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Author: Helene Balslev Clausen (AAU)

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Sustainable PLastics
for Food & drinks packaging industry

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Deliverable Contributors				
	Name	Org.	Role / Title	E-mail
Deliverable leader	Helene Balslev Clausen	AAU	Associate Professor	balslev@ikl.aau.dk
Contributing Author(s)	Pil Solhart	AAU	Research assistant	psol@student18.aau.dk
	Carlos Santana	AAU	Research Assistant	cpcs@ikl.aau.dk
Reviewer(s)	Anders Damgaard	DTU	Associate Professor	adam@dtu.dk
Final review and quality approval	Cristiano Varrone	AAU		cva@bio.aau.dk

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1 Executive summary

This deliverable addresses the plastic waste management challenges in Denmark's circular economy framework, focusing on plastic food and drink packaging. The deliverable emphasizes public behavior, awareness and technological innovation to create viable recycling solutions.

Key findings reveal that despite general awareness of plastic issues, practical barriers still limit recycling efforts. For instance, consumers struggle with sorting plastic waste due to confusion about materials, inconvenience in cleaning packaging and a lack of trust in recycling systems. Notably, 75% of Copenhagen residents attempt to sort plastic waste but find food packaging particularly challenging, highlighting a gap in user-friendly designs and clear communication.

The UPLIFT Living Lab in Ørestaden, Copenhagen, was established to investigate the consumer and public awareness. The UPLIFT Living Lab serves as a model for public engagement and sustainable behavior studies. The Innovation District's eco-conscious residents including national and international corporations, small and medium-sized enterprises, Copenhagen University, IT-University and Ørestaden's High School. They participated in quantitative and qualitative approaches for instance, ethnographic research, revealing that behavior change requires not only technological solutions but also social and cultural shifts. Key challenges include the need for a clearer labelling, reliable information and effective behavior nudges.

These findings underscore the importance of multistakeholder collaboration in achieving a circular economy for plastics. Unfortunately, the findings also demonstrates that new technologies are often met with scepticism and new plastic technologies are no exception. To prevent widespread rejection of new food and drink packaging, it is necessary to understand the factors that influence consumer acceptance. Improving the likelihood of successful adoption ensures that the technology can be effectively used to achieve the desired outcomes. Recent research highlights that most consumers are personally motivated to reduce, recycle and rethink their plastic packaging usage, further emphasizing the importance of this endeavour. The initial findings pave the way for further studies to refine these strategies and foster a deeper integration of sustainable understandings and practices in everyday life.

2 Introduction

The global reliance on plastic is driven by its convenience, durability and cost effectiveness, especially in the context of plastic food and drink packaging. However, as plastic waste continues to rise, particularly in the European Union (EU), where the average person generated 36.1 kilos of plastic packaging waste in 2021, marking a 29% increase per capita from 2010 to 2021 (EU Commission, 2021; Cimpan et al., 2021), the environmental consequences of plastic use are becoming increasingly urgent. While plastic food and drink packaging offers advantages such as low production costs, durability and flexibility (among others Hopewell et al., 2009; Marsh and Bugusu, 2007; Heidbreder et al., 2019), these benefits are overshadowed by environmental damage of plastic waste. Despite advancements in recycling and upcycling technologies, a significant gap remains between the development of sustainable packaging solutions and their widespread acceptance by consumers and businesses. Under the Green Deal (EU Commission, 2021), the EU aims to recycle 55% of plastic packaging waste by 2030. Achieving this target will necessitate improvements in design for recyclability and stimulation of the recycled plastics market (see among others Heidbreder et al., 2019; Herrmann et al., 2022).

To address this requires a shift towards circular economy and better technologies. New innovative plastic packaging technologies are emerging, designed to be fully reusable or recyclable by 2030, in alignment with the EU's circular economy objectives. However, technological innovation alone is insufficient; the success of these solutions hinges on their acceptance by consumers and businesses. Although these innovations may offer environmental and economic benefits, significant challenges remain in promoting long-term sustainable behaviors among consumers and ensuring public acceptance. These new technologies can only be impactful if not only politics and producers but also consumers are willing to adopt them and companies willing to integrate them into their supply chains. Resistance from consumers or strong non-governmental organizations - whether due to limited awareness, scepticism regarding performance or difficulty in altering established habits or behavior - represents a significant barrier to the widespread adoption of sustainable packaging (among others Henriksson et al., 2010; Nemat et al., 2020; Williams et al., 2018). The UPLIFT project recognizes that focusing on new technologies without considering consumer and public behavior and acceptance, risks creating solutions that are not socially viable. Thus, the overall aim of this task is to explore, identify and assess consumers social acceptance and perception of innovative technologies and plastic recycling. Research has shown that effective public acceptance of innovative technologies will not be determined only by a focus on developing the needed technology; in fact, also the social dimensions are of fundamental importance. Therefore, the goal of public acceptance requires as much attention as developing the needed technology. This includes understanding how consumers and public perceive and engage with sustainable plastic food and drink packaging, including trust in certifications or potential mandatory sorting rules (Nemat et al., 2019; Ncube et al., 2021), their willingness to alter consumption patterns, and the role of businesses in adopting environmentally friendly packaging options.

The research conducted under the WP5 deliverable 5.4 has addressed these challenges by employing ethnographic intervention research and consumer behavior research to explore and analyse the social dynamics that influence the adoption of sustainable practices. By engaging with the social, economic and environmental dimensions of sustainability, UPLIFT aims to develop sustainable packaging technologies that are not only better for the environment but

also culturally and socially accepted by the end-consumers. Without public acceptance even the most advanced packaging solutions will struggle to succeed. UPLIFT Copenhagen serves as a compelling case study for exploring consumer behavior and public acceptance in the realm of sustainable food and drink packaging, particularly through the Living Lab in Ørestaden. While, this case study provides localized insights, the challenges and findings addressed in Ørestaden are not unique to Copenhagen. These issues resonate across numerous European cities that face similar struggles with plastic waste, recycling systems, and consumer engagement. The solutions and analysis developed under UPLIFT are therefore highly transferable and serve as a framework for identifying potential strategies that can be adapted to a wide range of urban contexts in Europe. By examining the relationship of social, economic and environmental dimensions in Copenhagen, UPLIFT contributes to a deeper understanding of public acceptance that is relevant for fostering circular economy transitions across the continent. These insights underscore the importance of tailoring sustainable packaging solutions to the preferences and behaviors of consumers, ensuring their applicability and effectiveness beyond the boundaries of Copenhagen to a wide range of European cities. Therefore, UPLIFT emphasizes the need to bridge the gap between innovation and adoption, ensuring that sustainable packaging solutions align with the preferences, habits and expectations of consumers. UPLIFT thus paves the way for new packaging technologies to be embraced by both consumers and businesses, contributing to a more sustainable, circular economy.

3 Contextualizing Waste Management and Plastic Recycling in Denmark

3.1 Denmark: Circular Economy Strategies for Plastic Waste

Plastic waste is widely acknowledged as one of the most critical environmental challenges of our time. While plastic as a material has significantly advanced innovation across various fields, its production based on non-renewable raw materials, and the predominantly linear economy in which it is manufactured and consumed render it problematic from both sustainability and human health perspectives. Transitioning to a circular economy in plastic production and usage could mitigate these issues by reducing overall plastic production and waste. A system for the production and use of plastics that is more circular in nature would ideally be renewable, thereby enhancing environmental sustainability (World Economic Forum, Ellen MacArthur Foundation, 2016).

Currently most plastic waste in Denmark is managed through energy recovery processes, primarily incineration. Despite efforts to encourage plastic waste recycling through household waste separation programs, it is estimated that around half of all plastic waste is directly incinerated (Interview Vestforbrændingen, Febr. 2022). The reliance on incineration highlights a misalignment with the waste hierarchy, which prioritizes waste prevention, reuse and recycling over disposal. Effective waste prevention can be achieved by designing products with end-of-life considerations, such as reuse and recyclability and by encouraging consumers to keep plastics within the materials loop. Strategies like ‘design-for-recycling’ and ‘design-for-reuse’ embody this lifecycle approach. Recent data indicates that the Danes recognize the importance of addressing plastic-related challenges and prioritize sustainable practices

concerning food and drink packaging which reflect a high level of awareness, though not necessarily indicative of their actions. For example, data from the Danish deposit-return system for beverage containers, managed by Dansk Retursystem A/S achieved a return rate of 92% (Interview Vestforbrændingen, 2022). This system is considered an effective way of not only raising awareness but also represents a game changer and pivotal step in shifting consumers and public behaviors.

3.2 Recycling and the Extended Producer Responsibility (EPR)

Denmark's commitment to circular economy is evident in the Plastic without Waste strategy (Danish Government, 2018) which outlines 27 specific detailed initiatives aimed at improving the circularity of plastic nationwide. These initiatives focus on enhancing the recycling and reuse of plastic materials, reducing plastic waste, and fostering innovations in sustainable plastic production. Although circular economy reports have largely emphasized the promotion of recycled-content plastics, bioplastics – which offer bio-based alternatives- have often been underrepresented as a feasible solution (Confederation of Danish Industry, 2023; Dansk Erhverv, 2023; Dansk Producentansvar, 2024). In alignment with the European Bioplastics (2018), there is a goal to replace 10% of all plastic packaging with bio-based plastics by 2030. This reflects a broader EU objective to reduce the environmental impact of traditional plastics by incorporating more sustainable materials into packaging production. One of the initiatives in Denmark's strategy Plastic without Waste initiative no. 23 specially addresses knowledge building on bio-based plastics. However, the conclusion of the report states that "...currently we do not have sufficient knowledge to confirm that a shift..." (The Danish Government, 2019) and the report does not detail any specific plan to address this knowledge gap.

Regulatory measures can play a crucial role in promoting material redesign and reducing plastic waste. These measures include the regulation of avoidable plastic packaging, the restriction of plastics prone to environmental leakage, and policies aimed at plastic producers. Among the most effective strategies is the implementation of Extended Producer Responsibility (EPR), which places the responsibility, whether financial or physical, for the waste management of post-consumer products on the producer (Preuss, 2023; Dansk Erhverv, 2023; Dansk Producentansvar, 2024). EPR schemes can include environmental taxes on single use plastics and incineration fees, designed to incentivize better product design. A study based on the role of EPR in increasing plastic recycling highlights that environmental fees should be proportional to the recyclability of a product (Joltreau, 2022). Specifically, producers of poorly designed plastics, those that are difficult to recycle, should face higher fees. However, EPR has yet to be fully implemented in Denmark (The Danish Government, 2019) and the introduction of such schemes would represent a significant step towards achieving a circular plastic economy (VANA, 2024; Miljø- og Ligestillingsministeriet, 2024). To promote design-for-recycling, the Danish Plastics Federation has detailed reports like Responsible Plastics Production (Danish Plastics Federation, 2020), and Dansk Erhverv (2023) has a design guide for producers paving the way to understand and suggest different types of materials to be used for plastic products, including the closures, seals, labels and decoration as well as how easy it should be for consumers to empty and prepare the item to be recycled.

4 UPLIFT's Living Lab for Consumer and Public Acceptance: Ørestaden

To explore the consumer and public acceptance of food and drink packaging the study focuses on Copenhagen, specifically the Innovation District known as Ørestaden. Ørestaden belongs to the Global Innovation District network in which the Sustainable Development Goals are foundational. The study creates a Living Lab in Ørestaden in which multiple perspectives converge to experiment with a variety of sustainability solutions. The neighbourhood comprises of diverse stakeholders including large corporations, small and medium-sized enterprises, maker spaces, Copenhagen University, IT University and Ørestaden's High School and residents representing the heterogeneity of the Danish population. In this sense, Ørestaden somewhat offers a distinctive environment for exploring citizen perceptions and responses to sustainability challenges, underpinned by its alignment with the Sustainability Development Goals (SDGs) in urban development initiatives. Initially Ørestaden was envisioned as a model for sustainable living and advanced infrastructure since Ørestaden has evolved into a dynamic ecosystem comprising residential, commercial and institutional spaces with a robust emphasis on innovation, green living and environmental sustainability. The Innovation District's residents are generally well-informed about environmental issues, such as plastic pollution and its ecological impact. Ørestaden's focus on smart urban solutions and green innovation seeks to attract a demographically engaged population, that is typically interested in environmental initiatives however this awareness does not necessarily translate into sustainability actions.

Ørestaden and Plastic Waste Management

The food and drink packaging sector is a major contributor to plastic waste, particularly through single-use plastics such as bottles, wrappers and containers. In response to the environmental impact of this waste, the Municipality of Copenhagen has initiated efforts to enhance the sustainability of food and drink packaging. The municipality is taking initial steps toward shifting from the prevalent linear economic model of "take-make-dispose" to a circular economy framework. This transition aims to reduce waste generation and promote resource efficiency. The municipality has launched the circular economy strategy outlined in the Circular Copenhagen: Resource and Waste Plan 2024, that includes six key initiatives designed to improve waste management and resource efficiency. A central objective of this plan is to increase the plastic packaging recycling rate to 50% by 2025 and 55% by 2030 (Copenhagen Municipality, 2019). However, apart from being a slow process, the reports regarding circular plastics economies have largely focused on promoting the production of plastics with recycled content but bioplastics are often ignored as viable options (European Bioplastics, 2018). The resource and waste plan, Circular Copenhagen: Resource and Waste Plan 2024, focuses on reuse system (initiative 3) with a target of 3x higher level of direct reuse. The municipality aims to achieve this by neighbourhood reuse stations and through development projects related to increasing reuse within the bulky waste stream. The reuse stations are still being developed, but they will include "resident-operated repair and workshop facilities" (Copenhagen Municipality, 2019). However, a significant challenge is that this is a suggestion and without resources to implementation and nothing more than a recommendation (Interview with Plastic Change Febr. 2022; Municipality Sustainable Manager, 2023)

The Living Lab ensures that the perspectives are cross-fertilized during the different interventions and methodological activities to gain insights regarding baseline for consumer and public acceptance of food and drink packaging.

4.1 The stakeholders involved in the report

Copenhagen Municipality; Ørestadens Innovation Network; Ørestadens Grundejerforening (Home Association); Copenhagen municipality; Ørestaden's High School; Aalborg University; Copenhagen University; IT University; Sweco; Rambøll; Otte-tallet; Timo Vinbar; Fields; Plastic Change (non-governmental organization)

5 Methods

The research team has employed a range of different engaging methodologies to ensure both comprehensive and in-depth data on the challenges related to plastic food and drink packaging within the UPLIFT's Living Lab. These varied methods facilitated the collection of multiple forms of evidence, enabling data triangulation and fostering the development of a holistic understanding of consumer and public acceptance of plastic food and drink packaging.

Qualitative interviews and surveys were conducted with the residents, businesses and non-governmental organizations in Ørestaden to establish a baseline understanding of their management, consumptions and perceptions regarding the recycling of food and drink packaging. The methodological approach combined surveys to capture a broad overview of the population's attitudes, including company perspectives and levels of interest in sustainability, Sustainable Development Goals (SDGs) and plastic food and drink packaging. To investigate and assess acceptance levels and facilitate a transformative shift in plastic recycling, an exploratory approach was adopted. Data collection methods included: surveys, qualitative interviews (Kvale and Brinkman, 2015), open dialogue, and focus groups, which assure an integrating of the consumer perceptions throughout development of the methodological process (Hastrup, 1995). Moreover, in the final phase, ethnographic interventions (Vang and Clausen, 2024 forthcoming; Pink et al., 2022; Smith et al., 2016) were conducted to deepen the understanding of the participant's lived experiences and their perception of real-world challenges associated with plastic packaging as well as to promote sustainable change. Ethnographic interventions refer to immersive, participatory research techniques where researchers actively engage with participants in their everyday life to observe behaviours, interactions, and decision-making processes in real time. This approach not only provides richer qualitative insights but also allows researchers to co-create the solutions with the participants by understanding their unique cultural, social and environmental contexts. For policy-makers, this method can offer valuable actionable insights into how sustainability policies might be received and adapted in practice while for researchers, it bridges the gap between abstract theories and lived realities. By embedding these interventions into the study, UPLIFT ensured a holistic approach to exploring consumer behaviour fostering deeper engagement with the participant, and driving contextually relevant sustainable changes. Additionally, a two-week period of shadowing and participant observation was integrated into the methodological framework (Hastrup, 1995) further supported by the photo voice technique (Wang and Burris, 1994; Wang and Burris, 1997). This approach allowed participants to voice their views through visualizations and share with other participant sparking discussions among participants outside of the structured ethnographic and focus groups sessions (Liebenburg,

2018). Through observation and real-life engagement, such as tracking how participants manage and how they handle food and drink packaging waste, allowed researchers to identify discrepancies between consumer's intentions and actions. These insights are critical for designing more effective communication strategies and policy interventions. The research consistently identified the following topics as most important for further investigation: 1) information, 2) trust, 3) labels, 4) 'lived experiences'. These factors yielded valuable insights into consumer assessments of recycling of plastic and to their willingness or desire to engage in sustainable practices at all.

The ethnographic interventions organized with the residents and corporations and SME's in Ørestaden offered multiple insights into consumer behavior and acceptance. For instance, a workshop was facilitated to explore, co-create and envision possible future scenarios (Smith et al., 2016; Pink et al., 2022) considering a recycling and circular perspective on plastic packaging, while examining the potential benefits and disadvantages for various stakeholders. Visual engagement activities, such as posting concerns, experiences, and suggestions for future plastic recycling on public billboards, posts extended beyond focus groups to solicit public feedback, integrating this input subsequent iterations and interventions.

Finally, we have done desk research, collecting data from archives, films and from validated, relevant social media platforms. The methodological approach has all the time tried to align with the progress across the WP.

5.1 The methodological process

Identifying core insights from the initial survey, the research team developed a structured interview guideline to support semi-structured interviews, the focus groups and foresight techniques, like 'impact' and 'uncertainty mapping'. These questions were informed by an extensive literature review and survey, ensuring that the researchers focused on the key aspects while allowing enough flexibility to explore emergent or collectively significant in greater depth. By synthesizing participants' feedback into a series of themes, the subsequent interventions sought to deepen understanding of how various future scenarios might influence and reshape participants practices. Focus groups discussions typically began with broad, open-ended questions, gradually transitioning into more specific themes. All interviews and focus groups were conducted in locations chosen by the participants and each session started with an icebreaker unrelated to the theme of plastic packaging. The recruiting criteria were carefully chosen to create a diverse participant pool to have the best possible mix of gender, age, education level, net household income, employment status, environmental interest ensuring a diverse representation of perspectives.

As part of the ethnographic interventions, digital approaches such as photovoice (Wang and Burris, 1994; 1997; Liebenburg, 2018) and sensorial activities (Pink, 2001) were employed to encourage participants to express and visualize their ideas, motivations and aspirations regarding plastic food and drink packaging. These methods facilitated the capture of underlying behavioural logics (mechanisms of the perceptions) of the participant's actions. Through the diverse ethnographic methodologies and assessments, these interventions highlighted several key advantages, potentials and barriers related to consumption practices, including usage, reuse and recycling.

Additionally, an intervention co-designed with several non-governmental organizations (NGOs) in the Innovation District, tested whether behavioural nudges, such as improved

labelling, enhanced waste sorting infrastructure, or incentives of recycling, could increase or boost engagement. At a local festival, for example, single use drinking cups were replaced with washable, reusable alternatives. This approach created an environment where sustainability was the default option, removing the need for consumers to make a conscious choice to act sustainably by setting the stage within which the consumers could act.

In preparation for the research, a data protection declaration was developed, signed by each participant prior to the start of discussions, activities and an adhered throughout the study. The research team also obtained ethical approval (Hastrup, 1998)

6 Preliminary findings

The key themes extracted from the interviews with stakeholders, consumer survey, semi-structured interviews, participant observations and ethnographic interventions are presented and discussed in this section. By working backwards from the envisioned futures interventions to present-day conditions (applied in second intervention) the research team identified pathways for initiating consumer and public acceptance of sustainable practices (see recommendations for further details).

Consumer and public awareness of plastic food and drink packaging

The aim of these preliminary findings is to establish a baseline and identify the barriers, drivers, key trends and critical uncertainties influencing consumer and public acceptance of the use, reuse and recycling plastic food and drink packaging.

7 Barriers identified in UPLIFT's Living Lab, Ørestaden

The Living Lab in Ørestaden revealed several barriers to effective plastic waste sorting.

- 1) Plastic often needs to be separated from other materials
- 2) Consumers have low or limited knowledge about proper cleaning of the plastic waste
- 3) Cleaning, especially rinsing food packaging, is perceived as inconvenient and/or time-consuming.
- 4) Consumers are unsure of what qualifies as recyclable plastics
- 5) Dirty plastic items are frequently thrown out in general waste bins
- 6) There is a high level of confusion around terms like bioplastics, bio-based plastics, and biodegradable plastics – indicating a need for much clearer guidance and communication

A significant concern raised by the participants in this study relates to the perceived lack of transparency in the plastic packaging's journey or post-consumer journey through the municipality's waste management system. The participants in interviews and focus groups expressed their doubts regarding the municipality's effectiveness in reuse and recycling efforts, with comments such as: "...will the food and drink packaging actually be recycled?...". The lack of trust and scepticism are further compounded by a lack of trust in labels and certifications as the participants perceive an absence of regulatory standards governing the labelling of circular

products. The barriers regarding lack of regulation around labelling and criteria for a product to be circular discourage consumers to engage and undermine the confidence in the recycling efforts.

The Copenhagen municipality's proposal to inform citizens about all the processes necessary for circular consumption (Copenhagen Municipality, 2019) places the responsibility predominantly on the consumers alone. As decisions regarding choosing recycled or bio-based products often rest on the individual consumers, and if such products are priced higher than for instance the fossil-based alternatives and moreover unclear in the labelling, it is less likely that a significant behavioural shift will happen. Moreover, if consumers believe that their efforts are pointless, their motivation to engage and sort properly the plastic waste declines considerably.

Findings from the semi-structured interviews and the survey of Ørestaden's residents underscore the importance of direct consumer engagement in real-world contexts to create behavioural change towards recycling of plastic food and drink packaging. However, it is also necessary with better information about the "reuse and recycling" management at a municipality level to build greater consumer and public acceptance and responsibility. These findings suggest that for new plastic packaging solution to be effective, consumers need to be actively involved and understand the practical implications of these innovations in their everyday practices. Simply providing information on the solutions or examples with for instance communication that illustrates scary scenarios about the planetary boundaries are exceeded will not make a difference in their practices towards plastic waste and recycling, they are insufficient; consumers and public need experiential insights to integrate sustainable practices effectively into their everyday routines in collaboration with the governmental setting in place.

Increasingly, household waste separation is one of the Copenhagen Municipality's strategies but may be hindered by a lack of consumer co-operation. Studies by Nemat et al. (2022; 2023) investigated the factors influencing individual waste management behavior and. The study showed that the lack of direct consequences (or at least the lack of severity of the consequences) is a reason for consumers discarding their plastic packaging improperly (Nemat et al., 2022). The study also notes that an underestimation or lack of awareness of the impact of plastics may be an explanation for the individuals' mismanagement of waste. For example, it became clear in our interventions that the consumers failed to connect their daily actions, such as improper disposal of plastic packaging, to the broader environmental consequences, such as pollution of waterways, harm to marine life and greenhouse gas emissions. This disconnect suggests that for a significant portion of the population, the consequences of plastic food and drink packaging remain abstract and distant, reducing the perceived urgency of engaging in responsible plastic waste management in the daily lives. One potential underlying issue seems to be the limited visibility of the end-life journey of plastic food and drink packaging. For instance, the participants did not realize that improperly discarded plastics might end up in landfills, incinerators or in the natural environment where they contribute to long-term ecological degradation. Without clear, tangible links between their actions and the resulting harm, the participants were less likely to internalize the importance of their disposal behavior. This lack of awareness was compounded by insufficient education on topics like the lifecycle of plastic food and drink packaging and the challenges of recycling systems. Moreover, the study suggests that misperceptions about recycling capabilities exacerbate this issue. Some participants believed that plastics were automatically and universally recycled regardless of how they were discarded which reduced the motivation to

separate food and drink packaging correctly. Similarly, the complex and sometimes confusing recycling requirements for instance, knowing which types of plastic were recyclable and in which bins can lead to consumer apathy or mismanagement, even among those with good intentions. Another significant finding is the consumer expectations. Consumers expect packaging to be convenient, functional and aesthetically pleasing and sustainable alternatives that are unattractive or inconvenient could face rejection despite their environmental benefits. The findings also point to a broader cultural and systemic issue: the normalization of food and drink packaging consumption and disposal. In the UPLIFT Living Lab it became clear that single-use plastics were perceived as readily available materials and as disposable without significant value, which also might lead to careless disposal habits. This reflects a need to consider not only awareness campaigns but also systemic shifts in how plastic food and drink packaging are marketed, consumed and managed.

All the different stakeholders represent and have an agenda, particular interest and values to pursue regarding plastic packaging use, reuse and recycling. This has consequences for the collaboration between the stakeholders. Following the Sustainable Development Goals and the sustainability agenda the stakeholder collaborate across sectors and industries, however it is a complex challenge to create a common forum for how, when and where to implement new innovative food and drink packaging. The impact of Extended Producer Responsibility (EPR) to be implemented in Denmark in 2025 is expected to have a significant impact on the plastic food and drink packaging waste management and it is a significant shift in the politics towards waste management as it places the responsibility on the producers which potentially leads to better design packaging improving the entire process of recycling.

8 Recommendations for designing consumer and public acceptance new plastic food and drink packaging

Ørestaden Living Lab's activities created relatable and tangible impact of residents' behavior and it was ensured that the activities were directly relevant for them to create behavioural shift and knowledge about recycling, reuse and use of their food and drink packaging. However, it needs to be based on already existing knowledge. For instance, the residents in Ørestaden had a range of self-organized events regarding plastic waste and often collaborate with Ørestaden's high school to ensure impact in the households by engaging the youth and residents directly. These activities or events should be considered integrated into the design of future, long-term campaigns to capture the interest, willingness and motivation to participate. The study also indicates that creating economic incentives for example create lower fees for companies that design recyclable packaging or imposing taxes on non-recyclable materials could drive better waste management behaviors from consumers encourage sustainable recyclable practices.

While the study is situated in Copenhagen providing localized insights, the challenges and solutions identified resonate across a wide range of European cities that face similar challenges with plastic waste, recycling systems and consumer engagement. The findings

offer transferable strategies to upscale and foster circular economy transitions across urban contexts, emphasizing the importance of aligning sustainable packaging innovation and adoption.

Consumer education is according to research important and essential to ensure consumer behavioural change. This study aligns with recent scholarly literature among others Nemat et al. (2022) that there is a need for clearer, more consistent communication about recycling practices and the benefits of new, sustainable packaging materials. In order to encourage consumers to purchase greener alternatives, 'green nudges' are often used in the labelling of bio-based products. These labels are only effective if consumers believe that these are better or greener sustainable products. While technological advancements are essential, they must be accompanied by consumer-friendly design. Packaging innovations need to prioritize ease of use and ensure that they meet consumer expectations for convenience and performance. UPLIFT highlights the critical role of consumer understanding in maximizing the impact of sustainable packaging technologies. As part of its findings, UPLIFT emphasizes that consumers must be equipped with intuitive sorting systems and targeted education to ensure proper disposal behaviors. By demonstrating the importance of proper sorting and disposal through relatable, real-world examples, these initiatives can build trust and understanding. In this way, UPLIFT not only underscores the need for consumer-friendly design but also situates it as fundamental component of a broader strategy to drive behavioural change and enhance the effectiveness of sustainable plastic food and drink packaging systems.

These reflections and recommendations establish the first in an ongoing process towards consumers and public acceptance and this deliverable represents the initial findings opening the floor for future studies to a better design of ethnographic interventions enabling better policy recommendations and ensuring more sustainable consumption practices aligned with the Sustainable Development Goals (SDGs).

8.1 List of key recommendations

1. Understand the cultural context of consumption
2. Focus on social and emotional norms
3. Create hands-on engagements and demonstrations
4. Behavioural nudging through design
5. Make sustainable behavior convenient and rewarding
6. Community-led initiatives and co-creation
7. Clear communication and transparency

9 Conclusion

In conclusion there is a need for more effort and targeted strategies to achieve a strong consumer and public acceptance and involvement. The cross sectoral and -industrial collaboration is crucial to solving the plastic food and drink packaging challenges and ensuring the proper implementation of these new technologies. Further research is needed to inform and facilitate decision-making processes towards a more sustainable environmentally friendlier food and drink packaging is accepted and integrated into the practices and everyday life of the consumers and the public.

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