes of deep uncertainty (Nationella expertrådet för klimatanpassning, 2022). These aspects have become evident throughout this project, illustrating the challenges of designing for an uncertain future. This project framed increased temperatures and heatwaves in a quite general way, partly due to the complex and uncertain nature of climate projections. There is the risk of inaccurately portraying the future, either under- or overestimating climate change impacts. Future projects could be more specific in using climate scenarios when suggesting and evaluating solutions, for example focusing on more local conditions or a defined time scale. At the same time, while the effects of heat may differ greatly between and within countries (Folkhälsomyndigheten, 2022b), this study interpreted that general heat advice was still relatively similar across the world. Therefore, it can be argued that in designing for an uncertain future, including this project, there is a value in the exploration of thinkable adaptations and how these are perceived, even with a hint of speculation.

Moreover, as Kuijer (2014) states, "*both the 'problem' and the 'solution' depend on the particular situation and viewpoint taken, and are subject to continuous change*" (Kuijer, 2014, p. 83). This seems like a valuable stance in relation to addressing different time scales and severities of climate change in general, given the uncertainty involved. In addition to the uncertainties involved in climate projections, there are likely uncertainties in how households' needs and desires of users evolve over time. Acknowledging that households' ways of doing are constantly changing, and working iteratively to take unpredictable developments into consideration (Kuijer, 2014), are other aspects of the practice-oriented approach that could prove important when connecting large and uncertain matters of climate action to the local and dynamic everyday lives of households.

While participants spoke from past memories of heat, in Sweden and abroad, most had only limited experience with heatwaves and extreme temperature conditions, particularly long-term and while having to uphold an everyday life. This may have made it difficult to remember details accurately. Additionally, a difficulty relating to the issue and imagining preferences in a reliable way, for example described as: "*because I'm not that bothered by the temperature right now, and I haven't lived that long periods in heat, I don't know how I would've wanted it*" (P15). In this project, a reflection was that designing for climate adaptation does not only require investigating a reality not yet experienced by participants, but also one which is not fully known for the designer or determined by the state of the world. This calls for design approaches that can support in envisioning possible futures for users. Partly, to be able to anticipate future needs and identify underlying needs that are independent of the climate change development, but also to evaluate acceptability and effectiveness of solutions ahead of them actually being needed.

In this project, workbooks and proto-practices were used to spark discussion about current and future ways of life, and it was experienced as promising for revealing needs and "frictions" even when conducting the study out of context (both seasonally and spatially). A challenge was to find

a balance between being too forceful and too open in framing the future, wanting to avoid reinforcing existing expectations of a “good life” and comfort. It was found that participants may need more guidance in elaborating on their imagined future ways of life. More probing questions might have been helpful, along with physical models that could potentially have been more effective at generating performances. Furthermore, conducting the study in households’ own homes and in different seasons. In summary, exploring how to convey an uncertain and not yet existing reality, to mediate more specific insights, could be the task for further research.

The uncertainty and unfamiliarity described above was also experienced as the other side of a wide design space. In this project, two perspectives on adaptation were combined: the definition used broadly in climate change discourse, and a definition suggested by Kuijer (2014) within practice-oriented design. These definitions side-by-side provided an interesting starting point for discussing climate adaptation, with the practice-oriented perspective nuancing the understanding what it means on a household level and opening the design space. For example, in literature, “adaptation” often refers to technologically complex and costly solutions, whereas the simple and accessible solutions that emerge intuitively from direct experiences of climate change are referred to as “coping responses” (Ferenčuhová, 2022). A review of Swedish climate adaptation approaches argues that vulnerability to climate change is currently addressed primarily as a technical issue. In itself, this poses a risk of maladaptation as the focus falls on building away threats rather than using a wider range of strategies to live with them (Wamsler & Brink, 2014b). Although technology was important in the interventions explored in this project, the practice-oriented approach positioned it alongside skills and images, which helped to identify opportunities for what can be designed to support households in adapting apart from just technical solutions.

4.2.2. Design to bridge different perspectives

As stated in the background of this thesis, public and political awareness of climate change risks is increasing globally. In addition to government action at different levels, the role of civil society is becoming evident (Lee et al., 2023). This thesis contributed with households’ perspectives on everyday climate adaptation. The starting point was that the support for households to adapt to climate change, in the form of different initiatives, was relatively unexplored in Sweden. Consistent with this, it was found that households in general are given a limited role in adaptation to more frequent and intense extreme heat events. Meanwhile, households are being affected and already adapting their lives reactively, indicating different emerging needs that could be addressed through design. Between relatively few participants, there was a range of experiences, routines and ideas related to coping with changing climatic conditions. De Koning et al. (2024) argues, related to domestic energy involved in making oneself comfortable, that design has a role to play in making this know-how available in the home, and building on it rather than replacing existing strategies with expert knowledge (De Koning et al., 2024). Expanding on this idea in climate adaptation, a task for design could be to enhance existing know-how based on an understanding of different perspectives – giving a voice to households as “domain experts” of their own everyday life but taking into account societal objectives and relevant expert knowledge.

On the other hand, it has been identified that the public, based on their current expectations of the future society, are unprepared for changes that mean reduced growth and welfare (MSB, 2023). The findings of this study partly reflected this, with households expressing a need for low-effort alternatives that are minimally intrusive. Automation and air-conditioning were discussed as solutions, and it is tempting from a designer point of view to see these as easy paths that offer households exactly “what they ask for”. This also builds on the ideas of Shove (2003), who

discusses spirals of convenience in which "*convenient 'solutions' exacerbate the problems they are expected to resolve. This spiralling generates a corkscrew-like pathway of demand for convenience from which there seems to be no turning back*" (Shove, 2003, p. 413). Another illustrative quote is that "*If designers keep assuming that people want easy solutions that require as little learning, effort and time as possible, everyday life will become increasingly resource intensive and inequality will continue to grow*" (Kuijer & De Koning, 2024, Section Discussion). Therefore, a reflection is that design comes with a responsibility for shaping expectations of "a good life" and that it might be necessary with a new perspective on "ease of use" which also favours developing agency and resilience in the face of a changing climate. Literature proposes that adaptation can be "*experienced as tolerable, interesting, manageable, exciting, challenging and curious*" (Strengers & Maller, 2017, p. 1446). This exemplifies that there is a variety of experiences that design can aim to build into adaptation, beyond what households expect and explicitly express a need for.

Additionally, scientific evidence is a guiding principle in national climate adaptation strategy (Prop. 2017/18:163, 2017). In climate adaptation, there are high stakes for human health and wellbeing, exemplified in this project as the potentially adverse effects of extreme heat. Thereby, it is important to involve experts from relevant disciplines in design, testing and implementation, to avoid the risks of unintended consequences and maladaptation. This project is transparent in that the proto-practices were designed with a limited understanding of human heat regulation, thermodynamics and indoor thermal climate, and should therefore be approached as such. A related reflection is that indoor thermal comfort is complex, encompassing a need to both address actual temperatures and residents' perceptions. Design may have a task in uniting these individual needs, technical and safety requirements, and the systems perspective.

Furthermore, studying households' everyday life raises questions of ethical concerns. Importantly, it involves conducting research which comes close to habits, practices, and values, and it is important to do so in a respectful way. For instance, describing routine performances can sometimes be embarrassing and private (Kuijer, 2014). The topic of heat was found closely related to health and bodily experiences, meaning that sensitive information may come up that needs to be handled with care for participants' integrity. Another concern is how to approach the context of study. In this project, the workshops and interviews were not held in participants' homes. While there were many reasons for this, including doubts of how much it would add when it was not summer, future studies may wish to study the lived realities of households first-hand. In that case, having to address that it is a possibly vulnerable situation for both researcher and participants. For example, related to norms about what constitutes a "household", "normal" ways of doing and "acceptable" ways of living, when inquiring, documenting and describing observations. With this, also keeping in mind that it can potentially be problematic to ascribe labels related to factors of vulnerability and adaptive capacity. These aspects could gain importance when approaching household climate adaptation, especially as health, financial and other losses could become more tangible with proceeding climate change.

Another ethical concern which has been reflected on in the project is the potential risk of misrepresenting practices and reinforcing stereotypes through the exploration and depiction of practices in other contexts. The perspectives from abroad and from outdoor lifestyles were based mainly on previous research and other written sources, and some stories emerged unexpectedly from the workshops and interviews. An important note is that these parts of the results are not intended to be comprehensive descriptions, generalisable for all households or participants in the

practices, rather examples of ways of doing that provided inspiration for solutions in this project. However, this still highlighted the importance of being mindful when “borrowing” elements from practices that you are not a part of.

Finally, in the search for promising practices and elements to be inspired by, a range of stakeholders that could potentially have a role to play in climate adaptation were encountered. With the limited time in the project, priorities were made to focus on the household perspectives, thereby limiting to only one other expert interview. In the household study, a theme was the need for change on different levels and interaction between individual and societal actors, also acknowledged in both international and national climate adaptation strategies. This also suggests various opportunities for design, both in terms of what different actors can offer households and vice versa, and in establishing platforms for effective interaction and collaboration between actors. Therefore, future studies could continue to explore perspectives of other important actors for household adaptation, related to housing (e.g. housing associations, student housing providers, property owners) and everyday life (e.g. employers, public transport, local initiatives, NGOs, communities of faith, outdoor recreation organisations). Thereby, identifying ways to align objectives and contribute to overall positive outcomes.

5. Conclusion

This thesis first outlined some possible effects of increased temperatures and heatwaves on societal functions, the energy system and human health and wellbeing, which could lead to different kinds of disruptions in households' everyday life. For example, power disturbances due to effects of heat on energy distribution. Urban areas are pointed out as particularly susceptible to overheating, and there is a tendency for indoor environments to feature higher temperatures than outdoors. Additionally, factors that contribute to risk and vulnerability in the face of heat were studied. This thesis took a practice-oriented perspective, contributing with knowledge about energy-related everyday practices of Swedish households in response to past encounters with heat. For example, related to an increased cooling demand. Thereby, revealing frictions and capturing strategies pursued by households to make everyday life work despite challenges brought by heat. This thesis identified that summer in general is associated with temporary lifestyle shifts, often related to viewing summer as a limited resource and wanting to take advantage of warmth and daylight. Meanwhile, heat triggered reconfiguration of practices such as sleeping, cooking, leisure and laundry, introducing new skills, stuff and images into households' everyday life. This thesis exemplified how overheating is already experienced as an issue, associated with sleep disturbances, discomfort and reduced quality of life even in a target group not typically seen as at risk and when heatwaves are still relatively rare. Thus, pointing to the relevance of further studies related to heat adaptation that considers different factors that contribute to vulnerability.

Furthermore, this thesis investigated household perspectives on everyday adaptation to heat using a research-through-design approach informed by practice-oriented design. Inspiration for desirable reconfiguration of everyday adaptation practices was found in different contexts, including general behavioural advice and organised adaptation initiatives. Additionally, attention was given to households' experiences and creative improvisations to cope with heat, in both theoretical and empirical studies. The thesis focused on the use of passive cooling methods, specifically shading and night ventilation, and restructuring routines to follow temperature variations. Thereby, exploring alternatives to widespread adoption of technologies such as air-conditioning, which is sometimes pointed out as a maladaptation. This was done by envisioning two proto-practices, both related to the term heat-consciousness, here used to describe a way of life with heat as a central element. These proto-practices were used as a tool for discussion, capturing a glimpse of everyday life in future summers through households' perceptions of adaptation. With these findings, this thesis contributed to the discussion on households' adaptive capacity and implications for present day climate adaptation action. Specifically, insights related to living in an apartment and in a Swedish urban context, pointing to different considerations in households' everyday lives that may impact the adoption of climate adaptation practices.

Finally, this thesis mapped out a range of opportunities for design, both related to *what* can be designed, but also a perspective on the role of design in household climate adaptation. This related to how technology can be used in supporting households to adapt to a changing climate, with key opportunities including providing contextualised, personalised, proactive and actionable behavioural advice. This way, engaging households to take a more active role in ensuring their good health and quality of life. Furthermore, this thesis exemplified how research-through-design can be used to explore and anticipate needs of an uncertain future, and the role of design in shaping expectations of "a good life". Finally, another role for design was identified to be to bridge different perspectives, to develop solutions that contribute to climate resilient development for all.

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