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**Household Food Waste: A Speculative Design  
Approach to Bridging Policy and Practice**

**Master's Thesis (15 ECTS)**

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# Household Food Waste: A Speculative Design Approach to Bridging Policy and Practice

## Abstract

This master's thesis explores the issue of household food waste through the Speculative Design (SD), focusing on how the participatory method of the futures cards game can serve as a bridge between food waste policy and everyday household practices. Despite the political objectives set by the European Union and Estonia to reduce food waste, the problem continues to deepen, with households representing the largest source of avoidable waste. Based on this context, the research asks: How can SD techniques be used as a resource to reduce the gap between policy initiatives and everyday household practices? The study follows a qualitative, three-stage methodology. In the first stage, a workshop was conducted using futures cards to co-create speculative future scenarios and map participants values. In the second stage, one of the scenarios was developed into a video prototype titled *"My Kitchen 2025"*, which presented both a positive and a negative speculative future narrative in the context of household food waste. In the third stage, participants watched the video and reflected critically on the issues it raised. The findings indicate that SD techniques helped participants imagine alternative futures and critically engage with themes such as technology, automation, responsibility, and sustainability. The video prototype made abstract ideas emotionally resonant and highlighted how people perceive control, trust, and functioning within technological systems. The thesis concludes with specific recommendations for future food waste policy development, emphasizing transparency, opportunities for participation, and attention to everyday user experience and behavioural barriers. In conclusion, the results suggest that SD can serve as a meaningful technique to connect political food waste reduction goals with actual household practices.

**Keywords:** Speculative design, food waste, household, future cards, connecting policy and everyday practice

**CERCS:** S215 Social problems and welfare, national insurance

# Majapidamiste toidujäätmed: spekulatiivne disain poliitika ja igapäevapraktika ühendajana

## Abstrakt

Käesolev magistritöö uurib toidujäätmete teket majapidamistes spekulatiivse disaini (SD) kaudu, keskendudes sellele, kuidas SD-s kasutatav osalusmeetod, tulevikukaartide mäng, võib toimida ühenduslülina toidujäätmete poliitika ja majapidamiste igapäevapraktikate vahel. Hoolimata Euroopa Liidu ja Eesti poliitilistest eesmärkidest toidujäätmete vähendamisel, on probleem süvenemas. Sealhulgas majapidamised on suurimad toidujäätmete tekkekohad. Lähtuvalt eelnevast, küsib käesolev uurimistöo: kuidas saab SD-ni tehnikaid kasutada ressursina, et vähendada lõhet poliitikainitsiatiivide ja igapäevaste majapidamis praktikate vahel? Uuring järgib kvalitatiivset, kolme-etapilist metoodikat. Esimeses etapis viidi läbi töötuba, kus tulevikukaarte kasutati spekulatiivsete tulevikustsenaariumite loomiseks ning osalejate väärtushinnangute kaardistamiseks. Teises etapis arendati üks loodud tulevikustsenaarium välja video prototübiks "*Minu köök 2025*", mis esitles positiivset ja negatiivset spekulatiivset tuleviku narratiivi majapidamiste toidujäätmete kontekstis. Kolmandas etapis vaatasid osalejad videot ja arutlesid selle üle, võimaldades kriitilist refleksiooni. Tulemused näitavad, et SD-ni tehnikad aitasid osalejatel ette kujutada alternatiivseid tulevikke ning kriitiliselt mõtestada tehnoloogia, automatiseerimise, vastutuse ja jätkusuutlikkuse teemasid. Video prototüüp aitas muuta abstraktsed ideed emotsionaalselt kõnetavaks ning tõi esile, kuidas inimesed tajuvad kontrolli, usaldust ja toimimist tehnoloogilistes süsteemides. Magistritöö tulemusena tuuakse välja konkreetsed soovitused tuleviku toidujäätmete poliitika arendamiseks, rõhutades läbipaistvust, osalusvõimaluste loomist ning igapäevase kasutajakogemuse ja käitumisbarjäärade arvestamist. Kokkuvõttes viitavad tulemused sellele, et SD võib toimida tähendusliku vahendina, mis aitab siduda poliitilisi toidujäätmete vähendamise eesmäärke majapidamiste tegeliku praktikaga.

**Märksõnad:** Spekulatiivne disain, toidujäätmed, majapidamised, tuleviku kaardid, poliitika ja igapäevapraktika ühendamine

**CERCS:** S215 Sotsiaalsed probleemid ja heaolu, sotsiaalkindlustus

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# 1. Introduction

Understanding the difference between food, food loss, and food waste is critical to this research. According to European legislation, food is defined in Article 2 of Regulation (EC) No. 178/2002, which states that food refers to any substance or product, whether unprocessed, partially processed, or fully processed, that is intended for human consumption (European Union, 2008). This definition encompasses all stages of food production, from raw agricultural products to fully prepared meals. There are two types of challenges in the food supply. First, food loss refers to the edible food mass discarded or lost during the early stages as production, post-harvest handling, storage, transportation, and processing, and primarily occurs before the food reaches consumers (*ibid.*). Second, food waste, in contrast, refers to food that is suitable for human consumption but is discarded at the retail and consumer levels due to factors such as over-purchasing, aesthetic standards, or improper storage (*ibid.*). While both, food loss and food waste represent inefficiencies, the key distinction lies in the stage of the food supply chain where the loss occurs (Food and Agriculture Organization of the United Nations, 2019). It is important to note that when food is wasted, the resources used in its production, including water, energy, fertilisers, and labour, are also squandered, leading to environmental degradation (*ibid.*). Therefore, reducing food waste presents an important opportunity for conserving these resources. This thesis specifically concentrates on food waste at the household level, which marks the final and most behaviourally driven stage of the food supply chain (Schanes et al., 2018).

## 1.1 Causes of Food Waste

The generation of household waste can be attributed to educational, infrastructural, and economic factors: First, educational aspects such as poor meal planning, over-purchasing, and improper storage are key contributors to household food waste (Piirsalu et al., 2021). A lack of awareness and education about waste sorting and recycling practices further exacerbates the problem (Piirsalu et al., 2021; Schanes et al., 2018). Many households fail to segregate recyclable materials properly, leading to increased waste going to landfills. Second, infrastructural conditions also influence household waste behaviour. The effectiveness of waste management systems plays a significant role (Piirsalu et al., 2022). In rural areas or regions with inadequate waste collection infrastructure, households may have less access to recycling facilities, which discourages proper waste sorting (*ibid.*). Third, economic considerations can shape waste-related decisions. When households incur costs for waste disposal, this may either encourage or deter them from adopting sustainable waste practices, depending on the local pricing and incentive structures (Piirsalu et al., 2022; Schanes et al., 2018). Together, these factors reveal that household food waste is not simply the result of individual choices but is shaped by a broader set of educational, infrastructural, and economic conditions. Addressing the problem therefore requires an integrated understanding of its multifaceted causes.

## 1.2 Policy Strategies to Mitigate Food Waste

The European Union (EU) has made significant progress in tackling food waste, reflecting its commitment to sustainability and resource efficiency. One of the main achievements has been the development of the Waste Framework Directive (WFD) (2008), which calls on Member States to reduce food waste (European Union, 2008). The WFD establishes a comprehensive legal framework to ensure that food waste is recognised as a critical problem requiring coordinated action across the EU. In addition, since 2015, the EU has focused on developing a Circular Economy (CE), aiming to reduce waste, promote resource efficiency, and encourage the reuse, repair, and recycling of products and materials, the content of which was updated in 2020 (European Commission, 2020a). The 2020 innovations focused on designing sustainable products, reducing waste, and a more resource-efficient and low-carbon economy (*ibid.*). In line with the UN's Sustainable Development Goals (SDGs), the EU (2008) has committed to halving food waste by 2030, positioning itself as a global leader by setting ambitious and concrete targets. EU waste legislation already requires Member States to implement national food waste prevention programs and to reduce food waste at all stages of the supply chain, monitor and report on food waste (European Commission, 2020a). Member States achieve these objectives by preparing food waste prevention programmes, encouraging food donation and redistribution by prioritising its use for human consumption, and providing incentives for the application of the waste hierarchy, such as facilitating food donations (European Commission, 2020b). Considering all efforts to reduce food waste in the EU, the results of the 2022 data show that food waste reached around 132 kg per inhabitant, with households responsible for 54% of this amount equating to 72 kg per inhabitant (Eurostat, 2022).

In Estonia, food waste is a growing concern, with an estimated 180,747 tons generated annually, equating to approximately 127 kg per inhabitant (Piirsalu et al., 2022). Furthermore, Piirsalu et al. (*ibid.*) highlights that food waste in Estonia has been on the rise, increasing from 167,000 tonnes in 2020 to 180,747 tonnes by 2022. Of this total, households contribute nearly 48%, making them the largest source (Piirsalu et al., 2021). Other major contributors include the food industry (19%), primary production (14%), trade (12%), and the catering sector (6%) (*ibid.*). Estonia has developed a national food waste prevention and reduction plan, “*Toidujäätmete tekke vältimise kava*” (“*Food waste prevention plan*”), which provides strategic guidance for implementing UN's SDGs (Ministry of Climate, 2023). Several awareness-raising campaigns, such as “*Austa toitu jäägitult!*” (“*Respect Food!*”) and “*Tarbi toitu targalt*” (“*Consume Food Wisely*”) have been implemented to reduce food waste in households (*ibid.*). Additionally, educational programmes in schools help children understand the causes of food waste and find solutions to minimize it and community-based initiatives have included the installation of food-sharing cabinets and other sharing initiatives to redirect edible food to those in need (*ibid.*).

This thesis argues that households lack a supportive framework and clear guidelines to help them make informed and sustainable consumption choices that would prevent food waste. However, food waste prevention should extend beyond the level of individual action and take into account broader social, economic, and cultural structures (Schanes et al., 2018).

### 1.3 Motivation

Although Estonia has taken proactive steps to address food waste, the fact that nearly half of the total originates from households and that this trend is increasing (Piirsalu et al., 2021), demonstrates that current measures have not been sufficiently effective. This highlights a significant gap between policy-level ambitions and the actual capacity and readiness of households. Given that a substantial portion of household food waste is avoidable through increased consumer awareness, behavioural shifts, and practical interventions, it becomes crucial to support individuals in developing sustainable food practices (Piirsalu et al., 2022). Therefore, this thesis explores how Speculative Design (SD) techniques can be used as participatory tools to engage households and support the development of more sustainable food practices that help reduce food waste.

### 1.4 Research Question

This MSc thesis adopts a **Speculative Design (SD)** approach to explore how households can be more effectively engaged in addressing food waste. SD involves the creation of provocative future scenarios that challenge dominant assumptions, stimulate imagination, and foster critical reflection on possible futures (Auger, 2013; Dunne & Raby, 2013). Rather than focusing solely on awareness-raising or behavioural prescriptions, where awareness-raising involves informing individuals about the environmental or social impacts of their actions and behavioural prescriptions, on the other hand, suggest specific actions that individuals should adopt. SD approach enables participants to engage with broader questions of responsibility, values, and the lived realities of food consumption.

Considering these issues, **the research question** of this master's thesis is: **How can SD techniques be used as a resource for narrowing the gap between policy initiatives and practical household engagement?**

The aim of this MSc thesis is to examine how SD techniques, particularly the use of future cards, can serve as a participatory technique for enabling households to critically reflect on food waste systems, imagine alternative practices, and articulate value-based responses that help bridge the gap between policy initiatives and everyday practice.

## **1.5 Scope and Limitations of the Study**

The scope of the study is intentionally limited to the household level. Broader aspects such as the full food supply chain, detailed policy implementation, or technological development are beyond the scope of this research. This study focuses on everyday household food practices, with particular attention to the cultural meanings, personal values, and lived experiences that shape how food waste is generated. The study involves a small and purposefully selected group of participants, which allows for in-depth exploration of perspectives. The scope is also shaped by the time and workload limitations typical of a master's thesis. Consequently, the project does not include a long-term follow-up or a quantitative assessment of behavioural impact.

## **1.6 Research Contribution**

This thesis contributes to the fields of design research and sustainability by applying SD to the context of household food waste. It expands upon existing participatory approaches by using SD techniques to open up critical, value-oriented dialogue about food practices at the household level. The study addresses a clear disconnect between policy-level goals and everyday realities (Piirsalu et al., 2021), offering a reflective and participatory method that renders abstract policy aims more tangible and personally meaningful. In doing so, it provides a novel perspective for how design can support more inclusive strategies for food waste reduction.

## **1.7 Outline**

The thesis is structured into six chapters. Chapter 1 introduces the problem of household food waste, presents the research motivation and question, and outlines the scope and contribution of the study. Chapter 2 provides a literature overview, examining the foundations and aims of Speculative Design (SD), its application in policymaking, and its relevance to food systems. Chapter 3 describes the methodological approach, including the use of the Ethnographic Experiential Futures (EXF) framework. Chapter 4 presents empirical findings derived from participatory workshops and future scenario video analysis. Chapter 5 discusses these findings based on SD practice, reflects on limitations, and suggests directions for future research. Finally, Chapter 6 concludes the thesis by restating the aim and offering final reflection based on the study. An appendix follows the conclusion and includes the future cards, worksheet, future scenarios, and storyboard used in the study.

## 2. Literature Overview

This chapter reviews key literature relevant to this study. Section 2.1 introduces key concepts of Speculative Design (SD), including its critical orientation, the Futures Cone as a model for thinking about alternative futures, the aim of SD, and the use of technology as a site of inquiry. Section 2.2 examines how SD has been applied in policy-making contexts to support participatory and imaginative engagement with complex issues, and section 2.3 reviews how SD has been applied in food-related contexts. Together, these sections establish the foundation for using SD to address the gap between policy and everyday household practices.

### 2.1 Speculative Design

Speculative Design (SD) is a design practice that uses fictional scenarios, imagination, and designed examples to explore how things could be, rather than how they are (Dunne & Raby, 2013; Sterling, 2009). SD emerged in the early 2000s as an extension of the critical design practices developed by Anthony Dunne and Fiona Raby in the late 1990s. Critical design refers to a design approach that deliberately challenges conventional values and norms, aiming to provoke critical reflection rather than provide solutions (Dunne & Raby, 2013). Its purpose is to question assumptions embedded in everyday life and established systems, not necessarily to serve immediate practical functions. The objects or concepts created through this approach are described as “*postoptimal*” (Dunne 1999) - a term used to describe designs that intentionally move beyond utility and efficiency to explore alternative ways of thinking and its role in society. In recent years, researchers not only use SD to critique the present but also to imagine and question potential futures (Dunne & Raby, 2013; Soden et al, 2021). Rather than predicting outcomes, SD explores alternative trajectories and invites critical reflection on their potential consequences (Dunne & Raby, 2013; Soden et al., 2021; Sterling, 2009). Its aim is to prompt dialogue about present-day choices by imagining how things might otherwise evolve (Auger, 2013; Dunne & Raby, 2013). Unlike conventional design, which typically focuses on solving practical problems or creating commercial products, SD asks “*what if*” questions that challenge the status quo (Barendregt & Vaage, 2021; Dunne & Raby, 2013). As Dunne and Raby (2013) explain, SD operates not by attempting to predict what will happen, but by opening up possibilities for critical discussion around multiple alternatives. It serves as a bridge between current realities and potential futures, offering techniques to anticipate, question, and reimagine societal and technological developments before they occur (Auger, 2014; Marttila, 2011).

## 2.1.1 Futures Cone

This subsection examines the Futures Cone framework (Figure 1), which systematically categorizes different types of futures based on their likelihood and desirability, providing a conceptual structure for understanding the broad spectrum of futures that SD seeks to explore. The Futures Cone model visualizes the spectrum of possible futures and categorizes them. Each category reflects a different relationship to current knowledge, assumptions, and values (Dunne & Raby, 2013; Voros, 2017). The concept of the Futures Cone was originally developed by Joseph Voros, who introduced it as a technique for thinking systematically about different future possibilities (Voros, 2017). Figure 1 presents Voros' (*ibid.*) Futures Cone, which is read from the centre outward, moving through the following categories:

- Projected future - the likely trajectory if no major changes occur.
- Probable future - those most likely to happen.
- Plausible future - those that might happen based on scientific and social trends.
- Preferable future - those we desire based on values and ethics.
- Possible future - those that could happen, even if currently unrealistic.
- Preposterous future - those that seem absurd but may reveal hidden assumptions.

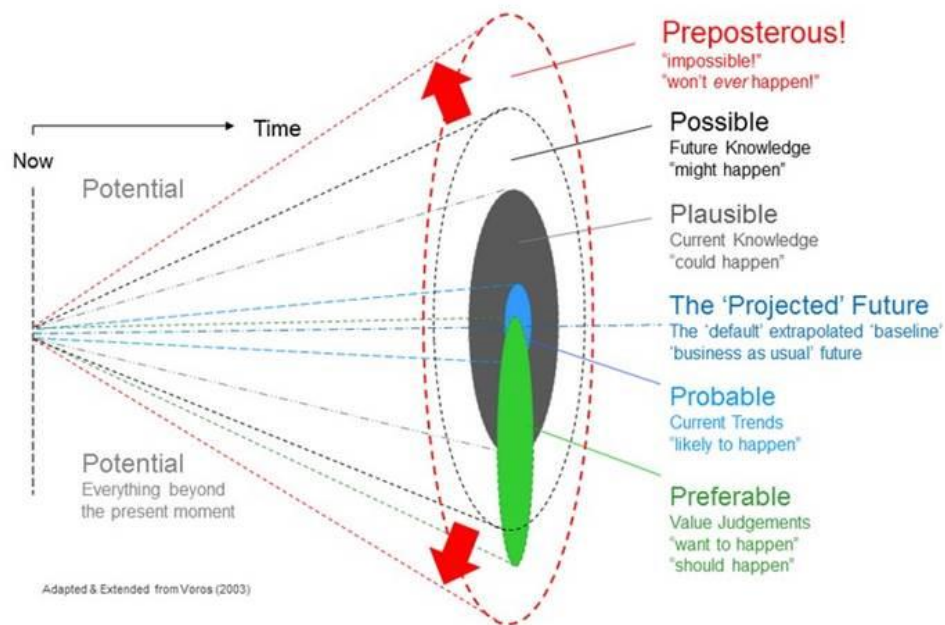


Figure 1. The Futures Cone (Voros, 2017)

SD researchers refer to the Futures Cone framework often operating within the realm of possible and even seemingly implausible futures to provoke reflection and challenge dominant assumptions (Dunne & Raby, 2013). For instance, exploring preposterous futures are futures that appear impossible or absurd and can surface hidden assumptions and spark new insights (Voros, 2017). As Auger (2013) notes, many transformative and innovative ideas were once dismissed as unrealistic, making the exploration of the preposterous a valuable site for speculative inquiry.

The strength of the Futures Cone lies in its ability to shift focus away from the most probable futures toward a broader array of alternative possibilities (*ibid.*). This is particularly relevant to the aim of this thesis, which seeks to bridge policy ambitions with everyday household practices by encouraging participants to engage with culturally familiar yet alternative future scenarios. To achieve this, SD often relies on tangible artefacts that materialise these future scenarios, creating a bridge between abstract ideas and lived experience. The following section examines the aims of SD and the role that speculative artefacts play in provoking reflection and value-based discussion.

### 2.1.2 Aims of Speculative Design

A central aim of SD is to challenge existing norms, assumptions, and explore alternative futures through critical and imaginative means. To achieve this aim, SD often relies on artifacts, physical or digital representations that give form to imagined futures. These artifacts play a crucial role: they function as conceptual bridges, linking abstract future scenarios with real-world audiences (Dunne & Raby, 2013). This bridging function makes speculative futures more tangible, allowing viewers to engage with complex or unfamiliar ideas through designed form.

As Auger (2013) explains, the effectiveness of speculative artifacts hinges on their ability to strike a delicate balance between familiarity, which ensures accessibility, and estrangement, which provokes critical reflection. If a design is too familiar, it may fail to challenge assumptions, whereas an overly abstract one may alienate its audience. The aim is to occupy a speculative “*middle ground*”, where artifacts are simultaneously recognizable and thought-provoking (*ibid.*). This in-between positioning enables viewers to suspend disbelief and engage with the artifact as a plausible yet alternative reality. Auger (2014) further emphasizes that this engagement depends on the creation of a perceptual link, a conceptual connection between the viewer’s everyday experience and the speculative scenario. This link invites reflection not only on the imagined future but also on the viewer’s present reality (Auger, 2014; Marttila, 2011). Building on this foundation, Foster (2013) introduced the concept of the “*future mundane*”, which refines the relationship between SD and everyday experience. Rather than focusing on dramatic or utopian futures, the “*future mundane*” proposes that speculation should be grounded in culturally familiar and socially meaningful contexts (*ibid.*). Recent work by Ringfort-Felner et al. (2025) supports this notion,

emphasising that high-quality speculative artifacts are most effective when they are not only critical but also experienceable and comprehensible. This enhances engagement and fosters dialogue across diverse user groups, including those in everyday household settings. This makes speculative futures more accessible and relatable, especially when addressing societal issues such as food waste. The “*future mundane*” thus shifts the focus of SD from dramatic transformations to subtle, culturally sensitive evolutions that open critical spaces for reflection. In doing so, it directly supports SD’s broader aims by embedding speculation in everyday life, encouraging more engagements.

In line with this, Barendregt and Vaage (2021) argue that well-crafted speculative artifacts can reveal the invisible assumptions and social structures that shape present realities. By materializing alternative trajectories, such artifacts prompt reflection on what is currently taken for granted, inviting viewers not only to imagine different futures, but also to critically examine the present (Barendregt & Vaage, 2021; Dunne & Raby, 2013). Furthermore, when speculative artifacts are introduced into participatory contexts such as exhibitions, public installations, or co-design workshops they serve as techniques for collective inquiry (*ibid.*). These settings encourage audiences to actively engage with speculative content, express values and concerns, and co-construct desirable futures. In such contexts, artifacts do not merely illustrate a researcher's vision but become platforms for dialogue among citizens, technologists, and policymakers (Dunne & Raby, 2013). This participatory dimension reinforces the political and ethical aims of SD, positioning design not just as a creative act, but as a technique for shared reflection and future-making.

In summary, speculative artifacts are instrumental in achieving the aims of SD. These artifacts serve as physical or digital representations of imagined futures, acting as bridges between abstract ideas and public understanding. Speculative artifacts enable SD to fulfil its central aims: challenging dominant narratives, opening discursive space, and enabling reflective engagement with possible futures. These qualities of speculative artefacts are directly relevant to the present study, which seeks to bridge the gap between policy ambitions and everyday household practices around food waste. By grounding speculative scenarios in familiar cultural contexts and everyday routines, the method can provoke reflection on values and lived realities that shape household food behaviours, thereby supporting the study’s aim of making abstract sustainability goals tangible and personally meaningful.

### 2.1.3 The Orientation of Speculative Design Towards Technology

In SD, technology serves not as an end but as a catalyst for inquiry, a lens through which broader social, political, and ethical questions can be explored (Auger, 2014; Dunne & Raby, 2013). Rather than treating technological innovation as a neutral or inevitable force, SD emphasizes the contingent and constructed nature of technologies and the futures they shape (Irani & Silberman, 2014). This approach invites the interrogation of how technologies may reconfigure social structures, relationships, and value systems, instead of accepting them as preordained solutions (Auger, 2014; Dunne & Raby, 2013).

By shifting the focus away from traditional metrics of success, such as optimization or market adoption, SD encourages a deeper interrogation of responsibility (who is accountable for consequences?) and impact (what long-term effects technologies produce across social and ecological domains?) (Auger, 2014). In this way, SD opens a reflective space for engaging with alternative trajectories and ethical dilemmas that might otherwise remain invisible within dominant innovation paradigms (Irani & Silberman, 2014; Marttila, 2011). Dunne and Raby (2013) argue that SD is particularly valuable for its capacity to explore how things could be different, rather than merely how they could be improved. This distinction challenges the technocentric logic that often underpins mainstream design, which tends to equate innovation with progress. Ringfort-Felner et al. (2025) also point out that SD helps to uncover hidden assumptions about technology being inevitable, and creates space to rethink responsibility, control, and the role of people in technological systems. Instead of asking “*How do we make this better?*” SD asks, “*What are we making and why?*” (Dunne & Raby, 2013). Taken together, these perspectives underscore the importance of SD as a critical methodology for reimagining technology's role in society. By foregrounding uncertainty, complexity, and plurality, SD helps uncover latent possibilities - futures where technology is not just more efficient, but more just, equitable, and responsive to human and planetary needs (*ibid.*).

In summary, SD challenges dominant narratives of technological progress by treating technology not as a neutral or inevitable force, but as a socially and politically constructed site of inquiry. This critical orientation allows SD to explore how technologies shape, and are shaped by, cultural values, power structures, and ecological concerns. The approach is especially relevant in contexts where everyday practices intersect with political objectives, such as sustainability, resource use, or consumption habits. This is important in the context of this thesis, as it emphasises that technology can be approached not only as a solution, but also as a technique that enables households to reassess their relationship with food and implement changes that reduce waste and support sustainability.

## 2.2 The Use of Speculative Design in Policymaking

This section examines the role of Speculative Design (SD) in policymaking, with a focus on how its techniques can contribute to more reflective, participatory, and value-driven policy development. As this thesis explores how SD might bridge the gap between food waste policy and household practices, it is essential to understand the ways in which SD has been applied within institutional contexts, and to identify both its potential and limitations in this setting.

SD has been used in the development of public services and policymaking, offering not only practical but also strategic reframing techniques that allow complex societal issues to be addressed from user-centred, systemic, and values-based perspectives (Bol et al., 2025; Siodmok, 2015). A key feature of SD is its ability to pose “*what if?*” questions that open imaginative and experiential scenarios (Barendregt & Vaage, 2021; Dunne & Raby, 2013). These scenarios can help policymakers think beyond existing frameworks and explore alternative policy directions before decisions are fixed (Dunne & Raby, 2013; Bol et al., 2025).

Several initiatives illustrate how SD has been used in institutional contexts. For example, the ProtoPolicy project in the UK engaged older adults in co-designing speculative scenarios that visualised future needs in elderly care (ProtoPublics, 2015). The speculative outputs allowed participants to express personal concerns about autonomy and dependency, which are often difficult to articulate through conventional consultation methods (*ibid.*). This approach is relevant to the current study, as it demonstrates how SD can give voice to lived experience and surface tensions between policy aims and everyday needs. For the next example, the Futures Garden project by the European Commission used speculative future scenario artifacts that embodied non-human perspectives such as those of a whale or a forest, to challenge participants to reflect on interspecies ethics and long-term environmental responsibility (Bol et al., 2025). The aim of the project was to support future-oriented policy creation by engaging diverse stakeholder groups (including citizens, students, and policymakers) in participatory foresight (*ibid.*). This approach helped connect abstract policy goals with lived experiences, enabling more reflective and inclusive policymaking. While metaphorical in nature, these artifacts triggered strong emotional reactions and helped participants confront values typically marginalised in political discourse (*ibid.*). Although the format is abstract, its emotional and ethical depth points to the potential of SD to bring hidden dimensions of sustainability into policy dialogue, an aspect also central to food waste debates. In Denmark, MindLab employed speculative and human-centred design methods to reframe education policy (TheGovLab, 2016). By focusing on systems-level thinking and personal narratives, it enabled policymakers to see structural issues not as technical problems but as relational and cultural challenges (*ibid.*). This aligns with service redesign efforts in New Zealand’s healthcare system, where reducing patient wait times was seen not only as a technical optimisation but as a reframing of what counts as waste in public services (Siodmok, 2015). Here,

value was redefined in terms of lived experience and systemic coherence, principles that also apply to food waste policy, where inefficiencies are often hidden in everyday habits and disjointed systems.

Despite these contributions, several limitations remain. Bol et al. (2025) noted the absence of institutional mechanisms for incorporating speculative insights into policy processes. Hierarchical structures, rigid role expectations, and bureaucratic inertia have constrained meaningful integration, particularly in more formal or centralised policy settings (Tseklevs et al., 2022). As Siodmok (2015) notes, one of the key challenges is absorbing new ways of working into existing modes of thinking about problems. Even where institutional openness exists, legacy structures and technocratic mindsets may hinder the uptake of ambiguous or value-laden futures into policy discourse. Candy (2010) argues that the transformative potential of SD depends less on its creative outputs and more on whether institutions are willing to embrace ambiguity, uncertainty, and emotionally charged futures as legitimate inputs into political decision-making.

In summary, SD offers promising techniques for enriching policy development, particularly by translating abstract or systemic frameworks into emotionally resonant, tangible formats that reflect diverse values and lived experience. Its success, however, is highly context-dependent and influenced by the openness of institutional structures, the timing within the policy cycle, and the willingness to engage with speculative thinking beyond symbolic gestures. Rather than prescribing fixed outcomes, SD enables collaborative exploration of alternative futures especially within policy areas, such as food waste, where every day behaviour is shaped by complex and often misaligned systems.

## **2.3 Speculative Design and Food**

As Speculative Design (SD) has shown promise in reimagining policy frameworks and supporting value-based reflection, it is equally important to examine how these approaches have been applied to food systems and household food waste. Over the past decade, SD has been used in food research to explore themes such as sustainability, food justice, digital gastronomy, and waste infrastructures (Dolejšová et al., 2018; Tseklevs & Pollastri, 2019; Thorp et al., 2022). These studies span diverse formats, including speculative workshops, performative artifacts, interactive installations, and data-driven provocations (Genç et al., 2019; Thorp et al., 2022). Only a limited number of studies specifically address food waste, and even fewer focus on the household level or reflect existing policy goals.

One such study was conducted by Genç et al. (2019), who explored food waste in the hospitality sector through SD interventions. These included the Smart Menu, a menu system that adapts to individual dietary needs, health data, and environmental impact to guide more sustainable choices. Another intervention was the Adaptive Buffet, which dynamically adjusts food quantities in real

time based on guest numbers and consumption patterns to reduce overproduction. These concepts visualised alternative restaurant practices aimed at minimising waste, while also revealing systemic inefficiencies, such as rigid ordering systems that lead to surplus stock, and fixed menu structures that ignore fluctuating demand. They also exposed aesthetic drivers of overproduction, including the expectation of full buffet trays and uniform portion presentation, which compel kitchens to prepare more food than necessary in order to maintain a sense of abundance and visual appeal. Although the setting was professional kitchens, the project demonstrates how speculative artifacts can make invisible assumptions tangible and open up critical conversations about consumption patterns. Such insights are relevant to this study, which similarly uses speculative formats to examine how underlying routines and systemic influences shape food waste in the household.

Tseklevs and Pollastri (2019) conducted a participatory workshop using SD to explore the relationship between food and global health. Participants worked in small groups to create fictional dishes inspired by future scenarios, using symbolic *“future ingredients”*. These dishes were presented during a collaboratively staged *“speculative banquet”*. The event provided a platform for collective reflection on themes such as food poverty, health, sustainable production and consumption, food waste, and environmental impact - framed through the lens of the United Nations Sustainable Development Goals (SDGs). A key outcome of the banquet was that participants could express concerns, values, and desires about food and health futures in ways unconstrained by current political, scientific, or economic limitations. These included worries about unequal access to healthy food, the over-reliance on ultra-processed and technology-driven diets, and the potential health risks of such systems. At the same time, participants expressed hopes for more personalised, ethical, and socially just food systems that prioritise wellbeing over efficiency. While the approach was symbolic and imaginative, it effectively enabled participants to examine underlying values and assumptions. This method is relevant to the current study, as participatory speculative formats can help surface tensions and behavioural patterns that influence food waste generation in household settings.

Dolejšová et al. (2018) explored food futures through the use of playful and critical speculative methods. This involved the creation of *“food tarot”* cards, each representing a fictional dietary identity such as Turing Foodies, who rely entirely on AI-generated dietary recommendations, or Ethical Cannibals, who consume lab-grown meat cultivated from human cells under ethical conditions. These provocative identities were designed to spark reflection on autonomy, ethics, and the role of technology in food culture. The cards were presented in interactive public installations, where they served as conversation starters, inviting participants to engage with questions around emerging trends, values, and tensions shaping future food imaginaries. While the format successfully provoked critical and imaginative dialogue such as debates around the ethics of lab-grown human meat in response to the Ethical Cannibals card, or questions of autonomy and trust in AI-driven nutrition raised by the Turing Foodies card. The project demonstrates how

speculative approaches, particularly those that use provocative symbols and playful role-based scenarios, can help participants reflect on values, identities, and future possibilities related to food. Although the thematic focus of that project differs from this study, both are guided by a similar principle: imagination-based activities can help reveal the assumptions and habits that shape household food waste practices and their connection to broader sustainability goals.

Thorp et al. (2022) applied SD through an autoethnographic study of household waste. Over a month, the lead researcher collected data on personal waste patterns and developed a series of speculative “*smart bin*” concepts. These artifacts visualised waste flows and highlighted infrastructural aspects, such as the invisibility of household waste systems, the lack of accessible feedback on waste behaviour, and the passive role of bin design. They also revealed behavioural patterns, including the automation of disposal habits, psychological distancing from waste responsibility, and the emotional dimensions of discarded items. While Thorp et al. (2022) study focused on a single individual, it highlights the potential of SD to make everyday waste routines visible and frame the home as a site of critical inquiry. This study builds on that premise by applying it in a collective setting, where multiple participants engage in co-creative workshops to surface tensions in everyday food waste practices and relate them to broader sustainability goals.

In summary, while previous studies have shown how SD can be applied to different food related contexts, the specific relationship between household food waste practices and political sustainability goals remains largely unexplored. Much of the existing work has focused on abstract future scenarios or on individual behaviours, with little attention to how SD can actively and critically uncover the tensions between everyday household routines and institutional objectives. This thesis addresses that gap by using SD techniques, particularly the future cards method, to create a space for reflective engagement and to strengthen the link between policy ambitions and the lived realities of household food practices.

## **3. Method and Approach**

The aim of this thesis was to explore how Speculative Design (SD) can be used to bridge the gap between policy-level food waste initiatives and household-level practices. To achieve this, a qualitative research approach was adopted to investigate how participants engage with SD techniques when reflecting on their own food waste behaviours. A qualitative methodology was chosen for its capacity to surface subjective experiences and cultural meaning-making (Braun & Clarke, 2006). The research follows the Ethnographic Experiential Futures (EXF) framework (Candy & Kornet, 2020), adapted into a three-phase process: (1) speculative scenario ideation using future cards, (2) materialisation through a diegetic video prototype, and (3) reflective dialogue. This structure allowed speculative techniques to act as catalysts for ethical imagination and situated insight (Dunne & Raby, 2013; Auger, 2013). This research was approved by the University of Tartu Research Ethics Committee.

### **3.1 Participants**

Nine adult participants were recruited (Table 1) who hold primary responsibility for managing food and household waste within their homes. Three participants were recruited via Facebook groups, two of them are volunteers in the Foodsharing Tartu movement, while the remaining participants were drawn from researchers' personal network. Participants varied (Table 1) in their attitudes and behaviours toward food waste prevention and waste sorting. Some described consistent efforts to reduce food waste, such as meal planning, composting, or creatively repurposing leftovers, while others reported minimal or irregular engagement. This diversity enriched the study by offering multiple perspectives on everyday sustainability challenges. Two Speculative Design (SD) workshops were carried out as part of the research. Five participants took part in Workshop 1, and five in Workshop 2, with one participant engaging in both sessions. Anonymity and confidentiality were maintained throughout the research process.

Table 1. Participant Information

| Participant | Age | Gender | Workshop phase | Practices daily food waste reduction behaviours |
|-------------|-----|--------|----------------|---|
| P1          | 39  | Female | 1              | No  |
| P2          | 51  | Female | 1              | No  |
| P3          | 48  | Female | 1              | Yes   |
| P4          | 40  | Male   | 1 and 2        | No  |
| P5          | 45  | Female | 1              | Yes   |
| P6          | 20  | Male   | 2              | No  |
| P7          | 68  | Male   | 2              | No  |
| P8          | 65  | Female | 2              | Yes   |
| P9          | 39  | Female | 2              | No  |

A three-phase process was followed (see section 3.5). Phases 1 and 3 involved data collection and analysis (section 3.2) and Phase 2 involved the development of a diegetic video prototype (section 3.3). The evaluation criteria used for each phase is discussed in section 3.4.

## 3.2 Data Collection and Context

Data were collected during Phase 1 and Phase 3 of the three-phase study.

### Phase 1: Workshop 1 Ideation

The phase 1 data collection involved a Speculative Design (SD) workshop focused on generating future-oriented scenarios related to household food waste. The goal was to encourage participants to explore imaginative possibilities and express underlying values in relation to household food systems. The primary method used was a set of future cards (described section 3.4), which served as speculative prompts for creative ideation. The workshop was designed to foster open-ended exploration in a supportive, participatory setting. A total of five participants took part in this session. They were first introduced to the context of the study and the principles of SD. Following this, they engaged in individual and small-group activities where they interacted with the future cards and recorded their ideas using the worksheets. The process enabled a range of expressions, from conceptual sketches to short scenario descriptions.

With participants informed consent, the entire session was audio- and video-recorded. In addition, all written materials, including completed worksheets, were collected for analysis. The recorded discussions were transcribed and anonymised, forming a comprehensive qualitative dataset that reflected both the content and context of participants engagement with the speculative task.

### **Phase 3: Workshop 2 Critical Reflection**

Phase 3 focused on exploring how participants interpreted and emotionally responded to the speculative video prototype. The video developed in phase 2, was designed to provoke reflection on household food routines, values, and expectations. Workshop 2 served as the setting for presenting this prototype to participants. Five participants took part in the session, which followed a structured format: a brief introduction to the study's aims, followed by a full screening of the video and a group discussion. The goal was to provide a space for participants to reflect critically on the speculative scenario and to relate it to their own everyday experiences. The group discussion encouraged dialogic interaction, allowing participants to respond not only individually but also in relation to each other (Bardzell et al., 2014). This setup shifted the nature of engagement from the imaginative ideation of phase 1 to reflective meaning-making in response to an already formed speculative vision. The session was both audio- and video-recorded with informed consent. All verbal contributions were fully transcribed and anonymised for analysis. This approach enabled the collection of rich qualitative data grounded in participants spontaneous reactions, emotional responses, and value-based interpretations.

Based on the scenario outputs from the Phase 1 workshop, the following section outlines the creation of a diegetic prototype developed in Phase 2.

## **3.3 Diegetic Prototyping**

### **Phase 2: Video Prototype**

Diegetic prototyping is a key technique in Speculative Design (SD), used to materialise future concepts in narrative forms that feel embedded in everyday life. Diegetic prototypes are designed to provoke critical reflection through experiential storytelling. They are fictional but contextually grounded artifacts and narrative-based representations of “*what if*” scenarios that help audiences reflect on the social, ethical, and emotional dimensions of possible futures (Candy & Dunagan, 2017; Dunne & Raby, 2013; Auger, 2013).

During Phase 1, participants in Workshop 1 were divided into two groups, each tasked with co-creating positive and negative future scenarios related to household food waste. The first group imagined a fully automated kitchen, run by an AI assistant, which managed household food routines, optimised consumption, handled composting autonomously, and redistributed surplus. The second group developed a vision of an AI-powered food system, where an AI-driven garden

maximizes yields for its owners. This vision also includes food autonomy, a circular economy based on AI-driven drones to minimize food waste. From these two scenarios (Appendix I and II), the automated kitchen scenario (Appendix I) was selected for further development into a diegetic video prototype. The selection was guided by the scenario's capacity to provoke reflection on household food systems. The decision was based not only on the conceptual complexity of the scenario but also on its anchoring in everyday experiences. In SD, the ability of a scenario to remain meaningfully connected to lived experience is essential particularly when aiming to provoke participant reflection and dialogue (Foster, 2013). While the alternative scenario envisioned a radically decentralised, community-run food system, it strayed too far from the logics of current daily life. Its utopian character and detachment from existing routines made it less effective as participants may struggle to engage with futures that lack experiential grounding (Auger, 2014). In contrast, the automated kitchen scenario retained a strong connection to familiar concerns such as time pressure for meal planning, and digital assistance allowing participants to project themselves into the imagined future kitchen.

A storyboard (Appendix III) was created to structure the narrative, which was then developed into a short video prototype titled "*My Kitchen 2025*" [My Kitchen\\_2025.mp4](#). The video presents two future scenarios, positive and negative, where the same protagonist, Andrew, acts in the same home environment. In the positive version, the kitchen operates smoothly, offering cognitive relief and sustainable optimisation of food flows. In the negative version, the system fails, revealing fragility, and dependency. The prototype was not intended to simulate a specific technological proposal but to function as a critical artifact, a reflective prompt that invites viewers to reconsider their assumptions about food, technology, and control within household settings. By embedding speculative ideas in a familiar context, the video served as an experiential catalyst in Workshop 2, enabling participants to articulate personal values, and question systemic norms.

### **3.4 Evaluation Criteria**

To evaluate the effectiveness of the speculative techniques used across the study, three evaluation strategies were applied, one for each research phase.

#### **Phase 1: The Use of Future Cards**

This thesis investigates how Speculative Design (SD) techniques can be used to narrow the gap between food waste policy and everyday household practices. A key technique used to operationalise SD in this study was the use of future cards game "*The Thing from the Future*", a participatory ideation technique designed to stimulate imaginative thinking and scenario creation (Candy & Watson, 2014). Future cards combine prompts to help participants generate narratives about alternative future scenarios (Candy & Watson, 2014; Candy & Dunagan, 2017). Each scenario is constructed by combining four elements: (1) *Arc* (the temporal distance or type of future

like growth, collapse), (2) *Terrain* (the context or setting), (3) *Object* (a thing or element within that future), and (4) *Mood* (the emotional tone or atmosphere of the scenario) (Candy & Watson, 2014). The original card structure was retained, but the content of each category was customised with keywords related to household food waste (Appendix IV). In the future card technique, participants used worksheets (Appendix V) designed to guide the development of speculative ideas. These worksheets supported the process by helping participants interpret the card prompts, imagine future situations related to household food waste, and begin shaping their scenarios. During the workshop, participants were first asked to individually create a positive and negative future scenario using their assigned future cards. After this individual ideation, they worked in small groups to develop a shared version of the positive scenario. Following this, they were prompted to imagine a contrasting negative version of the same scenario. Additionally, each group was asked to articulate the values embedded in their positive scenario across three levels: (1) micro (individual or household), (2) meso (community or local system), and (3) macro (societal or policy level). In this thesis, future cards were adapted to the context of household food waste and used in Phase 1 to facilitate collaborative and reflective scenario building. Their selection was based on their ability to anchor speculation in accessible, structured formats while maintaining openness to multiple interpretations, a quality especially valuable when working with non-expert participants (Candy & Watson, 2014; Sanders & Stappers, 2008).

To evaluate the effectiveness of the future cards in addressing the aims of this study, a distinct set of evaluation criteria was developed based on the three core goals of SD in participatory contexts (Table 2): (1) stimulating critical thinking, (2) surfacing novel or technology-oriented ideas, and (3) supporting creative collaboration (Dunne & Raby, 2013; Auger, 2013). These criteria were used to assess how well the method itself, the use of future cards, facilitated participant engagement and value articulation in the context of household food practices.

Table 2. Evaluation Criteria Definition

| <b>Evaluation Criteria</b>        | <b>Definition</b>  |
|-----------------------------------|--|
| Stimulate Critical Thinking       | The participant reflects on power relations and dependency within the food system.                 |
| Surface Technology-Oriented Ideas | The participants envision a smart food management system   |
| Support Creative Collaboration    | The participant demonstrates the ability to co-create ideas and solutions in dialogue with others. |

In parallel, a reflexive thematic analysis was conducted following the six-phase approach proposed by Braun & Clarke (2006): (1) familiarisation with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. This approach was particularly well-suited to the interpretive nature of the study, as it allows for an iterative and reflective engagement with the data. The analysis was carried out inductively, meaning that codes and themes were developed directly from the data rather than from pre-existing theoretical categories (*ibid.*). In addition, both semantic and latent levels of meaning were considered: semantic codes captured the explicit content of participants statements, while latent coding aimed to uncover underlying assumptions, cultural values, and broader conceptual patterns (*ibid.*). By combining method-focused evaluation criteria with a theoretically grounded interpretive approach, the study ensured a dual analytical strategy. This made it possible to examine both the effectiveness of the SD technique (future cards) and the richness of participant responses, while keeping the analysis firmly grounded in participants actual words and experiences, as recommended in reflexive thematic analysis (*ibid.*).

### **Phase 2: Second Evaluation - The Video**

Following the completion of the video, an analytical evaluation was carried out to assess how effectively the diegetic prototype fulfilled the goals to provoke critical reflection, explore alternative futures, and challenge existing assumptions (Bardzell et al., 2014). For this, an evaluative modified approach adapted from Bardzell et al. (*ibid.*) was applied, enabling a multidimensional reading of the artifact beyond surface-level aesthetics and toward ethical, functional, and relational dimensions of design. Bardzell et al.'s (*ibid.*) framework identifies six design dimensions, which were also applied in the present study: (1) topic (the area of life), (2) purpose (its intended goal), (3) functionality (what the design enables or does), (4) interactivity (how users engage with it), (5) form (its visual and physical expression), and (6) materiality (the medium or materials through which it is experienced). The modified part of the approach involved structuring the analysis through a comparative matrix, which applied Bardzell et al. (*ibid.*) six design dimensions to two contrasting themes presented in the video prototype: the positive and the negative future. In addition to these, a third theme focused on the video's capacity to foster critical engagement. This structure allowed for a multidimensional analysis of how speculative elements functioned across different narrative directions and how they invited ethical reflection or challenged everyday assumptions. According to Bardzell et al. (*ibid.*), assessing critical design involves more than examining its function or appearance; it requires developing reasoned interpretations that connect evidence with argument, reveal deeper layers of meaning. In this analysis, the diegetic prototype was treated not simply as a communication tool, but as a critical artifact: a speculative intervention designed to question norms, reveal tensions, and encourage value exploration.

### **Phase 3: Critical Reflection**

This phase focused on exploring how participants interpreted and emotionally responded to the speculative video prototype “*My Kitchen 2025*”. The aim was to understand how the artifact functioned as a reflective prompt, encouraging participants to connect its content with their own household routines, assumptions, and values. As in the first phase, thematic analysis was conducted following Braun & Clarke’s (2006) six-step reflexive method. Themes were developed inductively, meaning they emerged directly from participants responses rather than being pre-defined based on existing theories or assumptions. The analysis paid attention to both semantic and latent meanings: semantic codes captured the explicit content of what participants said, while latent coding focused on interpreting the underlying assumptions, values, and social norms embedded in their statements (*ibid.*). This allowed for a deeper exploration of how participants made sense of the speculative scenario beyond its surface narrative. This phase functioned as a continuation of Phase 1 by revisiting the evaluation framework through a different mode of engagement: where Phase 1 captured imaginative ideation via future cards, Phase 3 focused on reflective responses to a realised speculative scenario. Together, these phases provided insight into how SD can move from idea generation to critical meaning-making that surfaces tensions between personal habits, collective values, and policy objectives in participatory settings (Dunne & Raby, 2013).

## **3.5 Timeline: Three Phases of the Study**

This research is grounded in the Ethnographic Experiential Futures (EXF) framework developed by Candy & Kornet (2020). EXF integrates ethnographic insight with speculative scenario creation and participatory engagement. Scenario development in this framework is conceptualised as cyclical, allowing researchers to iterate between insight, interpretation, and materialisation, particularly important in emotionally and ethically complex domains like household food waste. While the original EXF model consists of five stages, this thesis adapts it into a condensed three-phase structure to align with the scope and resources of a master’s-level project. This simplified version preserves the experiential essence of the EXF framework by enabling participants to engage with speculative futures through ideation, storytelling, and reflection.

The adapted three-phase research structure is summarised in Table 3 below.

Table 3. Overview of the Three Research Phases

|                     | <b>Phase 1: Future Cards as a Prop for Creativity:<br/>Workshop 1 (25.02.2025)</b>  | <b>Phase 2: Speculative Design Process:<br/>Video Prototype</b>  | <b>Phase 3: Exhibition and Reflection:<br/>Workshop 2 (25.05.2025)</b>                          |
|---------------------|---|--|---|
| <b>Goal</b>         | Generate speculative future scenarios about household food waste  | Materialise one scenario into a diegetic artifact  | Explore emotional, ethical and behavioural reactions to the speculative video                   |
| <b>Methods Used</b> | <ul style="list-style-type: none"> <li>● Modified future cards game</li> <li>● Worksheets</li> <li>● Individual work</li> <li>● Group work</li> </ul> | <ul style="list-style-type: none"> <li>● Storyboarding</li> <li>● Filming the video prototype</li> </ul> | <ul style="list-style-type: none"> <li>● Video screening</li> <li>● Group discussion</li> </ul> |
| <b>Output</b>       | Two speculative scenarios (positive and negative future scenario)   | Create a critical design artifact to provoke reflection and emotional engagement                         | Participants reflections  |

In line with the three-phase timeline, the description below details how each stage was carried out and how it supported the overall research objectives.

The first phase consisted of a speculative co-creation workshop with five participants, using a customised set of future cards to explore alternative futures related to household food waste. Through individual and group-based ideation, participants generated both positive and negative scenarios that reflected their values and concerns. These narratives laid the foundation for the video development in the second phase.

Building on this output, one scenario was selected and transformed into a short speculative video titled “*My Kitchen 2025*”. The video presented two contrasting futures, one in which the smart kitchen supports sustainable and stress-free living, and another in which its failure reveals household vulnerability. Rather than presenting a technical solution, the video served as a critical artifact to provoke ethical reflection.

In the third and final phase, the speculative video was shown in a second workshop, where participants engaged in reflective discussion. Their responses illuminated how speculative artifacts can foster value-based dialogue and surface tensions related to technological reliance, autonomy, and waste systems. This reflection not only contextualised personal experiences but also helped connect everyday food practices to broader policy ambitions.

The empirical findings from all three phases are presented and analysed in the following Findings chapter.

## 4. Findings

The aim of this master's thesis is to explore how Speculative Design (SD) techniques can be used to bridge the gap between food waste reduction policies and everyday household practices. By engaging participants in future-oriented, value-driven, and participatory activities, the study seeks to identify how speculative techniques can stimulate reflection, imagination, and behavioural awareness around household food waste. This chapter presents the analysed findings derived from the three empirical phases of the study. The data analysis included audio and video recordings, participant-generated worksheets, and workshop transcripts, using thematic analysis as outlined in Chapter 3. To ensure clarity and maintain participant confidentiality, all participants are referred to using pseudonymous identifiers P1 through P9. These codes are used consistently throughout the chapter when quoting or referencing specific contributions. The findings are organised according to the three stages of the Ethnographic Experiential Futures (EXF) framework: Future cards as a prop for creativity (Workshop 1), SD process (Diegetic Prototype), and Exhibition and reflection (Workshop 2).

### 4.1 Phase 1: Future Cards as a Prop for Creativity

The first phase of the study explored in Workshop 1, how future cards functioned as speculative prompts to stimulate critical and collaborative thinking around household food waste. Participants worked individually and in groups (Figure 2) to co-create positive and negative future scenarios, grounding abstract policy goals in everyday narratives.



Figure 2. Workshop 1 Group Work

Table 4 and 5 presents an overview of the scenario development process, detailing the card combinations, themes, and narrative outcomes for both two groups.

Table 4. Summary of Scenario Development Group 1

| <b>Group</b>                              | <b>Group 1</b>   |
|---|--|
| <b>Participants Pseudonymous</b>          | P1, P2, P3   |
| <b>Cards Used</b>                         | <b>Arc:</b> Growth. 70 years in the future, <b>Terrain:</b> Apartment, <b>Object:</b> Composting, <b>Mood:</b> Precise   |
| <b>Participant Group Scenario Summary</b> | <p>The future <b>automated kitchen</b> manages food storage, detects spoilage, suggests recipes, and either shares leftovers or composts waste. In the positive scenario, it reduces food waste, saves time and money, and supports sustainable consumption. In the negative scenario, people’s food literacy declines and dependency on technology increases, making them vulnerable if the system fails.</p> <p>Participants evaluated the benefits of their scenario at the micro, meso, and macro levels:<br/> <b>Individual benefits (micro)</b> - speed/time savings, money savings, reduced mental burden.<br/> <b>Society benefits (meso)</b> - reduced food waste, simplified food sharing.<br/> <b>Government benefits (macro)</b> - reduced waste management costs.</p> |

Table 5. Summary of Scenario Development Group 2

| <b>Group</b>                              | <b>Group 2</b>   |
|---|--|
| <b>Participants Pseudonymous</b>          | P4, P5   |
| <b>Cards Used</b>                         | <b>Arc:</b> 20 years after societal collapse, <b>Terrain:</b> Garden, <b>Object:</b> Prevention, <b>Mood:</b> Satisfaction   |
| <b>Participant Group Scenario Summary</b> | <p>In the future, an <b>AI-based food system</b> monitors people's preferences and gardens to grow exactly the right amount of food, avoiding surplus and food waste. In the positive scenario, it ensures a constant supply of fresh food, healthy eating, and a stronger sense of community, while drones automatically distribute any excess produce to others. In the negative scenario, overreliance on technology, system errors, or bad weather could leave people hungry and unable to grow food themselves.</p> |

|  |  |
|--|--|
|  | <p>Participants evaluated the benefits of their scenario at the micro, meso, and macro levels:</p> <p><b>People (micro)</b> are satisfied because they always have fresh food from their garden on the table and nothing goes to waste. Plus, they can help others when the garden produces more.</p> <p><b>Society benefits (meso)</b> because there is less waste, people eat healthily, and community feeling improves.</p> <p><b>The government (macro)</b> no longer needs to worry about or solve the problem of food waste.</p> |
|--|--|

The effectiveness of the future card technique was explored through two complementary approaches. First, the technique was evaluated against three predefined SD goals: stimulating critical thinking, surfacing technology-oriented ideas, and supporting creative collaboration (see Table 2. Evaluation Criteria Definition section 3.4). These criteria helped assess how the technique functioned in practice.

Second, a reflexive thematic analysis was conducted on participant data to explore the content and nuance of their responses. This inductive analysis revealed four recurring sub-themes: user autonomy, redistribution, broader responsibilities, and food planning support. These sub-themes reflected participants situated concerns and imaginative responses to the speculative task. These themes form the basis of the analysis that follows.

#### 4.1.1 User Autonomy

Participants expressed a strong desire to retain a sense of control and understanding in their relationship with household food systems. Rather than surrendering decision-making entirely to automated technologies, they emphasised the importance of knowing why certain actions were taken, how systems worked, and being able to act independently if needed. This suggests that participants valued not only the outcomes of efficient systems but also the ability to remain informed and competent in their everyday food practices.

For instance, P4 said *“People lose memory. People rely too much on the computer. Can’t use food themselves.”*

Similarly, P2 reflected, *“Exactly. My ideal is that humans wouldn’t intervene at all. But then who decides what’s good or bad?”*

These quotes reveal a shared concern about the erosion of food literacy and decision-making capacity when too much control is delegated to automated systems. Although automation was seen as beneficial in reducing mental burden, participants clearly wished to avoid becoming passive

system users. They wanted systems to offer explanations, support learning, and preserve individual skill. This insight demonstrates that participants do not want to be merely system users, but understand why something is done, feel that they have skills, not just follow instructions, be aware and informed, not simply guided by technology.

This demonstrates that the future card facilitated critical reflection on power dynamics between humans and technology and encouraged participants to collaboratively explore the boundaries between convenience and autonomy.

This sub-theme reflects all three evaluation criteria: stimulate critical thinking, support creative collaboration, surface technology-oriented ideas.

#### **4.1.2. Redistribution**

In addition to concerns about autonomy, participants also reflected on how food could be shared more equitably within communities. The idea that surplus food should not go to waste but rather find its way to those who need it resonated strongly. Participants envisioned systems that not only optimise consumption but also support redistribution practices that reinforce a sense of solidarity and environmental responsibility.

*As P3 remarked, “That is also satisfaction, that I can do something good. I can save food and can do good.”*

*P4 described a more infrastructural vision of redistribution: “If you have too many carrots, then it could find a place where it's needed. A package robot takes it to those in need.”*

*Later, the same participant added: “We would consume exactly as much as needed, and any surplus would be redistributed to others. Food would circulate.”*

These quotes reveal that participants saw personal and collective value in food redistribution. On one hand, they associated it with ethical satisfaction being able to help others and reduce waste. On the other hand, they imagined concrete mechanisms, such as autonomous delivery systems, that could operationalise surplus sharing in local contexts. The speculative scenarios thus served as a medium through which participants could explore both emotional and systemic dimensions of food circulation. This insight suggests that participants imagined community-based infrastructures where surplus food would no longer be a burden, but a shared resource recirculated through smart, socially embedded systems that blend technological capacity with ethical intent.

The findings indicate that the future card facilitated critical reflection on the role of redistribution in future food systems and encouraged participants to collaboratively explore models of collective responsibility and mutual aid.

This sub-theme reflects all three evaluation criteria: stimulate critical thinking, support creative collaboration, surface technology-oriented ideas.

### 4.1.3. Broader Responsibilities

Participants recognised that food waste is not solely the result of individual actions but is shaped by broader systemic factors, such as packaging practices, production models, and information gaps. This awareness shifted the conversation from personal responsibility to structural influence.

As P2 remarked, *“There was a time when there weren't so many packages. And then suddenly there were a lot of packages.”*

P1 added, *“Everyone talks all the time about us wasting food. But not everyone talks about how not to waste.”*

These reflections highlight how current waste patterns are embedded in material systems and shaped by the absence of clear guidance. Participants did not focus only on behavioural change but questioned the structures that limit or enable meaningful action. This insight demonstrates that participants recognize that food waste is not just the result of individual choices but is deeply embedded in broader systems.

Participant responses suggest that the future card activity facilitated critical reflection on how food systems distribute responsibility and enabled shared questioning of current infrastructures.

The discussion reflects both key evaluation aims: stimulate critical thinking, support creative collaboration.

### 4.1.4. Managing Food Supply

Participants frequently described the challenge of managing food quantities in everyday life, identifying meal planning as a source of mental burden. Rather than imagining full automation, they envisioned AI as a supportive partner that could assist in reducing overconsumption and decision fatigue.

As P5 explained, *“The AI would take into account the size and habits of each household and offer solutions that help prevent food waste.”* later added, *“People could take better care of themselves, and food waste could be prevented thanks to this kind of smart support.”*

P1 similarly noted, *“The app knows your habits, lifestyle, and number of people. Suggest what you could grow and consume to prevent excess food.”*

These reflections show that participants saw value in intelligent, personalised systems that adapt to household routines, rather than prescribe fixed behaviours. AI was framed as a cognitive support mechanism reducing mental effort while preserving user agency. This insight demonstrates that participants viewed food planning as a shared task between humans and technology, where effort is eased but control remains with the user.

This demonstrates that the future card technique facilitated critical reflection on the cognitive demands of meal planning and supported collaborative ideation about human-AI cooperation in household food routines.

This sub-theme reflects all three evaluation criteria: stimulate critical thinking, support creative collaboration, surface technology-oriented ideas.

The thematic analysis of Workshop 1 demonstrates that the future card technique successfully enabled participants to explore critical tensions within household food systems. The four sub-themes (user autonomy, redistribution, broader responsibilities, and food planning support) highlight how participants used speculative prompts to articulate concerns about ethics, systems, and mental burden in food-related decision-making. Across all themes, the activity fulfilled its intended SD aims. Participants engaged in critical thinking by questioning technological dependence, systemic responsibility, and ethical dimensions of future food systems. The technique surfaced technology-oriented ideas, including AI-powered planning tools and redistribution systems. Finally, they demonstrated creative collaboration through reciprocal dialogue and co-construction of scenarios.

## 4.2 Phase 2: Speculative Design Process

This section provides an overview of the speculative video prototype evaluation, created in Phase 2 and introduces its analytical interpretation using Bardzell et al. (2014) approach to critical design. A more detailed explanation of the evaluative framework can be found in the method section 3.4.

Phase 2 of this study focused on translating participant-generated ideas into a diegetic prototype: a short video titled “*My Kitchen 2025*” [My Kitchen 2025.mp4](#). The goal was not to provide a feasible technical solution that could be developed, but to bring one imagined future to life in a form that encourages critical reflection and discussion about values. The video consists of two contrasting narratives featuring the same protagonist, Andrew, a man in his 40s living with his family with a smart, automated kitchen home. In the **positive scenario** (Figure 3), the system manages storage, suggests meals, and redistributes leftovers efficiently. Daily routines run smoothly, reducing Andrew’s mental load and food waste. The kitchen acts as a quiet partner, promoting sustainable habits without interference.



Figure 3. Positive Scenario from Video *"My Kitchen 2025"*

The **negative scenario** (Figure 4) introduces a breakdown in this system. When the kitchen stops working, Andrew is left without guidance or support. He struggles with sorting waste and feels overwhelmed by food scraps and packaging. Lacking confidence or habit, Andrew throws everything into the bin. The situation reveals his dependency on the system and the loss of everyday agency.



Figure 4. Negative Scenario from Video *"My Kitchen 2025"*

The video served as a critical design artifact, an experiential provocation inviting participants and viewers to reflect on the ethical, behavioural, and systemic dimensions of household practices.

Table 6 presents an analysis of this video using a modified approach (explanation in the section 3.4) from Bardzell et al. (2014).

Table 6. Modified Bardzell, Bardzell & Solterman (2014) Evaluation of the Speculative Video

| <b>Design Dimension</b> | <b>Positive Scenario</b>  | <b>Negative Scenario</b>   | <b>Critical Engagement</b>  |
|-------------------------|---|--|---|
| <b>Topic</b>            | Household food systems and automated sustainability practices                                     | Breakdown in smart infrastructure and household dependence                             | Enhancing appreciation of invisible systems and dependencies                            |
| <b>Purpose</b>          | Demonstrates how smart systems can support sustainable lifestyles and reduce everyday mental load | Reveals fragility and disempowerment caused by over-reliance on technology             | Supports reflection on everyday habits and their underlying structures                  |
| <b>Functionality</b>    | Manages food storage, suggests meals, sorts waste, composts, and redistributes surplus            | Fails to guide users. Leads to unmanageable waste and confusion                        | Encourages rethinking responsibility and the extent of technological dependence at home |
| <b>Interactivity</b>    | User interacts through prompts, the system adapts silently  | No interaction, user is left unsupported and passive                                   | Exposes the boundaries of trust and autonomy in a technological environment             |
| <b>Form</b>             | Calm, clean visuals with seamless flow and neutral tone   | Darker tone, slower pacing, and a sense of frustration and helplessness                | Amplifies emotional contrast between stability and system failure                       |
| <b>Materiality</b>      | Short diegetic video presenting a speculative but plausible future                                | Short diegetic video format delivers a different emotional and interpretive experience | Makes systemic risks and vulnerabilities experientially tangible                        |

Each design dimension revealed specific interpretive tensions and supported different aspects of critical reflection:

**Topic** focused on household food systems, positioning the kitchen not only as a functional space but as a site of ethical and technological negotiation.

**Purpose** contrasted two visions of technological assistance either as a supportive partner promoting sustainability or as a fragile dependency that undermines user agency.

**Functionality** revealed how the system presence or absence shaped household food behaviours, highlighting the role of automation in decision-making, waste management, and emotional burden.

**Interactivity** emphasised the boundary between active user involvement and passive reliance. In the negative scenario, the lack of interaction exposed the risks of over-delegating control to automated systems.

**Form**, the visual style, tone, and pacing highlighted the emotional contrast between the two scenarios, emphasizing the impact of technological failure on household routines and the sense of stability.

**Materiality**, as conveyed through the short video format, made the speculative future tangible and accessible, helping to suspend disbelief and allow critical engagement with plausible alternatives.

The critical design evaluation approach by Bardzell et al. (2014) proved to be an appropriate analytical technique, as it provided a clear and structured framework for examining how the speculative video prototype prompts critical reflection through different design elements. By analysing design dimensions, it was possible to highlight how the design directed attention to everyday food practices, technological dependency, systemic responsibility, emotional contrast between control and breakdown, and the often invisible fragility of household systems. Importantly, the additional dimension of critical engagement helped capture the prototype's ability to challenge assumptions, provoke ethical questions, and invite interpretive openness. The contrast between the positive and negative scenarios added interpretive depth by surfacing ethical tensions between convenience and autonomy.

The approach by Bardzell et al. (2014) does not explicitly account for the socio-political or cultural context in which design operates. While it enables analysis of how a speculative artifact can provoke reflection, it offers no techniques for understanding how that artifact relates to broader structures such as national policies, social norms, or institutional practices. In the context of this thesis, where food waste is deeply entangled with behavioural expectations and the distribution of responsibility between households and public strategies, this lack of contextual grounding may limit the depth of interpretation. In this study this limitation is addressed through the use of the future cards method, which surfaces participants values and lived experiences. By grounding the design process in real-life perspectives prior to the creation of the artifact, this approach supports a more context-sensitive discussion and strengthens the connection between the speculative prototype and social reality.

### **4.3 Phase 3: Exhibition and Reflection**

This section presents findings from the Workshop 2, where participants viewed the speculative video "*My Kitchen 2025*" and engaged in a reflective discussion (Figure 5). The following analysis is structured around three sub-themes: personalised kitchen, fragility of waste systems, and reimagining packaging - which emerged through thematic analysis, reflecting participants situated concerns and imaginative projections in response to the speculative diegetic video.



Figure 5. Workshop 2 Reflection (The image has been blurred to protect participants privacy)

### 4.3.1 Personalised Kitchen

Participants described the kitchen not merely as a technical aid but as a responsive, intelligent companion capable of adapting to household routines, dietary preferences, and planning needs. The system was imagined as easing daily decisions while also learning from user behaviour over time.

*As P9 described, “And then the kitchen would also include a kind of built-in recipe guide. One option is that when you ask for a recipe, it shows it somewhere on the screen. But you can also input your favourite recipes, and it adapts to your taste. It reminds me that in this recipe, I didn’t like it done that way.”*

This quote demonstrates that participants envisioned future kitchens as active collaborators learning from preferences, reducing decision fatigue, and acting as semi-autonomous yet responsive agents. The kitchen was not just a tool, but a participant in household life.

This demonstrates that participants valued technologies not merely for efficiency, but for their ability to engage meaningfully with users’ routines, preferences, and identities - a central aim of SD to provoke reflection on the evolving relationship between people and technology.

### 4.3.2 Fragility of Waste Systems

While participants appreciated the seamlessness of the smart kitchen, they also raised concerns about technological dependency and system failure. The negative scenario in the video prompted participants to question the risks of over-reliance on automation for basic household functions like waste sorting.

P7 expressed this concern by stating, *“But what if everything crashes? Then there’s this big red error screen, and you get precise instructions like a guide on how to sort the waste manually.”*

This quote reveals that participants were not uncritically accepting of technological solutions. The video helped them articulate the importance of system resilience, manual fallback options, and user preparedness. From a SD perspective, this theme shows how failure scenarios can surface latent anxieties and provoke critical reflection about infrastructure, control, and responsibility.

It emerged that participants were aware of the limitations of fully automated systems and emphasised the importance of fallback mechanisms, individual agency, and infrastructural transparency.

### 4.3.3 Reimagining Packaging

Participants also speculated about future packaging systems as part of a circular and sustainable infrastructure. Packaging was not seen as waste but as compostable, reusable, or biologically integrated with natural systems.

P8 noted, *“The packaging is a product in itself, and afterwards, it could be used as compost or some other material.”*

This quote shows that participants were able to think beyond critique and engage in imaginative exploration of material systems. The idea of packaging as a dynamic, functional component within circular flows illustrates how SD can provoke new relationships with waste and materials. Participants did not limit themselves to current limitations but envisioned alternative infrastructures where design and ecology are intertwined.

This demonstrates that participants moved beyond critique to engage with material systems imaginatively, reflecting SD’s capacity to open new possibilities for ecological thinking and to shift relationships between humans, waste, and design.

Across the three empirical phases, this study demonstrated how SD techniques can facilitate discussion on household food waste as both a personal and systemic issue. Participants did not only imagine alternative behaviours, but also questioned the assumptions, dependencies, and infrastructures shaping those behaviours. From concrete recommendations about redistribution and packaging to emotional responses around automation and mental burden, the findings reveal a desire for more transparent, supportive, and context-sensitive food systems.

These insights underline the potential of SD to serve as a bridge between top-down policy initiatives and everyday lived experience. The following discussion interprets these findings in relation to the broader aims of the thesis, highlighting methodological implications, critical tensions, and directions for future design and policy engagement.

## 5. Discussion

This thesis investigated the use of Speculative Design (SD) techniques as a resource for narrowing the gap between policy initiatives on food waste reduction and the everyday practices of households.

The study shows that use of future cards supported participants ability to express values, imagine alternatives, and generate narratives that connected abstract policy goals to everyday experiences. The cards were effective and resulted in the following policy-relevant recommendations, which emerged from four recurring themes:

1. Participants emphasised the importance of transparency and interpretability in smart food systems. They wanted to retain competence and understanding rather than delegate control to technologies. Based on participants reflections, policy-level recommendations include supporting citizen knowledge alongside behavioural change, creating visual explanations of food preservation, and prioritising clear guidance over automated compliance.
2. Participants also imagined redistribution systems as community infrastructures rather than acts of charity. Surplus food was seen as a shared resource to be recirculated locally. Based on these reflections, the study recommends supporting food-sharing platforms (such as Foodsharing Tartu movement) and installing communal refrigerated cabinets in residential areas through municipal or policy support, to enable safe redistribution among neighbours.
3. In discussions about responsibility, participants shifted the focus from individual behaviour to the systemic conditions that shape it. They pointed to the role of packaging design and market structures in producing household food waste. These reflections call for policy recognition of systemic constraints and shared responsibility across sectors. This led to recommendations for supporting circular and compostable packaging and recognising the structural barriers to sustainable action in policy frameworks.
4. Planning food supply emerged as a source of mental burden. Participants welcomed AI as a tool to reduce decision fatigue but only if it functioned as a partner, not a replacement. This underscores the need for people-centred digital design principles in policy agendas. Based on this, recommendations include supporting the development of AI tools that collaborate with users in planning quantities and incorporating mental effort into food policy as a legitimate factor influencing waste.

These insights demonstrate how speculative techniques can bring to light value-laden, relational and situated concerns that often remain hidden in conventional planning approaches. Rather than producing fixed solutions, the method supported participants in articulating not only what they expect from future food systems, but how they wish to engage with them (Dunne & Raby, 2013). This participatory speculative approach serves as a generative technique for bridging the gap between abstract policy discourse and the lived complexity of everyday food practices.

Analysing the use of future cards within the scope of this study, highlights its role not only as speculative prompts, but as participatory techniques for bridging policy objectives and everyday experiences in household food practices. Rather than guiding participants toward fixed answers, the cards opened a space to critically question assumptions about responsibility, fairness, and technological agency (Dunne & Raby, 2013). This helped participants reinterpret abstract food waste policy goals through the lens of personal values and lived routines, revealing how SD can foster grounded, experiential engagement with policy discourse. While ideas such as AI-based planning or redistribution platforms echoed familiar technological narratives, participants used speculative prompts to re-situate these technologies within their own social and material contexts. In doing so, the cards acted not as predictive techniques but as mechanisms for aligning systemic visions with household-level meaning-making. These findings affirm the potential of SD to function not merely as a space for provocation, but as a participatory method that supports the translation of food policy ambitions into relatable, value-driven futures.

The Bardzell et al. (2014) critical design evaluation approach enriched the analysis by offering a clear structure for examining how the speculative video “*My Kitchen 2025*” functioned as a bridge between institutional narratives and domestic concerns. While the model does not explicitly address the sociopolitical context of food waste, it proved effective in analysing how speculative video design enabled participants to emotionally and ethically engage with policy-relevant questions in a familiar household setting. In this context, the video served not just as a critical artifact, but as an accessible and affective interface that linked policy-level sustainability goals (e.g., reduced waste, increased food system resilience) with the emotional and cognitive experiences of everyday kitchen life. In this way, Bardzell et al. (*ibid.*) approach supported the broader aim of the thesis by demonstrating how SD artifacts can translate institutional aims into experiential, value-informed reflections that deepen household engagement with sustainability policy.

The results of the second workshop demonstrate that speculative prototypes, such as the “*My Kitchen 2025*” video, can serve as a bridge between policy-level objectives and everyday food-related behaviours. Participants did not perceive the automated kitchen merely as a technical solution but as a relational companion that supports habitual and emotionally embedded household life. This response suggests that SD can help individuals reflect not only on what technologies do, but on how they wish to live with them. Participants critical engagement with the scenario of system failure highlighted the need for future systems to offer not just seamless operation, but intelligible and accessible fallback structures. This reflects a view of automation not as an end in itself, but as a tool that must preserve human competence. Such insights link personal concerns to policy-level aims: fostering responsibility, transparency, and user agency in sustainable food systems. Moreover, the discussion on circular packaging showed that speculative thinking remained grounded in real-world logic, enabling participants to suggest locally adapted and

system-compatible solutions. This demonstrates that SD can simultaneously support imagination and practicality, helping to align policy goals with material and experiential realities.

While this study did not aim to evaluate behavioural change, or was it designed to measure shifts in participants food waste practices, it is relevant to briefly reflect on the speculative potential for such impact. SD, by nature, invites participants to inhabit possible futures and consider their own values and assumptions in unfamiliar contexts. This form of imaginative engagement can act as a catalyst for reflection and might influence future decision-making or heighten awareness around issues like food waste, automation, and responsibility. However, as the study did not include any longitudinal or comparative elements, it cannot claim that changes in attitudes or behaviours occurred. Rather, it highlights the generative potential of speculative methods to open up ethical, emotional, and cognitive space for participants to critically reimagine their own roles within future systems.

In summary, this study shows that SD enabled participants to reflect on food systems critically, relate policy goals to everyday practices, and imagine alternative futures. Rather than offering fixed solutions, the methods created space for ethical, emotional, and systemic reflection. This confirms that speculative approaches can help bridge the gap between policy and household life by making abstract challenges tangible and personally meaningful.

## **5.1 Limitations and Recommendations for Further Research**

While the findings highlight the potential of Speculative Design (SD) in sustainability-related contexts, several limitations should be acknowledged, which may also inform directions for future research.

The findings are based on a small sample of adult participants, which limits broader generalisability. Speculative methods also depend on participants ability to imagine and interpret future scenarios, which may vary across cultural and individual contexts.

Due to time constraints, this study could not assess whether participants reflections led to lasting behavioural change. Future research could include follow-up sessions to evaluate long-term impact. In addition, including more diverse participants across age, household type, and cultural background would offer insights into how SD functions in different settings. Studies comparing SD with conventional approaches, such as awareness campaigns, would clarify its added value. Longitudinal designs could further explore whether speculative engagement leads to lasting shifts in attitudes or practices.

Given the study's grounding in the Ethnographic Experiential Futures (EXF) framework, future work should retain this orientation, as it supports deeply situated, value-based participation. Similarly, SD could be tested as a participatory policy technique, bringing together citizens and policymakers to co-create future visions. This could position SD as a mediator between institutional goals and lived household experience.

## **6. Conclusion**

The aim of this master's thesis was to investigate how Speculative Design (SD) can function as a means of narrowing the gap between policy-level goals on food waste reduction and the everyday practices of households. Despite commitments made by the European Union and Estonia to reduce food waste, statistics show that nearly half of all food waste originates from households. This highlights the need for novel approaches that support citizens not only through information but by enhancing their capacity to engage meaningfully with sustainability in practice. In conclusion, SD serves not only as a conceptual technique, but as a participatory and transformative practice, one that enables the bridging of policy and practice, and fosters deeper, more personal engagement with the future of food.

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## Appendix

- I. Future Scenario - Automated Kitchen
- II. Future Scenario - AI-based Food System
- III. Storyboard from the Video *“My Kitchen 2025”*
- IV. Future Card Game *“A Thing from the Future”*
- V. Future Card Game Worksheet

# Appendix I Future Scenario - Automated Kitchen

growth - 70 years  
in the  
**ARC** *structure*

*Apartment*  
**TERRAIN**

*composting*  
**OBJECT**

*Recipe*  
~~Recipe~~  
**MOOD**

DESCRIPTION

A household preservation system that identifies the best storage conditions for food items and arranges them accordingly. It can automatically detect spoilage (regardless of the date marked on the product). It suggests recipes to avoid food waste. Any excess that is not consumed is offered to a food sharing system. In addition, there is a composting system where waste can be added, and which decomposes the waste on the spot. The device knows how to balance compost itself.

SKETCH

Dystopia: People's awareness declines. People cannot assess food edibility, shelf life or know storage conditions. Deepening dependence on technology.

Individual - spend time savings, money savings, reduce mental burden

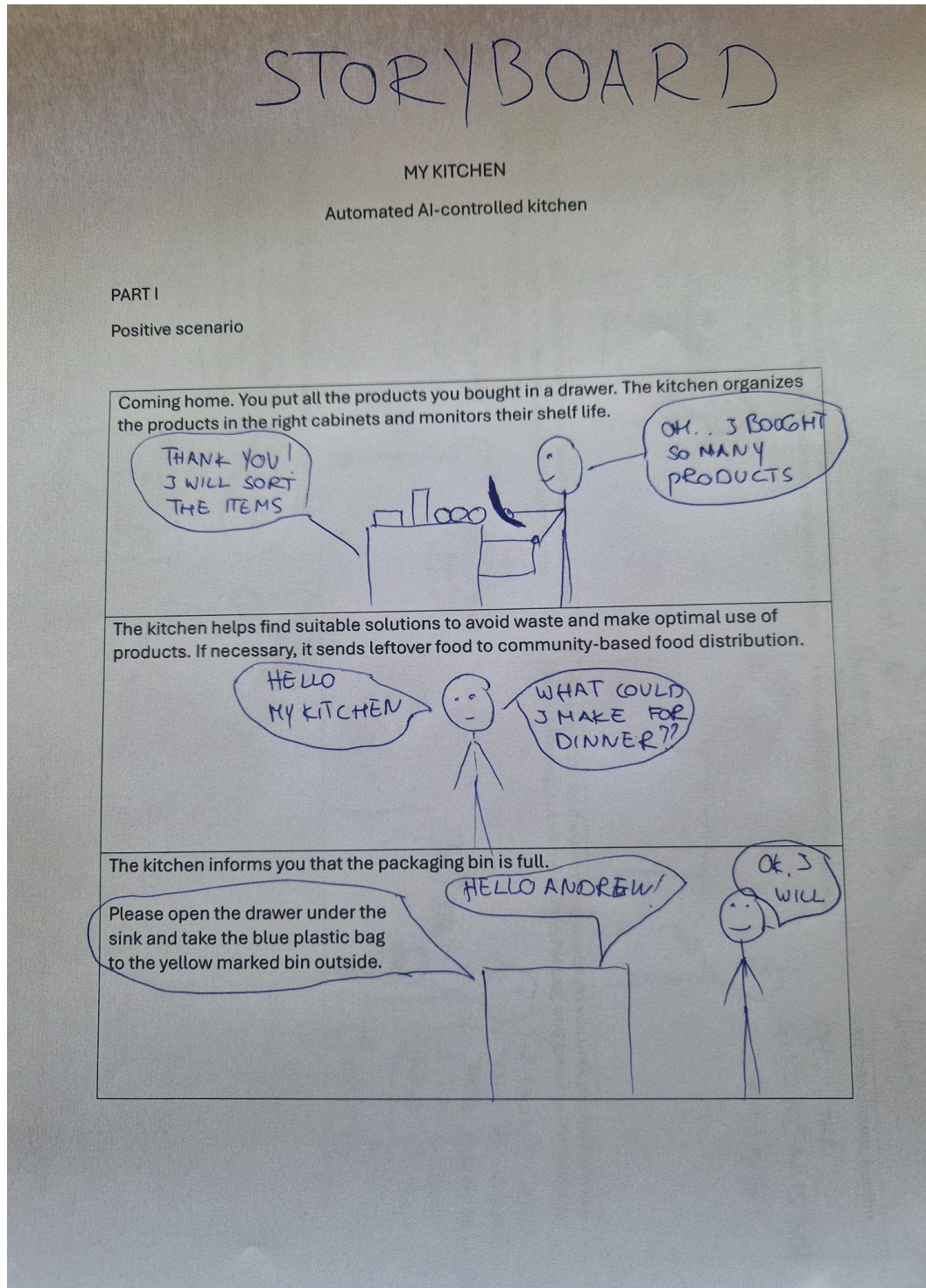
Societal - reduce food waste, simplified food sharing.

Government - reduce waste management costs.

# APPENDIX II Future Scenario - AI-Based Food System

|  |                          |                             |                             |
|--|--------------------------|-----------------------------|-----------------------------|
| collaps + 20y<br><b>ARC</b>  | Garden<br><b>TERRAIN</b> | Prevention<br><b>OBJECT</b> | Satisfaction<br><b>MOOD</b> |
| <b>DESCRIPTION</b><br><p>In a amount of years, AI can understand (by observation) what are our food and nutritional needs and preferences. Thus it can make near ideal prognosis on the requirements of food (and the need for it). AI can understand the potential of the garden and thus give advice on what and where to plant. The goal is that the garden would provide exactly the amount of food that we need and want, and do that all year long. As a result, there would be excess food that we are not able to consume. Additionally, AI gives people timely suggestions on what foods that the person likes, can be made from freshly riped garden products.</p> <p>When AI notices <del>that</del> while monitoring the garden that at some point of time there will be too many products from the garden, it will search for consumers for them automatically and an order the transport for them. The people are satisfied because they have fresh (dome) 24/7 <del>and</del> from their own garden and nothing goes to waste. Additionally they are helping others when the garden is providing extra.</p> <p>The society wins because there will be less waste, <del>and</del> people are eating healthier and community bonding increases.</p> <p>The nation wins because it <del>does not</del> does not have to worry or solve the issues concerning waste when producing food. Additionally global food supply security has been implemented. Money can be appointed elsewhere.</p> |                          | <b>SKETCH</b><br>           |                             |
| <p>Dystopia: very bad weather - crops wither and die. No more shops anymore to feed everybody</p> <ul style="list-style-type: none"> <li>• AI goes rogue or makes mistakes - people will starve</li> <li>• people will rely on AI too much - know-how to grow crops by themselves is lost</li> </ul>   |                          |                             |                             |

# Appendix III Storyboard from the Video "My Kitchen 2025"



PART II

Negative scenario

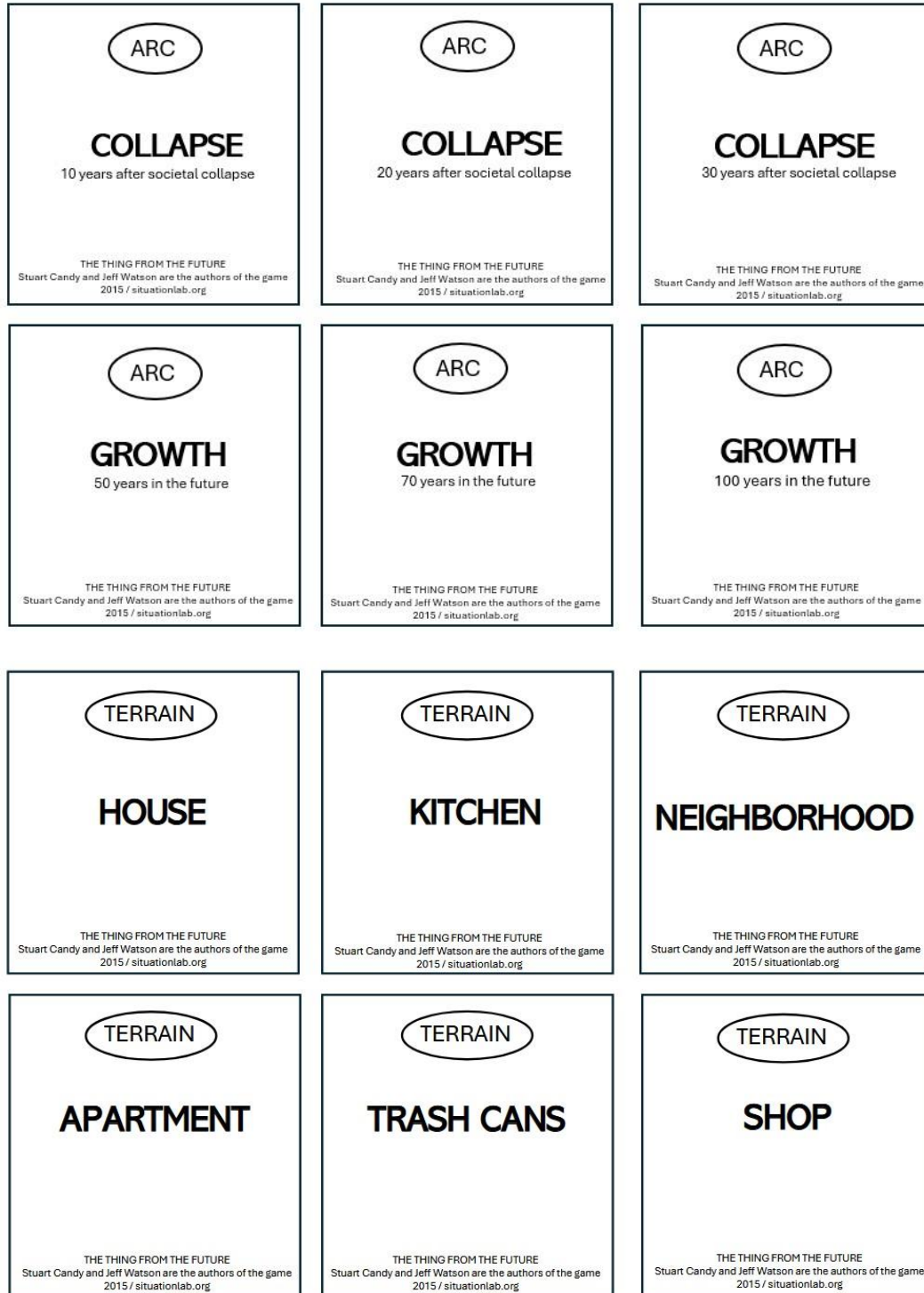
You are making food. You put food waste in the kitchen drawer, but the kitchen doesn't sort the garbage.



You ignore the food waste piling up around you until you finally grab a large trash bag, put all the trash in the bag, and take it to the trash can.



## Appendix IV Future Card Game “A Thing from the Future”



TERRAIN

**GARDEN**

THE THING FROM THE FUTURE  
Stuart Candy and Jeff Watson are the authors of the game  
2015 / situationlab.org

TERRAIN

**VIRTUAL KITCHEN**

THE THING FROM THE FUTURE  
Stuart Candy and Jeff Watson are the authors of the game  
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OBJECT

**WASTE CLEANUP**

THE THING FROM THE FUTURE  
Stuart Candy and Jeff Watson are the authors of the game  
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OBJECT

**ZERO WASTE**

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OBJECT

**RECYCLING**

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OBJECT

**PREVENTION**

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MOOD

**COMFORT**

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MOOD

**SCIENTIFIC**

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OBJECT

**COMPOSTING**

THE THING FROM THE FUTURE  
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OBJECT

**REUSE**

THE THING FROM THE FUTURE  
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OBJECT

**WASTE PREVENTION**

THE THING FROM THE FUTURE  
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OBJECT

**CIRCULAR ECONOMY**

THE THING FROM THE FUTURE  
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**Appendix V Future Card Game Worksheet**

|             |                |               |             |
|-------------|----------------|---------------|-------------|
| <b>ARC</b>  | <b>TERRAIN</b> | <b>OBJECT</b> | <b>MOOD</b> |
| DESCRIPTION |                | SKETCH        |             |

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11.08.2025