DISSERTATION | DOCTORAL THESIS

Titel | Title

(Re-)thinking plastics with time: The role of temporal narratives for citizens' sensemaking of plastics

verfasst von | submitted by

Laura Bomm BSc MSc

angestrebter akademischer Grad | in partial fulfilment of the requirements for the degree of

Doktorin der Philosophie (Dr.phil.)

Wien | Vienna, 2025

Studienkennzahl lt. Studienblatt | Degree programme code as it appears on the student record sheet:	UA 796 310 121
Dissertationsgebiet lt. Studienblatt | Field of study as it appears on the student record sheet:	Wissenschafts- und Technikforschung
Betreut von | Supervisor:	Univ.-Prof. Dr. Ulrike Felt

CONTENT

Acknowledgements iv
Abstract viii
Zusammenfassung ix
1. Introduction 1
2. State of the art: Plastics and public participation 11
2.1 Plastics in and with society 11
2.1.1 Historical aspects of plastics 11
2.1.2 Socio-material entanglements 14
2.1.3 Politics of plastics 16
2.1.4 Temporalities of plastics 17
2.2 Public engagement (with plastics) 19
3. Theoretical sensitivities: Time and narratives 24
3.1 Time as ordering mechanisms 24
3.1.1 Probing the past: Engagements exploring the role of time 25
3.1.2 Considering the present: Temporal construction of society and materials 30
3.1.3 Sensing futures: Construction and making of the prospect 35
3.2 Narratives as means for telling and knowing 39
3.2.1 Entanglements of time and narratives 41
3.2.2 Narratives for constructing realities 43
4. Methodology and materials 49
4.1 IMAGINE: A card-based discussion method 49
4.2 IMAGINE PLASTICS: Choreography and foci 53
4.3 Developing its cards and video 57
4.3.1 Analysing media and policy materials 57
4.3.2 Creating story cards 61
4.3.3 Creating context cards 63
4.3.4 Creating responsibility/action cards 64
4.3.5 Creating future visions 66
4.3.6 Creating the introductory video 66
4.4 Organising participants, collecting and handling data 67
4.5 Analysing empirical materials 70
FINDINGS 73

5. Diagnostic narratives: Temporalities of plastics and society 75
5.1 Slow enculturation: Co-production of plastics and society 75
5.1.1 Living differently: Recollecting a plastic-reduced past 76
5.1.2 Slowly, yet suddenly: Plastics permeating the present 82
5.1.3 Temporal orchestration: On some temporalities of contemporary society 88
5.2 Boon and bane of durability: The use duration of plastics 95
5.2.1 Double-edged durability: Durable plastics for long- and short-living artefacts ... 96
5.2.2 "The expiration date is built into it": How things are not made to last 99
5.2.3 Changing trends: On desires for enduring consumption 103
5.3 Persisting over time: Legacies of plastic consumption 106
5.3.1 How fast is waste managed? (Not) seeing plastics accumulate 108
5.3.2 (Un)concerning persistence: Afterlives of plastics 115
5.4 Condensing diagnostic narratives 121
6. Justificatory narratives: Moralities of different usage times 125
6.1 Defending the one-time use of plastics 126
6.2 Weighing temporal (in)conveniences of (not) using plastic packaging 132
6.3 Balancing use life and afterlife: Reducing plastics moral burdens 139
6.4 Condensing justificatory narratives 147
7. Anticipatory narratives: Exploring pathways towards making futures with(out) plastics 152
7.1 The individual consumer: Simply and quickly replacing plastic materials 153
7.2 The larger scale: Slowly transgressing to material alternatives for plastics 158
7.3 Towards slow and circular: Shifting rhythms of consumption 163
7.4 Taking time: To challenge how we consume (plastics) 169
7.5 Future citizens: Expecting others to (mobilise) change 173
7.6 Condensing anticipatory narratives 179
8. Conclusion: Paradoxes of our lives with plastics 186
8.1 Slow enculturation meets urgent action 186
8.2 Invisibility: The boon and bane of fast waste management 187
8.3 Paradox of plastics' durability 189
8.4 Replacing plastics: Balancing quick fixes and lasting solutions 190
8.5 Fast and linear meet slow and circular consumption rhythms 193
8.6 The intergenerational burdens of plastics 194
References 196

Appendices 211
Appendix A: Story cards (English and German) 211
Appendix B: Context cards (English and German) 214
Appendix C: Responsibility/Action cards (English and German) 220
Appendix D: Discussion board (English and German) 226

ACKNOWLEDGEMENTS

As time unfolds, we are often reminded of the transient nature of our existence. Each passing moment invites us to appreciate these fleeting instances whilst they last and offers an opportunity for reflection. This dissertation would not be the same without the insightful and inspiring human and non-human encounters I've had over the past years, many of which have centred around the topic of plastics. Whilst I have carried gratitude throughout my entire PhD journey, these acknowledgements are the moment where my appreciation becomes visible to others, recognising the invaluable contributions of those who have contributed to shaping this doctoral project.

I would like to express my deepest gratitude to my supervisor, Ulrike Felt, for her unwavering support and guidance during my PhD journey. Working with you has been an incredibly rewarding experience, and I truly appreciate the freedom you gave me to explore and develop my ideas independently. Your trust in my academic abilities allowed me to grow both practically and theoretically, and I've learned so much under your mentorship. Beyond academic guidance, I have especially valued our shared sense of humour, which made even the most challenging moments easier to navigate. Your encouragement and support during difficult times have been invaluable, and I am so thankful for your patience, understanding, and belief in my potential.

Sincere appreciation goes to my colleagues from the PLENTY Plastics Research Platform: Charlotte, Gerhard, Leonie, Maria, Maja, Mili, Ruoting, Thilo, and Thorsten. Your support and expertise have been instrumental in enhancing my understanding of microplastics and the broader field of plastic research. Through our collaboration, we have learned a great deal from each other, and your valuable insights and constructive feedback have significantly enriched our IMAGINE PLASTICS method. The knowledge shared within this team has not only deepened our research but also fostered a sense of community and shared purpose that has been truly inspiring.

A special thank you is extended to those who played a pivotal role in the development of the IMAGINE PLASTICS method used in this research: Constantin, Gabriel, Hanna-Kaisa, Harry, Kirstin, Miroslav, Peter, Renata, and Sofie. Whether by testing the method, providing critical feedback, helping to refine and improve its application or support the completion of

the method, your contributions have been invaluable. I would like to express particular appreciation to Harry, whose efforts in proofreading this dissertation have been extremely helpful in elevating its quality with his use of language and thoughtful input. Additionally, an honest thanks to all the participants in the discussion groups; your engagement and insights formed the empirical heart of this dissertation. Thank you!

My gratitude goes to my colleagues at and the visitors to the Department of Science and Technology Studies who enriched my work environment through collaboration, intellectual curiosity, and mutual support over the past years: Ariadne, Andrea, Artemis, Bao Chi, Bettina, Ekatherina, Erik, Esther, Florentine, Fredy, Kamiel, Katja, Kaya, Ingrid, Lisa F., Lisa S., Max, Michaela, Nina, Paul, Pouya, Rasmus, Robin, Ruth, Sarah D., Sarah S., Stefanie, Susanne, Timo, Vera, Virginia, and many others. It has been wonderful to witness the enthusiasm and diversity in our field. I cherish the shared coffees, Raach summer schools, and countless kitchen cakes that brightened our days. I am especially grateful for the engaging discussions, laughter, and camaraderie that turned many of you into dear friends. Your support, shared successes, and moments of inspiration have made this journey truly fulfilling and memorable.

A special thank you goes to Artemis, who has been there from the very beginning. Our journey started with a mutual interest in plastics, and it has blossomed into a wonderful friendship that beyond the PhD. I am truly grateful for the opportunity to share both the happy moments and the tough times with you.

I would like to express my gratitude to the members of our online STS x PLASTICS discussion group: Artemis, Babet, David, Tridibesh, Joachin, Johanne, Karl, Kim, Rasmus, and Skye. We connected at the onset of the pandemic, forming a vibrant community at the intersection of plastics and Science and Technology Studies. Our remote discussions became a source of unwavering support and inspiration, fostering an environment rich in knowledge exchange. The insights we shared not only deepened our understanding of complex issues surrounding plastics but also encouraged us to think critically and creatively. I am truly grateful for the collaboration and camaraderie we built during this time.

A special thank you to the ScienceCenter-Netzwerk, especially Barbara, Michael, and Sarah, for the opportunity to bring the IMAGINE PLASTICS method to students. Through this collaboration, I refined our method into a discussion game that complements their Escape

Game on marine microplastics, which began touring Austria in 2022. This project has been a rewarding way to bridge academic research and public engagement, using creativity and problem-solving to inspire young minds. Thank you!

I would like to express my deep gratitude for the invaluable support I received through the ViDSS Scholarship and the Literar Mechana Scholarship. These scholarships not only alleviated the financial burdens of my research but also provided me with the opportunity to focus more deeply on my studies and personal growth. In this sense, I would like to specifically thank the ViDSS and Eva Kössner, who supported me through all the different PhD stages.

Heartfelt gratitude goes to my (extended) family — Brian, Celly, Chris, Irma, Jürgen, Kevin, Marga, Peter, Petra, Tina, Tim, Tobias, Vivien, and Waltraut — for their unwavering interest and support throughout this PhD journey. Your encouragement and love have provided me with the strength and motivation to persevere. I especially appreciate your genuine interest and thoughtful questions. I am truly grateful to have you all in my life.

Through the ups and downs, my long-standing friends—Evelyn, Helena, Kathalien, Katharina, Kira, Tosja—have been my anchors, offering laughter, comfort, and wisdom when I needed it most. You enrich my life and remind me of the importance of friendship and connection. Thank you for being such an integral part of my life and for standing by me as I navigated the challenges of my dissertation. And thereby, a special thanks to our cats, Tim and Tom, whose playful antics and comforting presence brought joy to this journey and reminded me to take breaks. My furry support team!

Stefan, this is the space to express my love for my little brother. More than that, I want to tell you how incredibly proud I am of you and everything you have achieved. Thank you for always supporting me and believing in me as much as I do in you.

Papa and Mama, my education would not have been possible without you, and I am incredibly thankful that you made it possible for me to follow the path that I chose. Papa, your enthusiasm and encouragement have been a guiding light for me. I am very thankful to have you in my life and will never forget the small praline packages you kept sending me for mental support! Mama, during one of those moments, when I struggled, you gave me a colourful puzzle of around 30 pieces. When I finished, you said, “See, and someday you will

have finished your PhD too." Thank you both for your unwavering support and love—not just during my PhD journey, but throughout my entire life.

Steven, words cannot fully express how much your love and support mean to me. From the very beginning, you encouraged me to take on this challenge. Through the long days and even longer nights of research and writing, you were always there, reminding me, "Denk dran, du warst noch nie so weit wie heute." You not only believed in me but also made it possible for me to dedicate the time I needed to write, taking on more than your share so that I could focus. For that, and for so much more, I am endlessly grateful. You mean the world to me, and I am so grateful to have you by my side. I look forward to all the years ahead, filled with new adventures, shared ambitions, and the life we continue to build together.

Paul, watching you grow has been the greatest gift of all. Your laughter, curiosity, and boundless energy have been a constant source of joy, even in the most challenging moments. The memories we have already created are so precious to me, and I cannot wait to share many more with you. And to your soon-to-arrive sibling, I look forward to meeting you and embracing the new chapters!

ABSTRACT

Plastics are a fundamental material that has shaped late modern societies, with production and consumption continuing to rise. At the same time, awareness of the potential negative impacts of plastics and microplastics on environmental and human health has been growing. As a result, plastics occupy an ambivalent position in society—deeply embedded in everyday life whilst increasingly scrutinised for their environmental and health consequences.

To explore how citizens perceive the role of plastics in contemporary life and its complex societal dimensions, this research draws on a series of discussion groups conducted in Vienna in late 2019. The analysis reveals how various forms of time and temporal repertoires influence the way citizens narrate about their understandings of plastics and plastic-related problems, justify the (non-)use of plastics, attribute responsibility, and envision (non-)actions and potential solutions.

At the core of the empirical analysis for this research are three main sets of *temporal narratives* found in citizens' discussions. These narratives function differently in citizens' ordering of the relationships between plastics and society. (1) The first set of temporal narratives, *diagnostic narratives*, addresses how participants diagnose contemporary times by connecting memories of a plastic-reduced past with mobile and accelerated lifestyles that foster certain rhythms and paces of plastic consumption. (2) This gets then deeply entangled with *justificatory narratives* through which participants balance the moralities of artefacts' short use durations with the long afterlives most durable plastic materials face. (3) Finally, citizens' *anticipatory narratives* gravitate around imaginations of possible futures with plastics (and who can shape them) and the setting of the temporal horizons of respective responsibilities.

Taken together, these temporal narratives make concrete six interrelated *plastic paradoxes* that exist in our society. The research concludes by rendering these plastic paradoxes explicit, which allows us to better understand why people have such a hard time engaging with, re-thinking and eventually re-doing their well-entrenched consumption habits and routines with and through plastics.

ZUSAMMENFASSUNG

Plastik ist ein grundlegender Werkstoff, der die modernen Gesellschaften geprägt hat, wobei Produktion und Verbrauch weiter zunehmen. Gleichzeitig ist das Bewusstsein für die möglichen negativen Auswirkungen von Plastik und Mikroplastik auf die Umwelt und die menschliche Gesundheit gewachsen. Infolgedessen nimmt Plastik in der Gesellschaft eine ambivalente Stellung ein – es ist tief in den Alltag eingebettet und wird gleichzeitig zunehmend auf seine ökologischen und gesundheitlichen Folgen hin untersucht.

Um zu untersuchen, wie Bürger:innen die Rolle von Plastik im heutigen Leben und seine komplexen gesellschaftlichen Dimensionen wahrnehmen, stützt sich diese Forschung auf eine Reihe von Diskussionsgruppen, die Ende 2019 in Wien durchgeführt wurden. Die Analyse zeigt, wie verschiedene Formen von Zeit und zeitlichen Repertoires die Art und Weise beeinflussen, wie Bürger:innen über ihr Verständnis von Plastik und kunststoffbezogenen Problemen erzählen, die (Nicht-)Verwendung von Plastik rechtfertigen, Verantwortung zuschreiben und sich (Nicht-)Handlungen und mögliche Lösungen vorstellen.

Im Mittelpunkt der empirischen Analyse für diese Untersuchung stehen drei Hauptgruppen von *zeitlichen Erzählungen*, die in den Diskussionen der Bürger:innen zu finden sind. Diese Narrative haben unterschiedliche Funktionen bei der Einordnung der Beziehungen zwischen Plastik und der Gesellschaft durch die Bürger:innen. (1) Die erste Gruppe zeitlicher Erzählungen, die *diagnostischen Erzählungen*, befasst sich damit, wie die Teilnehmer die Gegenwart diagnostizieren, indem sie Erinnerungen an eine plastikreduzierte Vergangenheit mit mobilen und beschleunigten Lebensstilen verbinden, die bestimmte Rhythmen und Geschwindigkeiten des Plastikkonsums fördern. (2) Dies wird dann eng mit *rechtfertigenden Erzählungen* verwoben, in denen die Teilnehmer die Moral der kurzen Nutzungsdauer von Artefakten mit der langen Lebensdauer der meisten langlebigen Kunststoffmaterialien abwägen. (3) Schließlich drehen sich die *antizipatorischen Erzählungen* der Bürger:innen um Vorstellungen über mögliche Zukünfte mit Plastik (und wer sie gestalten kann) sowie um die Festlegung der zeitlichen Horizonte der jeweiligen Verantwortlichkeiten.

Zusammengenommen machen diese zeitlichen Erzählungen sechs miteinander verbundene Plastikparadoxien in unserer Gesellschaft deutlich. Die Untersuchung schließt mit einer expliziten Darstellung dieser Plastikparadoxa, die es uns ermöglicht, besser zu verstehen,

warum es den Menschen so schwerfällt, sich mit ihren eingefahrenen Konsumgewohnheiten und Routinen mit und durch Plastik auseinanderzusetzen, sie zu überdenken und schließlich neu zu gestalten.

1. INTRODUCTION

A white and blue-covered book stands in various libraries worldwide, including one library of the University of Vienna. Shelved and camouflaged between other books, its title refers to one of today's most used and ubiquitous materials: *Plastics*. The year of publishing catches the eye. The first edition of *Plastics* was published in 1941, amid World War II and during a time when plastics had not yet mingled with our society. Back then, global plastic production was less than a million tons per year—compared to 400,3 million tons in 2022 (Plastics Europe, 2023). Yet, already in 1941, the authors of the book Victor E. Yarsley and Edward G. Couzens noted that "the possible applications [of plastics] are almost inexhaustible". In the book's final chapter, the authors imagine how plastics would shape human life in a future 70 years ahead of them:

> "*This [imaginary] plastic man will come into a world of colour and bright shining surfaces where childish hands find nothing to break, no sharp edges, or corners to cut or graze, no crevices to harbour dirt or germs … The walls of his nursery, his bath … all his toys, his cot, the moulded light perambulator in which he takes the air, the teething ring he bites, the unbreakable bottle he feeds from [all plastic]. As he grows he cleans his teeth and brushes his hair with plastic brushes, clothes himself with in plastic clothes, writes his first lesson with a plastic pen and does his lessons in a book bound with plastic. The windows of his school curtained with plastic cloth entirely grease- and dirt-proof … and the frames, like those of his house are of moulded plastic, light and easy to open never requiring any paint. [Until the old age the plastic man] wears a denture with silent plastic teeth and spectacles with plastic lenses ... until at last he sinks into his grave in a hygienically enclosed plastic coffin*" (Yarsley & Couzens, 1945, p. 149)

Envisioning the future with plastics more than 70 years ago, Yarsley and Couzens provided a projection of our very present, wherein plastics would be deeply interwoven in our homes, everyday lives, and society at large. Indeed, the emergence and rise of plastic materials have changed our lives and practices. For example, disposable plastic cutlery and plastic packaging enable people to move away from traditional dining cultures and to consume food in other spaces and places (Freinkel, 2011; Scott, 2019). Another example is plastic bottles, artefacts which are intertwined with access to and consumption of clean and potable drinking water—a resource lacking in many countries (Hawkins, 2011). And yet another illustration is the credit card. Also known as plastic money, credit cards have increased access to credit and allowed debt markets to gain massive traction, contributing to economic changes that continue to shape our lives and living standards (Deville, 2013). Nowadays, almost every sphere of

contemporary life incorporates plastics: buildings and interior design, (tele)communication and transportation, food and finance, leisure and travel, health care, and sports. In many ways, our contemporary society (or at least the functioning of it) is tied to the ubiquitous existence of plastic materials.

For many decades, members of our society have enjoyed numerous plastic-related conveniences and benefits. However, alongside this, what has also materialised are the (unintended) consequences of our shared existence with these materials. Notions like 'plastic problems' or 'plastic crises' hint at the challenges in and made through our society. International and national media outlets keep reminding us that "[p]lastic pollution is a huge problem—and it's not too late to fix it" (Parker, 2020), whilst others say that "[m]icroplastics represent a ticking time bomb in the oceans" (Matzka-Sanoi, 2021). Natural scientists contribute to narratives about the lifespans of plastics degrading in natural environments and how plastics' chemical additives (such as phthalates) and microplastics put human and environmental health at risk in the long run (Liu, Mai, & Zeng, 2020; SAPEA, 2019; Villarrubia-Gómez, Cornell, & Fabres, 2018). Numerous environmental organisations are concerned about future human generations being subject to the consequences of our decades-long production, use and discharge of plastics. These concerns about plastics also touch political waters. For example, the European Commission (2018) concluded: "[i]t's time to rethink plastic", which paved the road for the Single Use Plastics Directive. Echoing various concerns and debates around plastics, these voices bring together the argument that our society finds itself at a tipping point: where the need to change our relationship with plastics—thus our very being with them—seems inevitable.

Through the example of plastics, we will sense how technology and society develop together. Values and norms are embedded in plastic-related technologies and become entangled with societal orders (Jasanoff, 2004). We live in a society, that is simultaneously shaping and being shaped by both the potential of plastics and the problems they bring with them. Contemporary society make space for and enact plastic in specific ways whilst, at the same time, our society are performed through the multiple uses of plastics. Thereby, plastics and society co-produce each other and contribute to shaping the ways of life, that we know today.

Just how deeply our lives are entangled with plastics becomes evident when one begins to recognise the utter impossibility of living without, rejecting, refusing, or dismissing plastics. Indeed, separating plastics from our society or avoiding plastics seems impossible today. This sparks the question of how citizens make sense of their lives and how they live or want to live with or without plastics. With plastics as an integral part of our society being such a rising concern, the main question of my research aims to answer:

How do temporal narratives matter in how citizens make sense of plastics in society?

When narratives are enmeshed with temporal repertoires[1], I refer to them as *temporal narratives*. Focussing on and examining temporal narratives is this research's gateway to a better understanding of how citizens in Vienna make sense of plastics in our society—constructing, negotiating, and re-thinking their meaning and role in the process. These narratives serve various functions in citizens' sensemaking and help them to construct, negotiate, and re-interpret the meaning and role of plastics in their lives. The importance of adopting a temporal perspective is discussed further below.

At the same time, this research concentrates on Viennese citizens, who predominantly identified as being part of the Viennese society. However, their narratives also tap into other societies as well: Austrian, European, and beyond, including many societies and communities in the Global South. Therefore, it is no surprise that citizens' use of the term 'society' is not uniform, but ranges from very broad to very specific depending on the narratives being told. Thus, in my writing, I try to clarify which (parts of) our society are at the centre of their discussions, and why this temporal dimension is essential in comprehending their overall perception of plastics.

The interest of my research rests specifically on the perspective of citizens because citizens are daily users of plastic-related technologies. How individual citizens understand the relationships between plastics and society allows me to paint a more nuanced picture—both of individual positioning work as well as moments of broader collective agreement or disagreement in

[1] With the notion of temporal repertoires, I refer to the diverse temporal frameworks and patterns people draw on to make sense of their experiences, their lives, and the world around them. These repertoires encompass not just linear concepts of time (such as past, present, and future) but also more complex temporalities like rhythms, repetitions, cycles, pace, duration, and speed.

coming to terms with plastics. This layered focus provides us not only with the plastic-related experiences and narratives of individual citizens but also relates them with wider cultural narratives citizens utilise as they make sense of a life within a society that shapes and is being shaped by plastics.

Different from most academic work at the intersections of plastics and society (see Chapter 2. State of the art for an elaborated account), I do not aim to follow one specific plastic artefact, plastic-related practice, or plastic-associated policy alone. Instead, the specific temporal gaze of my research allows for the inclusion of different yet co-existing aspects of our lives with plastics. Thus, this research will discuss not only a variety of plastic materials and artefacts of various sizes and use cases, but also plastic-related responsibilities, arguments, experiences, emotions, problems, and solutions. Studying how citizens make sense of our lives and society with plastics—a material integral to countless human and non-human assemblages, processes, practices, and everyday interactions—requires a sophisticated methodology.

Therefore, my research makes use of a specific citizen engagement method our Vienna-based Science and Technology Studies (STS) team developed in the context of the PLENTY plastic research platform (University of Vienna) in which my research is situated (see elaboration in Chapter 4. Methodology and materials). Supplied by the citizen engagement method, IMAGINE PLASTICS, our STS team conducted a series of citizen discussion sessions with Viennese citizens. Focusing on Viennese citizens in the public engagement method provides locally relevant insights into how people in an urbanised area perceive their lives with plastics, including plastic waste and plastic pollution, which are issues more typically associated with marine, aquatic, and coastal areas. The engagement with Viennese citizens in various discussion sessions in late 2019 offered practical advantages by facilitating local research whilst also capturing a diverse range of socio-economic perspectives on their lives with plastics. The main empirical material for this research's analysis is the result of five of these discussion sessions.

When taking notes during discussion sessions, I could already notice that citizens would constantly share their *narratives* to make sense of plastics and their lives with these synthetic materials. This is not surprising: narratives are important cultural vehicles through which people see and know the world. They contribute to the social construction of reality (Macnaghten, Davies, & Kearnes, 2015). Narratives can carry understanding, meaning, and values across

several human generations and different social communities. At the same time, narratives can also express how people engage with, negotiate, and make sense of the world, often including uncertain, novel, or complex socio-technical developments (Czarniawska, 2004). When digging deeper into the analysis of the narratives shared in citizens' discussions, a particularly interesting aspect that emerged was the re-occurring presence of different temporal repertoires. "*It's all designed anyway, that after so and so many years it has to break"*[2] (G3_OL:29), "*yes, we ingest so many grams of plastics every week*" (G1_DA:44), "*if I can get rid of something quickly, I can also buy something new quickly*" (G2_JA:21), "*what's being shipped around the world in plastic every second*" (G2_JA:13), or *"[l]ong-living [plastic] products like armchairs and mattresses are actually not our main problem*" (G2_TO:57) are a few glimpses into the different temporal repertoires that permeate the empirical material. Re-occurring throughout the narratives, in each of the citizens' discussion groups, these different temporal repertoires caught my interest due to their likely role in how citizens make sense of plastics and how they live with them.

When narratives are enmeshed with temporal repertoires, we can refer to them as *temporal narratives*. Temporal narratives are important elements that people use to order and make sense of their and others' living realities. Through temporal narratives, people understand their own lives with plastics and set them in relation to past, present, and future societies. Therefore, temporal narratives are the central analytical elements of my research. Analysing citizens' temporal narratives offers a nuanced way to make tangible how these narratives fulfil different functions in citizens' sense-making and their ordering of the relationships between plastics and society. In what follows, I elaborate on how my analysis unravelled *diagnostic*, *justificatory*, and *anticipatory* functions of such temporal narratives, which help citizens in their sense-making processes in a world and life filled with plastics.

When citizens engage with plastics—and thus try to develop an understanding of their ways of living with these materials—they construct *diagnostic narratives*. What this means is that within these temporal narratives, citizens develop a diagnosis of the plastic present with the past playing a central role as well. Different historical references help citizens construct today's

[2] In this research, all cited materials originally shared in German have been translated to English to convey the intended meaning rather than providing a word-for-word translation. This approach was adopted to ensure that the nuances and context of the original texts are accurately represented in English, facilitating a clearer understanding for the reader.

society. They help citizens diagnose what it means to be part of a fast-living society characterised by an abundance of things and a throwaway mentality. These narratives also bring to light how citizens diagnose the use life and durability of plastics, shaping and shaped by human action, material characteristics, and capitalist-oriented market logic. Different mechanisms that speed or slow the consumption of plastics inform how citizens consider members of our society being able or unable change how we consume. In diagnosing the material and chemical afterlives of plastics, we learn how narratives about the speed of waste management systems, the (in)visibility of waste, the lack of scientific evidence proving plastics' adverse impacts, and the historical analogies of other substances all unfold from citizens' diverging calls for future action. These diagnostic narratives paint a picture of the co-production of plastics and society. They reveal how plastics enable and are enabled themselves through the ways of life that many of us know and find comfort in, and how plastics are (not) turned into a matter of urgent action.

When making sense of plastics and our lives with them, we encounter another set of temporal narratives: *justificatory narratives*. Citizens' temporal narratives are linked to their moral arguments and justifications for or against the use of certain plastics. In these justificatory narratives, various temporal repertoires are tacitly interwoven with citizens' stories to justify the (non)use of plastics. Citizens regularly use these narratives to justify the preference for some plastics over others: they explain in which situations and social sub-systems plastics would or would not be a problem and why certain plastics should or should not be used. On one hand, often gravitating around the duration of use and afterlives of plastics, justificatory narratives regularly enable citizens to morally defend the continued use of certain plastics and rebut challenges to their existence. On the other hand, justificatory narratives are also used to construct certain plastics to be problematic and needing to be changed. Such narratives are crucial to understanding how citizens determine when our use of plastics should be rethought, informing potential pathways to change and shaping the future of our lives with plastics.

Another aspect of citizens' sense-making of our being with plastics is the interweaving of their diagnostic and justificatory narratives with their future-making practices. Pointing to questions of how citizens envision where society is going and what their role in these futures will be, what materialises are citizens' *anticipatory narratives*. Shaped by their recollections of the past, their diagnoses of the present, and their ideas about the future(s), citizens' anticipatory narratives

explore five main strategies that, in one way or another, attempt to challenge or change contemporary practices, standards, materials, artefacts, rhythms, paces, or levels of awareness. In discussing the future of our relationships with plastics, we learn about citizens' (non)willingness and (non)capacities to contribute to respective futures in the now. Citizens' strategies differ in terms of how they delegate the action and responsibility of different actors of various spatiotemporal levels of society. Understanding how citizens envision possible futures with plastics on different societal scales has powerful consequences for the making and (non)enactment of these respective futures.

Using a time-sensitive perspective brings to light how temporal narratives function within citizens' sense-making of our society. The temporal gaze also enables me to show how deeply paradoxical our lives with plastics are. To make this more concrete, my research concludes with six interrelated *plastic paradoxes*. These paradoxes make it difficult for individuals to question their relationship with plastics in the first place. By making these plastic paradoxes explicit, we gain a better understanding of why people struggle to engage with, reconsider, and ultimately change their deeply ingrained consumption habits and routines involving plastics.

The remainder of this introduction is dedicated to providing an overview of the research chapters and giving the reader some guidance on what to expect. The research is organised into eight main chapters: (1) introduction, (2) state of the art, (3) theoretical sensitivities, (4) methodology and materials, (5) findings on diagnostic narratives, (6) findings on justificatory narratives, (7) findings on anticipatory narratives, and (8) conclusion.

The purpose of this *introductory* first chapter was to set the scene for my research by elaborating its relevance, narrowing its research frame, and introducing my main research question. In it, I situated myself within the PLENTY plastics research platform and its participatory agenda and provided some initial insights into the important roles narratives and temporal repertoires play in citizens' sense-making of our lives with plastics.

In chapter 2, the *State of the art*, I situate my research within strands of scholarly work and debates. This chapter is divided into two main parts. The first part discusses how my research speaks to and builds upon existing knowledge of the historical, object-related, political, and temporal aspects of plastics in the fields of STS and social science more broadly. The second part sketches out the relevance of using a public engagement method to explore a socio-

technical issue as complex as plastics. In doing so, I engage with both the advantages and potential pitfalls of public engagement for a better understanding of people's sense-making with regard to plastics.

Chapter 3 is concerned with the *theoretical sensitives* of my research. It begins by gravitating around the role of time in both society and research and how time contributes to constructing social and material worlds. The chapter then unravels narratives as important cultural vehicles for people to tell and know the world and its phenomena. It concludes by sketching out how the entanglements between time and narratives (including temporal narratives) inform people's experiences of social realities, including their lives with plastics.

The fourth chapter covers the *methodology and materials* used for this research. It dives into the details and specifications of the card-based public engagement method discussed earlier: IMAGINE. After explaining how our team turned IMAGINE into IMAGINE PLASTICS by tailoring the method to the context of Vienna and the case of plastics, it then moves to discuss the spatiotemporal contexts and organisational specificities of the citizen engagement sessions. This methodological chapter ends with a more elaborated account of the research's analytical approach.

Chapters 5, 6, and 7 comprise the empirical heart of my research. Each of the chapters revolves around a specific type of temporal narrative and analyses its function in citizens' sense-making of (our lives with) plastics. Each empirical chapter concludes with some condensing remarks that bring together the analytical findings—discussing them in consideration of existing work as well as directions for future research.

Chapter 5 unpacks citizens' *diagnostic narratives*. Through these diagnostic narratives, citizens develop a diagnosis of the relationships between plastics and society. In the first part of this chapter, we learn how the entanglement between memories of past times and present perceptions sheds light on the slow but also sudden enculturation of plastics. The chapter then begins to unravel how our participants diagnose temporal tensions as being inscribed into plastic objects, whereby temporal a-synchronicities in plastics' material-object relationships inform the duration of life and afterlife. This diagnostic chapter concludes by exploring the chemical and material legacies associated with the (after)lives of plastics. It paints a nuanced picture of how citizens' idea(l)s of fast and well-functioning waste management standards and

infrastructures in Vienna and the Global South inform the pace and visibility of plastics' accumulation, their use of plastics, and their concerns about plastics' afterlives.

Chapter 6 elaborates on citizens' *justificatory* narratives in which temporal repertoires pair with moral arguments about the use or non-use of plastics in specific contexts. The chapter begins by discussing how citizens identify health care and medical spheres as systems of society in which hygienic and sterile standards—established to prolong human life—justify and vindicate the use of disposable single-use plastics. The chapter then discusses the case of plastic packaging in food and consumer goods. In this case, the temporal conveniences of plastic packaging as a time-saving device serve as citizens' main justificatory mechanism to keep plastics in place. The chapter closes by discussing how participants balance the timespans of life and afterlife of plastic artefacts to morally legitimise longer-living plastic artefacts as less problematic.

The seventh chapter gravitates around citizens' *anticipatory narratives*, which rise to the surface when citizens engage with the future of plastics. In doing so, the chapter focuses on five different strategies that appeared recurrently in the narratives shared in citizen discussion groups. (1) The first strategy revolves around material alternatives to plastics and the meaning of quick material replacements on a small scale for the individual. (2) This next strategy expands on this with citizens' anticipatory narratives that envision a replacement of plastics on a larger societal scale and follow a much slower pace in which the realisation of changes—in the form of material replacements—are imagined. (3) Anticipatory narratives about challenging the rhythms (from fast and linear to slow and cyclical) in which plastic materials and objects are consumed are the focus of the third strategy. (4) Their next strategy is concerned with individual efforts to take time to (not) contribute to enacting different and sometimes less plastic-intensive individual and collective futures. (5) The last strategy taking shape in citizens' anticipatory narratives is about the importance of better awareness and education for governing future problems with plastics, especially for children and younger generations.

Each empirical chapter concludes with a sub-chapter that condenses the findings, relates them to existing literature, and raises aspects for further discussion and research. These dedicated sub-chapters build a bridge to the last chapter of my research, the *conclusion*. Using a temporal lens to investigate how people make sense of our lives with plastics brings to light how

ambivalent and paradoxical our lives with plastics are. The results and insights from the ways citizens (a) diagnose our lives with plastics, (b) do or do not justify and defend plastics' situated use, and (c) negotiate plastics' future existences and ways of use are all touched on in the conclusion of this research whilst spelling-out six interrelated plastic paradoxes existing in our plastic-permeated society. The conclusion reveals these paradoxes as follows: (1) It first sketches the tensions of how the slow enculturation of plastics is met with the urgent yet uncertain need for action. (2) It then moves to elaborate on the boon and bane of fast waste management, which contributes to the paradoxical invisibility of plastics. (3) After expanding on the paradox of plastics' durability, (4) the conclusion turns towards the paradox of replacing plastics as a material that was once heralded for replacing more natural materials. (5) The next paradox covers the tug of war between fast and linear versus slow and circular consumption rhythms. (6) The chapter concludes with a take on citizen's paradoxical tendency to shift care and responsibility for plastics towards future generations whilst also being concerned about the future consequences of plastics and their remnants in the present.

2. STATE OF THE ART: PLASTICS AND PUBLIC PARTICIPATION

My research is situated at the crossroads of two strands of scholarly debate: (1) discussions of the historical, socio-material, political, and temporal aspects of plastics, and (2) analyses aiming to understand public sense-making processes with science and technology more generally, particularly through public participation. Speaking to and building upon existing knowledge, the first sub-chapter focuses on plastic matters in the fields of STS, social science, and humanities more broadly. The second sub-chapter specifies one public participation method (and its possibilities and limitations) to approach citizens' sense-making of plastics: The card-based discussion method, IMAGINE PLASTICS.

2.1 PLASTICS IN AND WITH SOCIETY

2.1.1 HISTORICAL ASPECTS OF PLASTICS

Driven by the motivation to find an alternative to valuable and scarce materials like ivory, jade, shellac, and tortoiseshell, the story of our society with plastics begins. Whilst difficult to pinpoint when inventors began to experiment with materials alternatives, it was in the early 20th century when Leo Baekeland gave life to Bakelite, the "first fully synthetic polymer, made entirely out of molecules that couldn't be found in nature" (Freinkel, 2011, p. 6). Once set into its form, Bakelite could not be remoulded, its form was final. Still, with its ability to be initially formed into many different shapes for many different purposes, Bakelite was praised as the "Material of a Thousand Uses" (Perrée, 1996). The story of Bakelite's development might serve well as the starting signal for the rise of a new material type that would help to shape the lives of many humans yet to be born: Plastics.

What began as a few polymers in a laboratory made their way into society beginning during the Second World War. The war served as an important driver in fostering the expansion of plastic research and related industries (Freinkel, 2011). Or to say it in Susan Freinkel's words, "World War II pulled polymer chemistry out of the lab into the real world" (Freinkel, 2011, p. 6). Plastic types like polyethene, Styrofoam, acrylic, and nylon supported countless war applications: components for radar insulation and aircraft, strings for parachutes, and liners for body armour and helmets (Fenichell, 1996; Freinkel, 2011). Whilst the military and industry had a genuine interest in this new type of material that could win wars, the general consumer remained more sceptical. This scepticism against plastics might have been related both to their newness and their versatility. During the 20th century, the versatile and multipurpose characteristics of

plastics did not fit consumers' prevailing view, wherein one material should have one function (Bensaude-Vincent, 2013). In the backdrop of this early scepticism, whilst plastics were becoming materials that could be made into nearly anything, their multipurpose character had not yet convinced people to root for them.

This slowly changed as plastics were used in the commercialisation and mass production of goods, giving rise to a world of plenty. The use of plastics revolutionised industries by making manufacturing more affordable and more scalable. It enabled products to be produced at lower costs and in greater quantities. As a result, goods became accessible to a broader population, fuelling economic growth and fostering a culture of mass consumption. However, coming from a past of scarcity in which several generations had to hold dear the few possessions they had, people had to learn how to manoeuvre in this new landscape of abundance. Active marketing campaigns and advertising taught people that plastics would bring comfort into everyone's reach and that conveniences would be flooding into evermore areas of everyday life– (tele)communication, leisure, interior design, cooking, and transportation, to name but a few examples. These campaigns were not only used to make plastic products palatable to the broader public, but they were also used to market an entirely new way of living.

Marketing efforts tried to teach people—people who were just coming out of (post)war times marred by scarcity, shortage, and general recurrent absences of things at any given point—to not hold on to their new (plastic) artefacts but to instead just throw them away. For example, in 1955, the 39th Volume of Life Magazine ran a section titled, "Throwaway living—Disposable items cut down household chores." The imagery depicts what looks to be a happy family throwing different items like "frozen food containers, [...], a disposable diaper, [...] throw away water wings, foil pans, [...] mats and a feeding dish for dogs" amongst various others into the air (LIFE Magazine, 1955, p. 43). On the one hand, the picture illustrates the abundance of plastic artefacts that were presumably making people's lives easier. On the other hand, it also gives the impression that using and throwing away plastic items is easy, fun, and affordable. A focus only on use and throw-away practices supposedly releases consumers from care and responsibility over their goods and from considering the afterlives of their used plastic artefacts.

Thus, coming from generations where "[t]hrowing away is a sin" (Belndorfer, 2019), people were now being taught to do so. Being taught and knowing that many plastic products were made to have a strong disposable character, people adapted their throw-away and disposal practices. Whilst we could discuss the differences between the practices of throwing away and disposing, both practices entail that used (plastic) products do not (need to) stay with us. The disposable character of plastics allows them to move through our everyday lives. This movement of plastics was not entirely coincidental. Instead, Max Liboiron describes how "[d]isposability was one tactic within a suite of efforts to move goods *through,* rather than merely *into*, consumer households" (Liboiron, 2021, p. 1). Often, the use of disposable products was met with the development of expanded waste management infrastructures to govern the rising amounts of disposed items. Once disposed of, it was rarely a problem to buy the same products again and again, as plastics' relatively easy manufacturing process enabled them to be mass-produced at scale.

Mass production paired with a throw-away society is fuel for the mass consumption wheel of capitalist logic. Plastics enable our society to consume extensively. Still, the historical perspective discussed above should remind us that plastics developed simultaneously with our society. In other words, plastics were not a pre-defined technology that was released into our society. Instead, the needs of our society, its convenience, and its living standards co-evolved with plastics and their new polymer types, their new application areas, and their new products. Only together did plastics and society give rise to the mass consumption society and its throw-away mentality that we live in today. Social and technological orders thus shaped one other (Jasanoff, 2004). This story of co-evolution between plastics and society should also teach us to be sceptical of pure technical solutionism: wherein technological progress and innovations alone would be able to solve and buffer the negative consequences of our lives with plastics. Introducing new, supposedly better types of plastics—such as oxo-degradable, bio-based, or compostable ones—to govern the problems of plastics would largely ignore the fact that it took our society generations to transform into a mass-consuming one with such throw-away characteristics. Simply changing technologies from one plastic type to another would ignore the human aspect that contributes to the shaping of problematic systems in the first place. Plastics and any of the problems that arise with them are part of a broader societal system. This fact sensitises us to the need to stay attentive to both the social and technical forces present in our contemporary ways of living with plastics.

2.1.2 SOCIO-MATERIAL ENTANGLEMENTS

Nowadays, plastics appear to be everywhere—an integral part of society. Thousands of plastic material varieties and respective plastic artefacts shape and, supposedly, ease our modern ways of life. Attempting to capture the sheer amount of plastics in our daily lives, Susan Freinkel (2011, p. 2) describes which plastic artefacts she touches in the first hour of her day:

> *"Alarm clock, mattress, heating pad, eyeglasses, toilet seat, toothbrush, toothpaste tube and cap, wallpaper, Corian counter, light switch, tablecloth, Cuisinart, electric teakettle, refrigerator handle, bag of frozen strawberries, scissor handle, yogurt container, lid for can of honey, juice pitcher, milk bottle, seltzer bottle, lid of cinnamon jar, bread bag, cellophane wrapping of box of tea, packaging of tea bag, thermos, spatula handle, bottle of dish soap, bowl, cutting board, baggies, computer, fleece sweatshirt, sports bra, yoga pants, sneakers, tub containing cat food, cup inside tub to scoop out the kibble, dog leash, Walkman newspaper bag, stray pack of mayo on side walk, garbage can".*

Every minute of the day we are surrounded by multiple plastic objects. Plastics are omnipresent technologies that shape the functioning of our everyday life: from cooking to travelling to also facilitating countless other underlying infrastructures, including water, energy, and internet supply. Plastics often have such a strong taken-for-granted character that we, as general consumers, do not even see them anymore. Most plastics have become mundane, domesticated technologies. At first glance, they often seem to be well-working, efficient, and unproblematic.

However, plastics can also be a valuable point of departure to critically debunk their potential issues and controversies (Michael, 2015). Various scholars have started their research with a mundane plastic object: Velcro, rolling luggage, and band-aids (Michael, 2015), credit cards (Deville, 2013), mobile phones (Fisher, 2013), vinyl (Westermann, 2013), plastic bags (Hawkins, 2001, 2009), polyester clothes (Stanes, 2021), and, of course, plastic straws (Wong, 2019). Through the investigation of these different plastic artefacts, the authors remind us how these seemingly mundane artefacts or products do not simply exist on their own but instead reinforce and are reinforced by certain societal structures and orders. The sub-chapter on the politics of plastics below makes this more explicit.

At the same time, the wasting, polluting, and contaminating trails that plastics leave throughout their existence have also received insightful attention from scholars associated with science and technology studies and other similarly interested areas of study. Whereas some scholars

have focussed on plastics as objects (as previously discussed above), others have approached plastics as chemicals (Bensaude-Vincent, 2013) and plasticisers (Liboiron, 2013), and have examined (micro)plastics as pollution (Bergmann, 2021; Braun & Traore, 2015; Henderson & Green, 2020; Liboiron, 2016). Despite differences in thematical foci, investigating plastics from an STS perspective often includes rethinking plastics' materiality and the material characteristics of plastics as flexible and dynamic rather than stable and inherent. As Farrelly, Taffel, and Shaw (2021, p. 13) summarise, "[p]lastics exemplify how matter is leaky, active, and transformative rather than static, placid, and inert". To make the materiality of plastics and their importance even more tangible, let us visit the example of a PET plastic bottle. The supposed purpose of most PET plastic bottles is to contain drinking water. However, in reflecting on plastics in Indian communities, Dey and Michael (2021) have painted a more diverse picture of how these PET bottles can be used. "PET bottles [are] tied together to form rafts or filled with detergent water and fixed to holes in the tiled roofs to diffract the sun's rays and lighten the dark interiors of desert homes without electricity. Sometimes such bottles were cut and redesigned as water sprinklers in agricultural fields or reused as volume enhancers for mobile phones, or they were partially cut and used as hanging bins or filled with soil and used as flowerpots." (Dey & Michael, 2021, p. 143). This shows how the meaning and function of a PET bottle depends on its socio-material context. PET bottles used in rural India might differ greatly in the meaning, role, and values of a PET bottle used in Vienna. Dey and Michael's example reminds us to be careful of placing PET bottles—or any other plastics for that matter—into one ontologically strict category.

Therefore, I distance myself from the idea of generalising the meaning of one plastic item, because that would mean ignoring its socio-material specificities. Instead, like the various scholars cited above, I invite us to take plastic's materiality seriously to reconsider the broader socio-cultural meanings of what, for example, a plastic bottle is and what it can do (Hawkins, 2011). Thereby, this research builds from the understanding that the materiality of plastics (including microplastics, plastic pollution, plastic additives, and plastic artefacts) continuously shapes—and is shaped itself—by relations with human and other non-human actors (Hawkins, Potter, & Race, 2015). Paying attention to the materiality of plastics is a fruitful perspective. These same understandings hold true for plastic waste as well. What is seen, understood, and constructed as being plastic waste differs depending on the socio-material circumstances. What is considered plastic waste at the level of the individual household might be a valuable

resource in thermal recycling to recover energy at the level of the municipality. Thus, understanding the materiality of plastics as a process, as something that is shaped through socio-material interactions and practices (Gabrys, Hawkins and Michael, 2013), helps me to resist reducing plastics to something that is ontologically fixed. Instead, various STS contributions have sharpened my understanding that, dependent on the socio-material settings in which they are situated, plastics' materiality is enacted differently.

2.1.3 Politics of plastics

When engaging with plastics in their various forms, many STS scholars invite us not only to take seriously their materiality but also how plastics can become political. On the one hand, this includes how plastics can turn into "plastic policy objects" (Papadaki-Anastasopoulou & Felt, 2021, p. 1) and can quickly move into the focus of legislative and political debates, agenda-setting, and decision-making. For example, my colleague Artemis Papadaki-Anastasopoulou investigates how political practices matter in implementing the European Single-Use Plastics Directive in Greece. Another example is Johanne Tarpgaard (2021), who explores how the issue of plastic pollution took only five years to become one of the most urgent environmental concerns in the Danish parliament. On the other hand, plastics becoming political speaks to a broader STS understanding that "[o]bjects also have politics and are entangled in struggles over power and meaning" (Liboiron, 2016, p. 90) and that "plastics [...] act as indices for social issues and political conflicts" (McKay, Perez, & Xiaoyu, 2021, p. 226). Following this line of thinking through the engagement of different STS scholars allows us to grasp just how tightly plastics are entangled with various forms of controversy, crisis, injustice, inequality, and power.

The (non-) use of plastics and plastic artefacts is political. Revisiting the plastic bottle from a previous paragraph, social and cultural theorist Gay Hawkins (2011) describes how a plastic bottle is bound to the politics of bottled water. Whilst plastic bottles provide a convenient and durable means of accessing safe water in regions where clean water is scarce or unreliable, their use highlights the global disparities in water access. The politics surrounding the (non-) use of plastic bottles is thus intertwined with issues of water inequality and their disappearance would certainly have a devastating impact on many human communities. Another interesting example is the plastic straw. Fuelled by the #StopSucking"campaign, a ban on plastic straws would impact the lives of millions of people with disabilities. Whilst well-intended by many environmentalists, who favour its ban, a plastic straw does not only accompany our liquids.

Rather, Wong (2019, p. 3) invites us to ask: "When is a straw more than a straw? It depends on who you ask. A plastic straw is an access tool I use for nutrition as a person with a neuromuscular disability. When sipping a latte at my favourite cafe, I use a plastic straw because I am unable to lift a drink to my mouth and it is safe for hot liquids." Banning the plastic straw is a political matter in the sense of denying people with disabilities access to their social life and their independence. These are but two examples of scholarly work rendering visible the politics of plastics that help sharpen my analytical gaze to stay attentive to such phenomena.

The influence of the politics of plastics unfolds beyond the present day and our present societies. Contributions around the politics of (plastic) waste strongly highlight the need to look beyond the present (Allon, Barcan, & Eddison-Cogan, 2020). Instead of only being political in the now, the politics of plastics (and plastic waste) are transferred to, unfolding in, and colonising different futures to come; near and far away; here and there. This research follows work that has engaged with materials and substances as a form of slow violence (Adkins, 2021; Davies, 2018; Folkers, 2021; Lebel, 2016; Nixon, 2011) as well as waste colonialism (Davis, 2022; Fuller, Ngata, Borrelle, & Farrelly, 2022; James, 2015; Liboiron, 2021). Instead of being eliminated in one place, plastics will continue to exist and gradually build up unimagined (polluting) remnants over time. From past to present, from present to future, scholars continue to draw attention to how waste and pollution are exported from one place to another and how this creates substantial inequalities. The focus on plastics—a type of material whose existence and impact exceed several human generations and exist in deep time (Gray-Cosgrove, Liboiron, & Lepawsky, 2015)—encourages me to make more explicit the ways in which people think of their lives with plastics in the present, and which aspects of their present lives with plastics (and its politics) might stay hidden in the future.

2.1.4 Temporalities of plastics

As hinted upon above, my research relates to work engaging with the temporal dimensions of plastics. A detailed elaboration on how my research taps into existing work intersecting social science, plastics, and time can be found in sub-chapter 3.1., therefore, I will keep this section rather brief. Taking a temporal perspective on plastics, I situate myself with other academics who consider it important to treat plastics as material that is both *in* time and *of* time (Hawkins, 2018a; Ingold, 2012). "In historical approaches plastic is recognised as being in time, in the sense of being caught up in the dynamics of historicity and changing contexts, but it is not

recognised as being of time: as actualising new temporal ontologies." (Hawkins, 2018a, p. 91). Acknowledging plastics being both *in* and *of* time allows me to make more concrete how plastics are not solely subjected to the forces of passing time, but that plastics are themselves powerful in (and for) mobilising different temporalities.

On the one hand, I consider plastics as being *in* time: they are constantly changing and becoming intertwined in new relationships due to ongoing processes of degradation and/or re-location. When moving through time, plastics' materiality alters and ever-changing socio-material contexts give form to plastics' "various modes of existences" (Bensaude-Vincent, 2018, p. 282). From virgin plastic granulates to plastic grocery bags, from plastic waste bags to a bird's nesting material, to microplastics, to leached plastic additives, to nanoplastics; the journey of plastics through our society has numerous and often unknown stations. Acknowledging plastics as being in time, allows me to see plastics without being fixed in time. Instead, plastics—in their diverse modes of being, travelling through different chronological times—remind us to stay attentive to how plastics become part of different social realities, histories and contexts (Ingold, 2012). This is especially important because plastics are part of different historical epochs, which situates plastics within historically temporal specificities and orders (of society, science, economy, and politics for example). Thus, in the 1960s plastics were part of different temporalities than in the 2020s, with differences not only in, for example, production speed, consumption rhythms, disposal frequencies, and waste management paces, but also in the speed of knowledge production and distribution, and time horizons of political decision-making. For many decades, plastics have been simultaneously subjected to and contributing to the changing temporalities in which they are situated.

On the other hand, I consider plastics as being *of* time: to say it in the words of anthropologist Timothy Ingold, plastics are materials that "do not simply exist in time; they are the stuff of time itself" (Ingold, 2012, p. 427). In this sense, plastics are technologies that contribute to the construction and orchestration of time in social life (in, for example, a digital watch, a plastic-encased clock, an electronic church bell, a laminated schedule, or a plastic-wrapped planning calendar). But as importantly, there are also less noticeable ways in which time is embedded into plastics and more specifically, plastic artefacts, such as different lifespans, usage times, and forms of planned obsolescence. This research, for example, renders graspable how disposable plastic food packaging is imagined to fuel and support a to-go culture with fast and linear

consumption rhythms. However, at the same time, the use of disposable packaging also provides consumers with a sense of ownership over their own temporal resources. Considering plastics as being *of* time allows us to better understand how plastics are constantly involved in the mobilising of various temporalities that make them so powerful.

2.2 PUBLIC ENGAGEMENT (WITH PLASTICS)

Our society has enjoyed the benefits and conveniences of plastics for quite a while. Nonetheless, voices about plastics as potentially harmful to environmental and human health have grown louder and louder. Whilst media visuals show marine animals trapped in plastics or their stomachs filled with them, ever more research activities focus on plastics, including microplastics, nanoplastics, and other plastic-related substances (e.g. plasticisers, flame retardants, stabilisers, pigments, lubricants, and so on (Hahladakis, Velis, Weber, Iacovidou, & Purnell, 2018)). With the establishment of various anti-plastic projects, zero waste movements, and regulatory efforts to try and govern plastics, members of our society have gradually started to realise that plastics do not have only great benefits but serious consequences too.

With perhaps the highest level of societal scepticism since their initials rise, "[…] plastics have been deemed as evil polluter due to their indiscriminate littering and mismanagement amid increased plastic use and waste generation […]" (Parashar & Hait, 2020, p. 1). Academics of various fields refer to what Mitchell (2021, p. 108) calls a "massive press demonisation of plastic as material" with (social) media helping to amplify concerns about the more negative facets of plastics. Thereby, concerns, worries, and problems related to plastics have increasingly found themselves in the spotlight. Boats and marine life become entangled in plastic ghost nets, causing substantial ecological and economic damages (J. Brown & Macfadyen, 2007). The transfer of microplastics within aquatic and terrestrial food webs brings with it new potential threats to human food sources (Bouwmeester, Hollman, & Peters, 2015; Diepens & Koelmans, 2018; Huerta Lwanga et al., 2017). Microplastics found in the human placenta and human semen spark questions about the impacts of plastics on yet unborn generations (Ragusa et al., 2021; Zhao et al., 2023). Together, these are but a few examples of the numerous possibly negative facets of our lives with plastics. Despite these concerns, my research aims to move beyond the mere demonisation of plastics as harmful entities. It instead acknowledges that the role of plastics in our society, and people's perception thereof, is much more complex—it is often ambivalent and highly context-specific.

Engaging with and making sense of these polymer-based technologies that are so deeply interwoven into our society is by no means easy. As mentioned in the introduction, plastics have become such an integral part of our everyday lives that they are almost invisible to us. We live at a point in time where the ubiquity, the omnipresence, the everywhereness, and "the prevalence of plastics can be striking. […] the consumer does *not* notice that he or she is actually using a polymer-based product" (Tolinski, 2011). Whether something is made from stone, wood, glass, or plastic is sometimes difficult to see and know, especially for the untrained eye and mind. It is a challenge in itself to discover and identify each of the plastics that sustain basic functions in countless areas of our contemporary life.

Another reason that engaging with and making sense of plastics in our society is such a complex endeavour is because plastics intersect with various other problematic areas. Discussions about plastics inevitably intersect with matters such as waste management, risk assessment, living standards, toxicity, climate change, or sustainability. To be a part of so many concerning issues whilst also being so essential to the functioning of our society has led scholars to argue that plastic, more particularly, plastic pollution, is a 'wicked problem' and poses "one of the key global challenges" (Fuger et al., 2021, p. 597). Discussing plastics and their many facets and coming to terms with problems and potential solutions to their more negative ones is no simple endeavour. Nevertheless, to enable citizens to make sense of their lives with plastics and to have more nuanced discussions and fine-grained reflections, we tailored the existing card-based discussion method IMAGINE (Felt et al., 2014) to the case of plastics and the context of Vienna and Austria.

The need to tailor a method to engage citizens with the proper consideration of the wide spectrum of issues in our lives with plastics (including materials, artefacts, use contexts, responsibilities, policies, arguments, experiences, problems, and solutions), was foreseen within the STS part of the PLENTY plastics research platform my research is situated in. The choice to adopt a method with an engaging and participatory nature that could address citizens' perspectives on plastics did not emerge out of the blue. Involving members of the public in discussions of technological development has been a general concern of much research in STS. Various scholars are interested in the relationships between science and society. Revisiting their work thus helps us to better understand the perspectives on citizen participation with technoscientific developments and their possible role in this research.

Early studies of the relationships between science, technology and society were often entrenched in thinking within the logic of a deficit model. Thereby, discrepancies between science and members of the public were regularly reduced to arguments of public deficiency in scientific literacy or citizens' lacking understanding of science. Citizens were often constructed as less knowledgeable than scientific experts and were routinely imagined to be rejective of technoscientific progress. A deficit model logic assumes that the knowledge gap between the public and science can be closed with more information and more evidence, which should result in citizens accepting scientific knowledge and supporting new technologies (Delgado, Lein Kjølberg, & Wickson, 2011; Stilgoe, Lock, & Wilsdon, 2014). This deficit model has received substantial criticism, especially for oversimplifying the connections between scientific knowledge and public understanding (Irwin & Wynne, 2003).

However, in contemporary democracies, there has been a shift away from the idea that science should inform the public solely to foster their acceptance of and support for new or contested technoscientific developments. Instead of following the path that science knows and needs to educate members of society, relationships between science and society target the idea(l) to open respective debates to broader groups of society. In the name of participatory practices, citizens' inputs and views should find their way into processes of political decision-making. Approaches to public participation increasingly function as features to govern technoscientific issues (Felt & Fochler, 2010). This participatory turn speaks to the increasing emphasis on involving citizens in the decision-making and governing processes of science and technology.

For a variety of researchers, STS scholars included, such engagement initiatives have also functioned as a methodological gateway into investigating how members of the public understand and make sense of techno-scientific phenomena. Yet, many of these engagement formats concentrate on the early stages of technoscientific developments. In other words, before studies are carried out, before crucial political decision-making processes take place, before expensive investments are made, and before members of the public form strong resistances (Macnaghten et al., 2015; Macnaghten, Kearnes, & Wynne, 2005; Pidgeon & Rogers-Hayden, 2007; Wilsdon & Willis, 2004). Aside from early stages of innovations, exercises to engage members of the public also tend to gravitate around specific (potentially) contested fields, including, for example, genetically modified food (Ferretti, 2007), nuclear energy movements (Wynne, 2013), nanotechnologies (Felt, Schumann, Schwarz, & Strassnig, 2014;

Schwarz-Plaschg, 2018), and environmental issues such as climate change (Ryghaug, Holtan Sørensen, & Næss, 2011) because they can be related to present or prospective risks to human health, to different environments and to distinct groups of people, their knowledge, and their identities.

The involvement of the public is becoming increasingly important when addressing uncertainties, risks, and controversies related to technoscientific progress (Chilvers & Kearnes, 2015). As discussed earlier, even well-established and everyday technologies can provide valuable grounds for public engagement, as they often carry hidden issues and controversies (Chilvers & Kearnes, 2015; Michael, 2015). Public participation offers an important methodological approach for exploring how people understand and make sense of technoscientific developments and socio-technical issues. Specifically, participatory formats create spaces where citizens can make sense of, engage with, interpret, and shape these developments, the associated challenges, and the socio-cultural contexts in which they are embedded. However, it is important to recognise that these sense-making processes are not formed in isolation. Instead, long before participating in formal engagement, citizens are already exposed to the issue through various channels, such as personal encounters, community narratives, and media coverage, all of which shape their prior understanding. Therefore, citizens may have a rich history with the matter at hand, ranging from individual experience to broader collective perspectives and narratives. Both individual and collective pasts with technologies can thereby fuel sense-making processes within the public participation format.

Even whilst using a public participation format to create a space for citizens to engage with and make sense of their lives with different technologies— including plastics, it is important to remember that many participatory settings still function as what Felt and Fochler (2010, p. 220) critically describe as a "linear model of participation". The main point of this criticism is that participatory formats are not simply a space for broader parts of society to openly express their voices and thereby open wider democratic debates around technoscientific progress, developments, and issues (Felt & Fochler, 2010). Instead, it is (often scientific) experts and professionals who are given the power to create participatory formats and decide which parts of the public are given a voice (Rose, 1999) and which issues these publics raise in return. Meanwhile, participants are expected to inhabit the participatory space and follow its pre-

established frameworks—to perform as citizens and engage with the relationships between science and society in specific and pre-defined ways (Irwin & Michael, 2003; Michael, 2009). In this sense, participatory formats are not always as open as initially imagined. Often, they are filled with specific (research) agendas, frames, content, purpose, biases, and goals whilst being open (or closed) to specific parts of the public.

To engage with this criticism, in the methodology and materials chapter (see sub-chapter 4.1) I reflect on the challenges and capacities of the participatory discussion method IMAGINE PLASTICS used in this research. There, I discuss how public engagement methods must address three main areas of challenges if they truly aim to involve citizens with complex socio-technical issues: the lack of a fixed frame of reference, group diversity, and expert capture. To counter these challenges our IMAGINE PLASTICS discussion method is aimed at fostering Viennese citizens to engage with, make sense of, and build a position towards plastics in our society.

IMAGINE PLASTICS facilitates participant engagement by providing a series of card sets that explore a wide range of debates and perspectives on plastics, specifically adapted to the context of Vienna and Austria. These tailored sets are designed to encourage deeper individual and collective reflection. Each discussion session, which lasts approximately four hours, is structured into four distinct phases of which each is supported by a different set of cards. Three of these phases are guided by cards featuring short texts and visual elements. These cards are specific enough to provoke meaningful debates on plastics, yet open-ended enough to allow participants to incorporate their own experiences, perspectives, and narratives. This approach enables participants to critically renegotiate their own positions, as well as those of others, in the broader debate surrounding plastics. Thereby, the discussion method of IMAGINE PLASTICS gave space to citizens' various re-occurring narratives about (our lives with) plastics, which were filled with different temporal repertoires. These various narratives, which I refer to as temporal narratives, form the analytical gateway of my research to better understand citizens' sense-making of plastics and our lives with these polymer-based technologies.

3. THEORETICAL SENSITIVITIES: TIME AND NARRATIVES

Time is a constant force driving change and continuity in our lives. It shapes the rhythms of everyday existence, influencing how we experience progress, setbacks, stability, and transformation. As the world around us evolves, so too do our values, beliefs, and understandings, which are all carried forward through narratives that pass between generations and communities. Woven over time, these narratives contribute to shaping how we perceive and make sense of the world, from our relationships with technology to the socio-environmental challenges we face. This inseparable intertwining—of time and narratives—conceptually guides this research, focusing on how temporal narratives shape people's understanding of plastics. Temporal narratives serve as my analytical gateway into understanding citizens' perceptions of plastics: their construction of plastics as essential yet problematic, their justifications of certain situated plastics in their lives and worlds around them, and their anticipation of future relations between society and plastics.

This chapter discusses the theoretical sensitivities of this research, working through different understandings and conceptualisations of time and exploring the intertwinement of time and narratives. The chapter is divided into two main parts. The first part of the chapter comes to terms with the role of time in society and research. This begins with a brief reflection on using a temporal perspective for socio-scientific analysis. I then elaborate on some of the ways in which time contributes to the construction of societal and material worlds. In doing so, I engage with different socio-scientific work in the field that helps me elucidate how time can be simultaneously treated as an object of study, an analytical device, and a social construct, and what respective consequences this has for my research. The second part of the chapter circulates around the idea of using narratives as a conceptual gateway into investigating how people speak about, make sense of, and re-negotiate the world and its phenomena. After highlighting how the entanglement of time and narratives shapes human experience, I explore why narratives are crucial cultural vehicles through which people perceive and understand the world—including its polymer-permeated aspects—and contribute to the social construction of a society shapes and is being shaped by the potentials and problems of plastics.

3.1 TIME AS ORDERING MECHANISMS

Time has been understood and described in various ways. Yet, despite historical engagements with time, for social science scholars, time as an analytical category is still "deeply taken for

granted in our daily lives and our social theories, it is not easily accessible to conscious reflection and social science analysis. This means that time needs to be made visible before its pervasive role in modernity can be appreciated" (Adam, 1992, p. 175). Still, whilst time has not always been an analytical focus for every academic community, there is a healthy body of valuable scholarly work that can provide some substance to the historically changing understandings and roles of time. Whilst this research does not aim to provide an extensive review of this work, it is valuable to engage with it in order to better understand the changing meanings and roles of time and certain temporalities. This engagement will help situate a contextual foundation for this research's use of temporal narratives to unravel people's sense-making processes in regard to our lives with plastics.

In this first theoretical sub-chapter, we will explore how time is not one straightforward category for analysis. Instead, as we will learn, time is constructed, historically contingent, and different from location to location (Elias, 2007). By being temporally and spatially bound, conceptualisations of time change with the social realms and societal structures that they are part of (Adam, 2002). Therefore, I invite the reader to familiarise themselves with the thought that, in my research, time is simultaneously a social construct, an object of research, and an analytical device (regarding the latter, see sub-chapter 4.5). The vague demarcation between time being an object of study and an analytical device highlights the importance of reflecting on how time itself is a social construct. This sub-chapter is therefore dedicated to examining various socio-scientific perspectives about time as a social construct and considering the implications of these perspectives for my understanding and conceptualisation of time and the future, and their relevance to this research.

3.1.1 Probing the past: Engagements exploring the role of time

Since the early days of humankind, temporal rhythms of bodily, natural, cosmic, and cultural forces have guided human populations in how they orient and organise life. Whilst these different temporal rhythms have always accompanied life, the scientific investigation of time is still rather young in this regard. As a scientific dimension that could help inquire about the social organisation of life, time appears to be only as old as the social theory that describes it. Nowotny (1992) and Adam (2013) explored how time and temporalities have escaped the investigation of social theory scholars for a long time. However, we can surely be more specific about which aspects of time have received more or less socio-scientific attention from scholars in the past few centuries. Many temporal aspects and the idea of time itself have regularly

resurfaced during various socio-scientific explorations of modern history. In 1992, for example, Helga Nowotny (1992) published an essay about theorising time. In it, she shared the challenges of providing a systematic account for the analysis of time. For example, the multiplicity of time, with different scales and experiences of time across individuals, societies, and cultures is a main challenge to providing a systematic account. Still, scholars are criticised for not following a structured or systemic engagement with the role of time in theorising life in our modern societies. This might not lastly be owed to the fact that time itself appears as a social construct, materialising itself into multiple forms that co-shape the organisation of social life. Nonetheless, retrospection can provide us with a mosaic of different socio-scientific engagements, which have explored the role of time in society in several ways that are important to the focus of this research.

Amongst the first important sociologists of the 19th century was the French sociologist Émile Durkheim, who regularly shared his observations regarding the role of time in and for social life. Durkheim's contributions have encouraged many generations of social scientists to see and treat time not merely as an ambient noise permeating society, but as a fundamental ordering principle of phenomena in social life (Durkheim, 1915[1965]). Taking up Durkheim's contributions on the role of time for social solidarity and cohesion brings critical insights into how members of society have been held together through "collective sentiments (shared pasts) and common values and beliefs (shared futures)" (Katovich, 1987, p. 374). This idea of a shared past and a shared future provides us with a precursor to the important role of trajectory thinking, in which people make sense of their living realities (see next sub-chapter). Even now, Durkheim's insights help to keep us attentive to the fact that people's sense-making of plastics is likely informed by shared pasts and that we must study how these pasts contribute to shaping how people establish and negotiate shared versions of our futures with plastics.

Durkheim's contributions to the sociology of time have also greatly influenced the work of Pitirim A. Sorokin and Robert K. Merton, especially their 1937 work on "Social Time: A Methodological and Functional Analyses", published two decades after Durkheim's death. In the article, they argue that "social time expresses the change or movement of social phenomena in terms of other social phenomena taken as points of reference." (Sorokin & Merton, 1937, p. 618). Sorokin and Merton's study suggests that social events and phenomena function as social time and that they act much more so as a temporal framework for people

than what they refer to as mere astronomical or calendrical time. Their work highlights that time in society is not solely determined by physical astronomical data (physical time), which is presumed to be more stable and measurable. Sorokin and Merton instead draw our attention to the importance of how different socially and culturally situated activities and practices co-produce different understandings of time and time units. They explore how time serves various purposes for different social groups: vacations, market schedules, weekdays, religious ceremonies, and more, illuminating how social time beats along the rhythms and pulses of the social group in which it is situated. "The system of time varies with the social structure", Sorokin and Merton point out (1937, p. 621). Characterising social time as qualitative, dynamically changing with its shifting context, Sorokin and Merton encourage us to consider time not as a universal phenomenon but as social, as time is relative to social actors, groups, and collectives and their own preferred uses of time. Whilst people in some communities might perceive that there is simply a lack of time to engage with their consumption of plastics, people from other communities may just as well recognise and construct the time as sufficient.

The sociologist Norbert Elias has also discussed time as being relative to social contexts. He particularly emphasises how temporal norms and standards develop within communities, which allows for the measurement and comparison of time units. These recurring time units—such as day, night, birthdays, Christmas, and the seasons—enable members of our society to establish connections between events, even across different spatial locations. Elias' insights impact my understanding of time in so far as they acknowledge that the measurement of time and its symbolic meanings change throughout humans' social development. Therefore, I position myself with others who also reject a dichotomous approach to time, of it being either of a subjective or objective nature. Instead, like Elias, I consider that "time [...] is neither [...] existing objectively, nor a category of experience common to all people" (Elias, 2007, p. 8); it is both. By using time as an analytical lens to understand how citizens perceive plastics, this conceptual insight encourages us to shift the focus from defining the nature of time to examining how time is represented. By exploring how time manifests in people's narratives about their lives with plastics, we can shed more light on the roles and functions of temporal repertoires in shaping our societal (future) relationships with plastics.

The entanglement between time and space in establishing social structure and societal functioning has also been reflectively elaborated on by Anthony Giddens (1981). In his

perspective, time contributes to providing structure to society; simultaneously, however, time itself is constructed through social actions that take place within that structure. Giddens encourages us to consider that every moment of social interaction, change, and transformation is situated in certain social systems—to stay attentive to the varying temporalities associated with different social structures and organisations. Central to Giddens' understanding of time is again the awareness that the relations that make up our social systems and structures are not stable but evolve over time. Thus, when studying how Viennese citizens make sense of their lives with plastics, we will find that the narratives shared within discussion groups reflect a multitude of temporalities and geographies. Taking Giddens's insights seriously allows us to see how citizens' narratives convey diverse realities about living with plastics that are imagined locally, globally, and across different times.

This exploration of time and narrative naturally leads to an examination of habits and patterns, where the recurring nature of time units becomes essential in organising social life. In this regard, Henri Lefebvre highlights how such rhythms shape the social phenomena of the everyday. Henri Lefebvre (2004) has brought attention to how the presence of such rhythms constitute the social phenomena of the everyday. Not published until after his death by a colleague, in *Rhythmanalysis: Space, Time and Everyday Life*, Lefebvre argues that "[t]he everyday is simultaneously the site of, the theatre for, and what is at stake in a conflict between great indestructible rhythms and the processes imposed by the socio-economic organisation of production, consumption, circulation and habitat." (2004, p. 73). Thus, when we study citizens' sense-making of plastics, we are bound to find a multitude of different social, biological, corporal, economic, and political rhythms. Being sensitive to the existence of these different rhythms is the first step in making the interplay between them tangible and discovering how this interplay matters for people's understanding of their lives with plastics in contemporary times. With his work on the role of rhythms in structuring social life, Lefebvre supports my interest in engaging with the interactions, variations, and modes of compatibility between different rhythms, which establish the temporal structuring of individual and societal practices, and shape the order and disorder of and in social phenomena. In the analysis, a major focus will thus be about how some rhythms in society, and indeed in our lives with plastics, are imagined to be more powerful and less changeable than others, and about how some of these rhythms do not align with one another, a realisation that often brings to light people's concerns and discomforts.

An especially significant part of Lefebvre's conceptualisations for my research is his differentiation of temporal rhythms, specifically between the notions of linear repetition and cyclical repetition. Lefebvre suggests that linear rhythms link to linear processes (like repetitive activities on assembly lines), whilst cyclical rhythms are likewise associated with alternating processes and practices (like alternating days and nights or high and low tide). Thinking about repetition in terms of people's lives with plastics helps to render a more concrete analysis; it can describe, for example, how linear repetition matters—especially in people's narratives that diagnose contemporary life with plastics (i.e., fast and iterative buy-throw-away-buy practices), or how cyclical repetitions is covered in citizens' anticipatory narratives (i.e., slower and more circular reuse cycles).

Similar to Lefebvre's understanding of rhythms, is Nowotny (1995) argument that time and temporal cues are loaded with different systems of power. To provide an easy example, shopping malls and online shopping realms are, for instance, organised around very different assumptions of who can perform shopping activities and when. Even this example shows how quickly this exercise can raise questions about whose needs and demands for offering products and purchasing things are met and whose are neglected. The politics of these rhythms also carry important consequences for individuals in so far as they impact who is left to wait and who must deliver on time. Thinking about the (de-)stabilisation of certain systems with their specific temporal norms thus sensitises my research to the role of time as a means for exerting control and power—how tactics around planned obsolescence are regularly understood to be a powerful mechanism in defining the lifespan of a plastic product or how consumers' perception of plastic packaging as a time-saving material supposedly allowing them to regain a sense of ownership about their time.

In closing this section on previous socio-scientific theories and engagements with time's role in society, I want to again underline that research treats time not only as an object of study but also as a social construct. It assumes that different socio-cultural specificities, social interactions, practices, understandings of time, and methods of measuring time shape and co-produce time, alongside various temporalities, trajectories, and rhythms. As such, we will see how time plays a powerful role in orchestrating people's social lives, including their relationship with plastics and how they make sense of it.

3.1.2 Considering the present: Temporal construction of society and materials

In former times, temporal cues of weather seasons, fertility and hormone cycles, moon phases, tidal currents, and day and night rhythms were each at the forefront of informing people's temporal structuring and coordinating their social practices (Adam, 1998). Yet nowadays, we find ourselves in a moment in history in which our technologised society faces increasing complexity as it is entangled with more and more forms of time that impact private, social, and political life. Today, the most prominent and universal temporal cue and ordering force in our society appears to be linear clock time, whereby quantifiable units of time move from the past to the future via the present.

My research takes the observation of Barbara Adam (2004) into account in arguing that within modern industrialised societies, the social fabrication of quantifiable clock time has become the predominant measure for understanding time. In many communities of the Global North, the dominant knowledge of clock and calendar time is tightly intertwined with a linear perspective of the world. Subscribing to an understanding of time along a linear path from the past via the present to the future is thus tightly intertwined with a Newtonian perspective of the world, which allows us to establish notions of causality and reversibility (Adam, 2004). Acknowledging people's linear understanding of the world as well as the related ideas of causality and reversibility matters a great deal in the case of plastics. Acknowledging the basis of this understanding allows us to attend to both how people make sense of temporally distant impacts and effects of using plastics on environmental and human health and how this contributes to shaping their calls for future action and governance.

Reducing complex phenomena like the impacts of plastics to clear-cut cause-and-effect relationships allows us to calculate and estimate the risks and consequences of human actions and technological use (Adam, 1995). By using historical data to calculate the likelihood and probabilities of events (such as the endocrine-disrupting effects from plastic additives), we feel that we can attempt to predict future outcomes and prevent unwanted ones. As Adam (1995) explains, within this Newtonian perspective that permeates today's line of thought, changes to the world are often seen as reversible and systems are expected to be able to return to their original state. This perspective is heavily influenced by a linear understanding of time, which ultimately fuels the belief that events and phenomena, including human actions and their effects, can be reversed through management and governance. Understanding this linear perspective of time is crucial to analyse how people make sense of, manage, and govern the

use of plastics and their related impacts. It helps explain why the future impacts of plastics are believed to be preventable or reversible through timely actions and interventions, including the creation of scientific knowledge and changes to the legal frameworks that should govern plastics.

Closely linked to the concept of linear time is the notion of time as trajectorial. Arjan Appadurai (2012), for example, emphasises the importance of trajectories in understanding our perception of life and the world. He describes trajectorism to be based on the idea of "a deeper epistemological and ontological habit, which always assumes that there is a cumulative journey from here to there, more exactly from now to then, in human affairs […]. Trajectorism is the idea that time's arrow inevitably has a telos, and in that telos are to be found all the significant patterns of change, process and history" (Appadurai, 2012, p. 26). Appadurai's perspective on trajectorial thinking highlights how time is perceived to be leading towards a specific destination, with trajectories that illustrate causal relationships between inputs and outcomes. For Appadurai, the sequence and order of events give meaning to this trajectory. What Appadurai also elaborates on, however, is how trajectorial thinking becomes entangled with narrative efforts to steer our present into this very (imagined) direction of the future. In doing so, Appadurai also discusses the conflicts between competing trajectorial narratives and highlights the importance of examining how different societal actors work to stabilise or destabilise specific trajectories and their corresponding future visions. By aligning with scholars who recognise the co-existence of multiple future visions, Appadurai's insights sharpen my sensitivities to better unpack how exactly trajectorial understanding is anchored in people's sense-making of their lives with plastics, from the past to the present, and the futures ahead.

Aside from trajectorial thinking and the dominance of linear clock time, Adam (1995, p. 6) reminds us that other temporal cues also contribute to shaping our reality, such as the "time embedded in social interactions, structures, practices, and knowledge, in artefacts, in the mindful body, and in the environment." Adam thus encourages us to also take into account that multiple temporal cues exist simultaneously and that they can be entangled with one another—some, of course, being more obvious than others. This understanding supports my interest in staying attentive and open to a multiplicity of different temporal cues that contribute to shaping people's sense-making of plastics, and to be able to grasp which ones become (less) dominant in people's everyday life with plastics.

Some of the temporal cues important to this research arise from the world of materials and artefacts. Whilst stones are by namesake the key material of the Stone Age, Bakelite cables, which supported the earliest forms of telecommunication, are what mark the infancy of plastics in our societies. Tracing the materials and artefacts allows humans to access and construct an understanding of historical contexts and periods of former and ancient times—to learn about practices, habits, rituals, traditions, and ways of life in the past (Ingold, 2021). Certainly, the very existence of the metric clock allows us to associate particular materials and artefacts with specific historical times and attribute meaning to them. The sociologist Tim Ingold, for instance, highlights the ability of materials to be situated in more than one temporal period. As he describes, materials are able to travel through many different chronological times and can thus become part of several different social realities all at once. Ingold's insights inform my theoretical sensitivity in so far as I understand plastics as a type of durable material—the same plastic artefact can become a part of not only one human generation and community but many different social realities.

At the same time, Ingold also encourages us to remember that materials "do not simply exist in time; they are the stuff of time itself" (Ingold, 2012, p. 427). His perspectives on the intertwinements of time and materials help sensitise my analysis with the understanding that time is embedded and enacted in plastic materials and artefacts, and how this contributes to the temporal construction of society. With a sensitivity to temporalities embedded in materials and artefacts, the work of sociologist Madeleine Akrich also supports my research interest. Akrich (1992) argues that different functions and ways of use can be pre-scripted into technologies and technical devices ('the script'). This work encourages us to consider how time and temporalities can be inscribed into artefacts and thereby how plastic materials and artefacts can provoke certain temporal realities in society. Generally, this speaks to an STS perspective as it opens up space to investigate the social conventions that shape how some members of society pre-script certain temporalities and time spans into artefacts, and how this contributes to constructing temporal structures that predominate social life and certain paces of living and consuming. In the empirical analysis, we will thus come to see how time and temporal norms embedded in artefacts and materials are imagined and negotiated by consumers, and how plastic artefacts become powerful devices for defining the predominant temporal realities and rhythms along which social life and society (are imagined to) function.

From Ingold's previous argument, we know how time and temporalities can be embedded in the material, yet materials can just as well exist simultaneously over longer periods of time. Throughout its existence, the meaning and form of a material is constantly in flux: due to processes of degrading or re-locating (see sub-chapter 2.1.2), the material becomes intertwined with ever-new relationships. This effectively underlines the argument of social and cultural theorist Gay Hawkins (2018a, 2018b), who argues that the social life of materials matters in our understanding of time. In connecting her ideas to Deleuze and Guattari (1987), Hawkins also refuses to consider materials as being fixed entities in time and instead argues for the importance of acknowledging materials' liveliness and the contextual changes they undergo that point to them being *of* time and not *in* time. For Hawkins (2018a, p. 93), relating time and materials must allow for "a focus on the interaction between the historicity of objects or their social lives and how materials must also be considered as inherently lively". Hawkins demonstrates how materials are not isolated entities that act alone but are incorporated into human practices, actions, and relationships. Her considerations encourage my research to make more explicit which aspects of people's living with plastics materialise in the present and which aspects might be hidden in the futures to come, as the existence of plastics as well as their multiplicity of remnants will exceed at least one human lifetime.

Similar to Hawkins, Bernadette Bensaude-Vincent (2018) draws attention to the everchanging character of plastic materials that gives birth to varying tempo-material realities. For Bensaude-Vincent, investigating the temporal aspects of artefacts means staying open to the different modes in which an artefact may exist. When trying to understand the role of time, she reminds social scientists to consider how artefacts keep enduring even after they have been produced, persisting in the world even after they have been used. She showcases how "artefacts have no ultimate essence and have instead various modes of existence inscribing them in various histories and temporalities" (Bensaude-Vincent, 2018). Positioning myself closely along these arguments, Bensaude-Vincent underlines the importance of taking plastic artefacts' intertwinement with the world seriously, including how they challenge our social, cultural, political, environmental, and temporal realities. To do this, my research will pay close attention to plastic artefacts' different modes of existence and their multiple temporalities.

One mode of existence of special interest in this respect concerns the temporally far-reaching impacts of long-living materials. In his famous book *Slow Violence and the Environmentalism of*

the Poor, scholar Rob Nixon (2011) draws attention to how environmental damage can spread throughout space and time. With his concept of slow violence, Nixon (2011, p. 2) makes tangible how ecological threats can exert a form of "violence that occurs gradually and out of sight, a violence of delayed destruction an attritional violence that is typically not viewed as violence at all". Slowly unfolding and materialising in nature and in people, different forms of violence can impact people's everyday lives. Putting the temporal discrepancy between cause and effect into perspective, socio-scientific investigations around slow violence are regularly situated at the intersections of society and environments and "draw attention to forms of harm and violence that have not often been at the forefront of scholarly and public awareness" (O'Lear, 2021, p. 1). This concept of slow violence thus also sensitises my research in that it allows me to better unravel how people understand cause and effect in their lives with plastics as temporally more or less distant. Especially in the diagnostic and anticipatory chapters, we will explore how citizens' ideas about plastics' slow violence inform the urgency to act on plastics now and how these ideas tie into discussions about the need to take responsibility for future human generations.

The insights around slow violence provide important sensibilities for my research to address how temporally delayed threats, fuelled by the practices and actions of one social group, burden other social communities to live with and be affected by these very consequences. Nixon's work on this subject encourages socio-scientific engagements like mine to look beyond the immediate and obvious consequences of human actions, provoking us to explore the role of social injustices that accompany and shape social realities. In recent decades, many forms of slow violence, particularly those associated with material and chemical legacies, have moved into the spotlight of our socio-scientific attention (Davies, 2018; Folkers, 2021; Lebel, 2016; O'Lear, 2016). Thinking through the concept of slow violence allows me to re-connect the social and environmental consequences of plastics inherent to our contemporary normalised routines, habits, and traditions, with the paces of living and consuming that often establish a certain degree of stability in people's organisation of their social and everyday life. In building from Nixon's work, O'Lear (2016, p. 10) highlights how slow violence can also hatch from actions considered to be normal, as "[m]aking a choice can have violent outcomes, but so can making no choice or going along with business as usual". Both choosing and not choosing plastics in everyday life can bring about different forms of slow violence. Nixon's work on slow violence also supports my analysis by addressing the meaning of the right time for action on

plastics, which renders visible a tug-of-war between keeping business as usual and implementing precautionary principles on plastic-related materials.

However, the scholarship that has arguably done much to shape the idea of the linear trajectorial of past, present, and future is the work that has been done with an anthropocentric sensibility. In this regard, "the Anthropocene appears to be a place and time of spatial and temporal 'cross-fire' where past and future, local and global are mobilised and come together to create new entanglements" (Head, Saltzman, Setten, & Stenseke, 2016, p. 4). Acknowledging the ideas of the Anthropocene renders concrete how already materialised impacts of past human activity, as well as visions of potential long-term material consequences in the futures ahead, inform human action in the present. Following this sensibility, I position myself with others in acknowledging that both remnants of the past and visions of the future contribute to shaping the present (see next sub-chapter). In turn, my research aligns with the work of other scholars, as the idea of the Anthropocene allows us to stay attentive to temporalities that exceed the social actions situated in one human lifetime (Boudia et al., 2018; Gray-Cosgrove et al., 2015; Idies, 2020; Marquardt & Delina, 2021; Peterson & Zahara, 2016, to name but a few). Encountering citizens' sense-making of their lives with plastics with an anthropogenic sensitivity sensitises my research to the temporally far-reaching consequences of present relationships between society and materials.

Thus, aside from different temporalities including temporal cues, rhythms, and trajectorial thinking co-producing social life in the past, present, and future, time is also embedded in the world of materials, things, and artefacts. When investigating time, my analytical sensitivities thus also take the tight intertwinement between time and material culture into consideration. Thereby, this research builds on the call of numerous scholars who have argued that socio-scientific investigations must consider the contribution of humans' intimate relations with materials and artefacts in the temporal construction of society.

3.1.3 Sensing futures: Construction and making of the prospect

In ancient times, cultural practices related to prophecies, myths, fortune telling, and foresight helped predetermine people's fate and futures, and changing these futures was rarely imagined as being in the hands of human beings (Adam & Groves, 2007). If we still lived under this way of understanding the future, the prospective relationships between society and plastics would be given: they would follow a pre-determined path and would not be open to

change. However, future-telling and prophecies are largely remnants of the past. They are not a major part of today's cultural practices nor do they maintain a great deal of popularity—at least not in modern industrialised cities like Vienna, where my research takes place. Instead, Adam and Groves (2007, p. 2) remind us that the future is often treated to be open "to exploration and exploitation, calculation and control". Speaking about the openness of what is to come, the authors remind us how technological innovations foster knowledge and visions about the future and create a certain degree of stability and certainty in the unpredictability of life itself. Ideas, visions, and imaginations about the future play a key role as temporal repertoires that shape both social realities and human action. Thinking about plastics, this sensitivity supports my interest in unravelling how people's imaginations and ideas about changing plastic consumption are imagined to be threatening the future of some plastic artefacts and the comforts they bring to our society. We will see how future visions of creating more sustainable paths of consumption, avoiding plastic waste, and preventing plastic-related impacts on human and environmental health inform citizens' negotiations of action in different segments of society.

Citizens' predominant understanding that the future of plastics is open to be shaped by a variety of actors stands in tension with another work on futures from Adam (2006, p. 8), who criticises that "[t]he empty and open future is an illusion. The future is an always already occupied territory in which we operate largely as trespassers." Instead of following the prevailing assumption of an empty, decontextualised, commodified future that is 'ours' to shape, Adam (2009) encourages us to pay attention to how futures are understood and made within society. This is exactly what this research also stays sensitive to: namely, to understand how future relationships between plastics and society are constructed and enacted in the present. Practices of anticipating and envisioning the future can have powerful consequences in the present because they bring ideas about the future into the now and thereby help to shape it. Especially when it comes to environmental futures, these politics of anticipation play a key role as "[i]deas of the future inform action in the present, and ways of knowing, forecasting, and actively anticipating future events are crucial elements of social organisation"(Granjou, Walker, & Salazar, 2017, p. 5). Like these scholars, I too understand the future to not be isolated from the present. How citizens narrate, make sense of, and enact their and other people's futures with plastics contributes to stabilising and destabilising contemporary ways of living and consuming with plastics.

Reflecting on how present action can impact human populations in the future ahead and affect the generations not yet born, Adam and Groves (2011) demonstrate how the construction of social futures is always entangled with questions of responsibility. With future uncertainties and potential risks accompanying every technological development and innovation, Adam and Groves remind us that social and moral responsibilities should inform techno-scientific debates in the present. In exploring the questions about how the future with plastics is intertwined with responsibilities, my research will be able to uncover how ideas about changing or continuing how we use plastics today become enmeshed with the acts of delegating responsibility to care for the quality of life of future generations. In doing so, my analysis stays attentive towards the delegation of responsibilities, embedded and situated in the structures and systems in which prospective individual and collective action on plastics are imagined.

Undoubtedly, future action is envisioned across various spatiotemporal levels. I therefore position myself with other scholars with the understanding that there exists not just one version of the future, but many. In this regard, my research too draws sensitivities from the work of Mike Michael (2017) with the understanding of an ecology of futures. Michael's work fleshes out a main differentiation between Big Future and Little Futures. Whilst Big Futures "imply very substantial, qualitative changes" and link to citizens' calls for systemic changes, Little Futures "point to the process of emergence that are attached to mundane social (and technological) processes and practices" being related to the many smaller segments of change people can imagine to be unfolding in the individual's everyday life (Michael, 2017, p. 510). Acknowledging multiple, co-existing futures provides a clearer picture of how different versions of the future—with or without plastics—interact, how futures at various societal levels can either be reinforced or undermined, and how these futures inform broader actions. A perspective on *Little* and *Big Futures* allows my research to pinpoint the spatiotemporal levels at which changes in the relationship between plastics and society are imagined to occur, and how the corresponding responsibilities for transforming our lives with plastics can be explored. This perspective also ties into my broader interest in how futures, as a key repertoire for citizens, shape their understanding of life with plastics, raising questions about the speed at which these futures materialise, the immediacy of the impacts of plastic consumption, and the pace at which changes in consumption and plastic management can take effect.

To foreshadow some of the analysis, a constant theme in citizens' Little and Big Futures concerns the pace of life in contemporary and future society. This invites us to explore Hartmut Rosa's concept of social acceleration, which helps us understand the rapidly accelerating pace of modern life and its implications for how the future is experienced and realised (Rosa, 2013). For Rosa, the motor of social acceleration is rooted in the logic of the capital economic system that requires a continuous striving for growth and speeding up, and for innovations that can secure social life in the future. Being sensitive to the presence and persistence of capitalist logics allow us to better understand how (future) problems of plastics become diagnosed not only as a material problem but also a systemic one. Keeping in mind that this research takes place in a capitalist-oriented system thus allows us to shed light on why changing or slowing down consumption patterns with plastics is (or is not) envisioned to challenge our prevalent economic system.

To understand social acceleration in the now, Rosa highlights the past as a crucial point of reference. In a similar vein to Rosa, Judy Wajcman's work on the subject of this acceleration argues that "talk about life accelerating only makes sense against an implied backdrop of a slower past" (Wajcman, 2015, p. 6). With an understanding that time is being accelerated, in other words, whereby things are speeding up and life is felt as becoming ever faster, various scholars from or intersecting with STS have investigated the idea and consequences of this acceleration for different spheres of life (see for instance Flaherty, 2011; Fuchs, 2019; Vostal, 2016). Especially important to my understanding of this social acceleration are the socio-scientific contributions that have warned against a universal understanding of modern time as being accelerated. In her work on time in academia, Felt (2016a, p. 11) connects to Rosa and Scheuerman (2009) by calling for a more fine-grained understanding of where acceleration actually materialises. "[W]hether we are witnessing an acceleration of research per se or whether different areas on which we reflected (more papers, more grants, more students, …in the same amount of time) show separate processes of acceleration within academia." Such reflections encourage me to not take social acceleration as a granted protagonist in people's everyday lives. Instead, Felt's work teaches me to pay close attention to the nuances of acceleration in different segments of society. Taking seriously the diversity in social acceleration allows us to grasp the consequences for social life when some aspects of society are imagined to be functioning at a faster pace whilst others are imagined to be following a slower one. Aside from enmeshing the temporal asymmetries along which society is imagined to function, a more

careful consideration of different paces (for example, waste management in different spaces) also allows me to unravel how plastics and society are co-produced in better detail.

3.2 NARRATIVES AS MEANS FOR TELLING AND KNOWING

One important approach for investigating time and temporalities is to reveal how they become enacted and come to matter through language and conversations. A central concept regularly conveyed through speech is narratives. Narratives are one of the main resources that social scientists analyse when they aim to understand how people perceive and make sense of the world around them (Clarke, 2005). Both *with* narratives and *through* narratives, people construct and convey different cultural norms and values. This makes narratives an important resource for stabilising (or destabilising) certain ideologies and beliefs within social communities (Czarniawska, 2004; Shenhav, 2015). Narratives are often woven into wider societal understandings and imaginations of the world. They thus always have a situated character. Making this situatedness explicit has been a major aim of STS research, which seeks to understand how narratives reflect and shape specific social contexts, relationships, and power dynamics. In my research, I adopt an STS-oriented approach to narratives, acknowledging the significance of this situatedness.

Especially for research with participatory settings, it is crucial to keep in mind that narratives emerge dynamically through interactions. Given the evolving character of narratives in participatory situations, Squire et al. (2014, p. 69) suggest that "researchers as well as participants become part of a mediation process through co-constructing and interpreting narratives." Both participants and researchers (session moderators, for example) shape the participatory space in which narratives are (re-)told, accepted, rejected, questioned, and negotiated. Thus, paying close attention to the context in which narratives are told and in which they are analysed allows scholars to take the situatedness of narratives into account (Czarniawska, 2004). The work of many social scientists, including Barkhuizen (2015, p. 99), demonstrates how "[n]arratives are discursively constructed with others in particular spatiotemporal contexts", and highlights the importance of considering the historical, social, physical, and discursive realities in which narratives are situated. I position myself with other scholars in arguing that it is important to investigate not only the content that is conveyed by a narrative but also the contextual specificities that help shape the narratives in the first place. The next chapter contains a sub-chapter that elaborates on the spatiotemporal contexts in which citizens' narratives about plastics are situated. These spatiotemporal specificities will be

a major feature of this research's empirical analysis: to put the narratives—told and constructed by citizens about plastics—into context.

Considering the constructed nature of narratives is especially crucial when "narrative materials come into existence as part of the research" (Squire et al., 2014, p. 7). When engaging with people in interview settings or in participatory exercises in which narratives will dynamically evolve, staying attentive to the constructed backdrop behind these narratives is of great importance for socio-scientific investigation. Highlighting the importance of scientific reflexivity when analysing narratives that emerge out of participatory approaches, in the methodological chapter I critically engage with my and our role as researcher and research team in gathering empirical data, which ultimately forms the foundation of this research. In addition to this elaboration on the implications of narratives that emerge from such research interactions, my analysis takes into consideration that the narratives discussed are constructed and shaped through the situated circumstances of the research. This reflexive understanding taps into the understanding that research itself is always a product of these situated circumstances—whether in participatory methods or more conventional approaches—shaping both the data we gather and the narratives we construct in the process.

Despite being regularly labelled as influential tools that help share understandings and meanings of the world, stabilising and, likewise, destabilising social worlds, what exactly a narrative is, remains a subject of debate with countless scholars continuing to argue over any clear-cut definition of what a narrative is and what it is not (Squire et al., 2014). When employing a narrative approach to understand how people make sense of themselves—of the world and its socio-technical phenomena—we are thus confronted with questions such as what counts as narrative and what counts as a story, what kind of element a discursive practice requires to be labelled a narrative, how local or global narratives are, or how general or specific the conditions are that are carried forward by a narrative (Merrill, 2007; Squire et al., 2014). In the face of these challenging questions about how to best operationalise narratives, the understandings, efforts, and insights arrived at by other social science scholars help sharpen my narrative approach.

To be clear, whilst I consider a critical engagement with the work of other scholars important in striving towards a robust narrative approach, arriving at any definitive and conclusive answer of what precisely a narrative is may not be feasible, especially since the meaning of narrative is

often strongly tied to specific disciplinary boundaries. I certainly share Merrills' (2007) scepticism of whether aiming for a clear-cut definition of narratives would actually contribute to a more meaningfully understanding of people's contemporary perceptions of plastics. Nonetheless, I still regard this engagement to be an important point of departure to offer the reader a better insight into how my theoretical sensitivities about narratives are situated within existing socio-scientific literature. So, much like Merrill (2007, p. 6), I do not attempt to establish any clear-cut delineation of what counts as narrative and what does not. Instead of defining, my research focuses on describing and "entertaining [the] possible functions of narrative[s]". Turning the focus towards the functions of narratives allows me to investigate the roles and functions of time, and the temporalities conveyed through narratives for people's sense-making of plastics. Before diving into the specificities of my own research, as promised, I will first make concrete my theoretical sensitivities by discussing the intertwinement of narratives and time before elaborating on my understanding of the roles of narratives as a means to both construct the world and make sense of it.

3.2.1 Entanglements of time and narratives

Narratives allow people to share their perception and understanding of the world, across a variety of temporal spheres. This multitemporal flexibility signifies the advantages of using narratives as a concept for engaging with matters that have to do with multiple timeframes (Bruner, 1987; Czarniawska, 2004; De Fina & Georgakopoulou, 2015). By the 1980s, philosopher Paul Ricoeur (1980a, 1980b) had drawn together time and narratives and explored how discursive endeavours help to create spaces for narratives to take form as societies come to reflect on their experiences in the world. Ricoeur discusses this interwovenness of time and narratives by arguing that "time becomes human time to the extent that it is organised after the manner of a narrative; narrative, in turn, is meaningful to the extent that it portrays the features of temporal experience" (1980b, p. 3). For Ricoeur, temporality is a crucial ingredient of narratives, as narrative forms of simultaneous speech inherently involve temporal consideration.

Ricoeur's attempts to investigate the meaning of time and narrative for the ordering of human life foreground the idea of linear ways of understanding and speaking about the world. Like other scholars, he carved out how processes of emplotment are a fundamental principle of the construction of a narrative's linear chronology. According to Ricoeur, even the smallest of narratives conveys a plot that relies on the temporal succession of events, whereby the

narrative develops: from somewhere towards somewhere else, from a certain beginning to a certain end or finale. A plot gains meaning only as its narrative content is recollected. In other words, one cannot know a narrative's plot before it arrives in the present moment, and one can only know the plot after they have read or heard it. It is with this understanding of narratives that we can come to better understand how people of various backgrounds come to treat this plot—of living with plastics—as an ongoing experience, as a story without an end. This understanding is also important because it helps explain why anticipating the conclusion and the ending of our story, of our lives with plastics, remains a difficult endeavour for many citizens.

In engaging with Ricoeur's work, other scholars have since reflected on how narrative plotting enables people to bring the complexity of different events, situations, and activities of life into a certain temporal order and to establish a sense of meaning (Freeman, 2015; Wood, 2002). For example, Wood (2002, p. 37, emphasis in original) notes that "[f]or Ricoeur contends that only narrative discourse can create figures of human time. Just as painting is a *visual* representation of reality which shapes or configures *space*, so narrative is a *verbal* representation of reality which shapes or configures *time*." Acknowledging the intertwinement between time and narrative as inseparable enables us to investigate how narratives function as discursive means to share and shape temporal orderings of the world, including its plastic-permeated parts. Thus, narratives support people's temporal ordering. This allows them to construct, understand, and make sense of their own living realities and actions with plastics, its consumption and its remnants, and set them into relation with the actions of other communities and their own living worlds. As social lives unfold over time, my research thus considers narratives to be an important device that enables people to describe and make sense of the plastics-related encounters that have taken place throughout the course of their lives.

How narratives organise human experience and thereby, how they structure people's thinking and senses of reality, has also been discussed by narrative psychologist Jerome Bruner. In his work, Bruner sketches out how the intrinsic temporal character of narratives establishes "narrative as a form not only of representing but of constituting reality" (Bruner, 1991, p. 5). Coining the notion of 'lived time', Bruner (1987) sees narratives as a key form of discourse that is entangled with temporal structures and that shape people's social realities. "We seem to have no other way of describing 'lived time' save in the form of a narrative. This is not to say

that there are no other temporal forms that can be imposed on the experience of time, but none of them succeeds in capturing the sense of *lived* time: not clock or calendrical time forms, not serial or cyclical orders, not any of these" (Bruner, 1987, p. 692, emphasis in original). Bruner argues that it is difficult, if not impossible, to express information about someone's 'lived time' without drawing on forms of narratives.

These insights sharpen my theoretical sensitivities in so far as they treat narratives not solely within the temporal structure that is created through calendars and clocks, but also through the sense of time brought to life through the very practises of storytelling that people draw on in making sense of the world and their lives in it. Such an approach to narratives can account for the multiplicity of temporalities that comprise people's worlds and equips us to better unravel how these narratives then inform people's understanding and sense-making processes of how they have lived, how they live now, and how they expect to live with complex socio-environmental issues like plastics. Ricoeur's and Bruner's contributions to the scholarship on narratives and time shed light on the advantages the analytical and interpretative work of socio-scientific scholars can benefit from if they acknowledge time and narratives as being inseparably entangled. Positioning my research amongst the work of these and other scholars—who approach time and narratives as a tight intertwinement—I take seriously how these deep intertwinements accentuate the multiplicity of ways in which people's minds, language, and living realities with plastics can be related.

3.2.2 Narratives for constructing realities

As we have seen, through narratives people connect with and communicate about the societal and material realities they have lived, live, and want to live in. Similar to Bruner's conceptual contributions, Czarniawska (2004, p. 6) not only argues that narratives are a crucial way of communicating but that they should be treated "as a mode of knowing" themselves. Thereby, it is the linear ordering of events and actions that allows people to make sense of and know a phenomenon. Importantly, Czarniawska notes that the linear sequencing in narratives is often the very thing that suggests or fosters a causal explanation. This deviates from Bruner who has, for example, cautioned that "[t]he loose link between intentional states and subsequent action is the reason why narrative accounts cannot provide causal explanations" (Bruner, 1991, p. 7). Czarniawska instead proposes that narratives themselves convey the very idea of causal logics—which come back to narratives to give them their own explanatory power. These discussions sharpen our attentiveness towards the ways in which the sequencing of events and

ideas of a causal relationship—between plastic-related action and effect for example—give meaning to the narrative and, as a result, construct a certain version of reality, even if the causality between the events might remain somewhat vague or yet unknown.

This line of research also draws on the contributions investigating the interactive character of narrative practices, such as memory-building or future-making. The next few paragraphs elaborate on how these two practices are central functions of narratives, particularly in analysing how people make sense of their lives with and without plastics. Partaking in social life gives fertile ground for recalling memories in the retrospect and aids in re-constructing realities of the past. This is the basic premise of the ideas explored by the sociologist Maurice Halbwachs (1992). Whilst individual memories do not need to be shared discursively per se, sharing them through narratives entails setting individual memories and experiences of the past into relation with broader collective memories of society. By participating in such narrative practices, different social communities therefore produce different accounts of the past and build what Halbwachs (1992) describes as a collective memory. Thus, narratives situated in a certain sociocultural context can function not only as cultural tools for people to (re-)visit past times and construct such collective memories, but also to make sense of the respective event or phenomenon and to define their socio-cultural reality (Wertsch, 2008). Halbwachs' insights draw attention not only towards how shared narratives can function to re-collect individual experiences with plastics, to establish a sense of what life was like in former times but also how these collective memories can provide deeper insights into the degree to which past norms and values continue to help shape today's realities in our plastic-permeated society.

Sharing narratives of former times and building collective memories together serves multiple purposes; it can, for example, help establish a degree of social cohesion within a social group (Halbwachs, 1992), stabilise interpretations of the social past (Nicholson, 2017), or even transform how people speak about and relate to a shared past (Glăveanu, 2017). Whilst the establishment of collective memory is built upon a tug-war between remembering and forgetting (Jovchelovitch, 2012), analysing narratives that gravitate around the past and accompany collective memories enables us to deepen the investigation of how individual experienced pasts can connect to collective pasts. This approach aligns closely with scholars who reject the idea of a generalised (plastics-related) past being the same for everyone. Instead, it embraces an understanding that sensitises research to relate individual experiences

and stories about living with plastics to collective pasts that are situated within the broader context of Western industrialised society.

Visiting the distant past through narratives to establish collective memories is thus an important practice of present-day meaning-making. Or, as Jovchelovitch (2012, p. 441) puts it, how "we feel, perceive, think and talk about in the present, can only come into being through the stories we choose to remember and the manner in which we tell them". Because most narratives about shared pasts are loaded with cultural meanings, values, and norms, understanding collective memory-building practices allows us to uncover which values and norms are accepted and which ones are contested in each social context and therefore, which ones continue to inform social worlds in the present. These insights play an especially valuable role in sharpening the analysis of citizens' diagnostic narratives about their perception of a plastic-reduced past and why we routinely encounter a conflict between two versions of the past that simultaneously inform how people understand the role of plastics in the present. At the same time, these ideas also help to shed light on how people's narratives about their past experiences with other substances shape their discussions about general precautionary principles that could help govern and manage (micro)plastics. This line of thought already hints at the function of narrative recollections of the past, which contribute to anticipating how life with plastics might look in the future and how potential change might be brought about.

With the forward-moving plot of life heading towards the future, various socio-scientific scholars have expressed the importance of narratives for informing the future (for example Adam & Groves, 2007; Adams, Murphy, & Clarke, 2009; Appadurai, 2013; Brown, Rappert, & Webster, 2000; Michael, 2017). As discussed, narratives enable people to connect the past and present of different phenomena to speculations, imaginations, and anticipations about the not-yet. Imaginary and narrative accounts thus not only describe various versions of the future but also how these versions are mobilised in the present and how they thereby help to create space for us to examine choices and alternatives (Adam & Groves, 2007; Tutton, 2017; Urry, 2016). Ultimately, the imaginations, expectations, and visions of the world that people share through their narratives have consequences. They aid in creating a future that fits people's interests or profits and reflects their values (Jasanoff & Kim, 2015). Investigating anticipatory narratives is one of the important means through which we can shed more light on how expectations about society's future with plastics and plastic consumption are shaped.

Whilst narratives are important for sharing expectations of the future, they also serve to make sense of and stimulate measures and regulations that should be implemented in the name of the futures people want to be realised. I therefore understand narratives of the prospect as cultural tools that inform the course of human action. In other words, I believe that talking about the future has real political implications and real material consequences for the present. This points to the performative power of narratives and the powerful "fabrications of the future", as narratives and discourses work to construct and shape our perceptions of what the future can and should be (Jasanoff & Kim, 2015, p. 337; Oomen, Hoffman, & Hajer, 2022). These fabrications influence decision-making processes and guide actions toward specific outcomes whilst they simultaneously legitimise and justify those very same actions. In this sense, people share narratives not only to understand their living realities and the world around them but also as tools to legitimise and justify human action or non-action, which function to mobilise certain futures and not others. For example, narratives about avoiding plastic packaging, following or implementing more precautionary principles, or reusing plastic artefacts are employed ostensibly to enact more sustainable versions of the future. Yet, there are also narratives arguing that plastic consumption is not inherently harmful and emphasising the benefits of plastics in modern life, such as their role in food safety, medical advancements, and energy efficiency.

Many contributions from the social sciences have discussed narratives regarding techno-scientific progress and future innovations, and more and more work increasingly gravitates around narrative practices of socio-environmental phenomena and their consequences, such as climate change, sustainability, and life in the Anthropocene more generally (Lidskog & Waterton, 2018; Moezzi, Janda, & Rotmann, 2017; Roßmann, 2021). Rather than arguing for a single version of the future, their work has regularly demonstrated that narratives of socio-technical futures are situated across a broad spectrum of realities: from dystopia to utopia and every future in between. These insights sensitise us to acknowledge the fact that there might not be a future version with or without plastics, a plastic dystopia, or a plastic utopia. Instead, what we might encounter is a multiplicity of futures with and without plastics, loaded with different responsibilities to re-think or govern how we consume plastics in the present. This approach to futures enables us to investigate how different future visions become associated with different spatiotemporal levels, further underlining the importance of acknowledging the temporal closeness or distance of the said future as well as the simultaneous existence of

different sociocultural scales and communities in which visions of the future are narratively attributed to.

However, because narratives about technological innovations and developments are also accompanied by future-oriented promises and concerns, we should always be mindful of representation. Felt et al. (2007, p. 35), for example, remind scholars to question "whose visions of the future should drive the direction of progress". By taking a narrative approach to investigating people's sense-making of (our lives with) plastics, it is thus vital to carefully look at whose expectations of the future become incorporated in narratives and whose do not. With narrative practices conveying expectations about the prospective relationships between plastics and society, there is a need to stay attentive to questions of whose versions of the future become avoided and closed down, and whose versions of the prospect become supported and opened up. The questions sensitise us to the need to take issues of power and authority—constructed and re-constructed through narratives at various levels of society—seriously (Squire et al., 2014). At the same time, the extent to which imagined futures are narratively shared and understood as plausible, feasible, or even desirable is tied to the socio-cultural context in which they become expressed and explored (Bai et al., 2016). This encourages us to pay close attention to how expectations, desires, and needs for the future travel in the forms of community and actor-specific narratives. Because narratives are always circulating across certain social settings, it is essential to keep in mind that some narratives will likely become more dominant than others. Accounting for this narrative asymmetry (Ochs & Capps, 1996) that can emerge when we investigate narratives, we must stay attentive to both the very powerful and well-entrenched narratives as well as the marginalised and often silenced ones. Doing so will ensure that we can shed more light on more voices, opinions, and concerns that have or have not been imagined to have a role in the making of societies' future with plastics.

In conclusion, the telling of narratives serves as a fundamental process through which individuals engage in sense-making, offering a means to understand and relate to the world around them. In the context of this research, citizens' narratives—carrying temporal repertoires—are essential for making sense of plastics. Central to this investigation are what Felt, Felder, Öhler, and Penkler (2014), in their study of the socio-medical phenomenon of obesity, have referred to as *temporal narratives*. By integrating the intertwinement of time and

narrative, temporal narratives provide a key gateway for understanding how people engage with plastics in their lives. They allow individuals to reflect on past encounters with plastics, navigate their present-day concerns and responsibilities, and envision future interactions with these materials. The next chapter will offer a more detailed exploration of how these temporal narratives are operationalised within the specific framework of this research.

4. METHODOLOGY AND MATERIALS

As part of the PLENTY plastics research platform, our team of researchers at the Department of Science and Technology Studies consisted of my PhD supervisor and one of PLENTY's Co-PIs, Univ. -Prof. Dr. Ulrike Felt, my colleague Artemis Papadaki-Anastasopoulou, and me. Together, as a team with different backgrounds, knowhow, and expertise, we re-fabricated the card-based discussion method IMAGINE (Felt, Schumann, & Schwarz-Plaschg, 2017) into IMAGINE PLASTICS, tailoring the method to cover a wide spectrum of multifaceted and often contrasting positions, views, arguments, perspectives, and stakeholders in discussions about our life with plastics. As a main component of the PLENTY research agenda, IMAGINE PLASTICS is the methodological heart of my research. The following chapter discusses this methodology and my research materials. In the first part of the chapter, I revisit three main challenges of participatory methods that aim to engage citizens with new or complex socio-technical issues, and how IMAGINE PLASTICS speaks to these challenges. The second part then elaborates on the specific phases and choreographies of IMAGINE PLASTICS and their role fostering in citizens' sense-making of plastics. Finally, the third part of the chapter revolves around the development of the cards and video used in the IMAGINE PLASTICS method. After elaborating on the organisation of participants and implementation of the method, the chapter concludes by providing insights into the specificities of analysing empirical material with a gaze on temporal narratives.

4.1 IMAGINE: A CARD-BASED DISCUSSION METHOD

Often subject to criticism (see Chapter 2. State of the art), participatory methods are an important tool for social science scholars to foster citizen engagement with complex socio-technical issues. Thus, it might not come as a surprise that the STS team of PLENTY had anticipated that a public engagement method would be the best pathway to understanding how citizens make sense of the relationships between people and plastics. As a methodology that seeks to involve members of society with complex socio-technical issues, engagement methods like IMAGINE PLASTICS face three main challenges (Felt, Schumann, et al., 2017; Felt, Schumann, et al., 2014). These routine challenges along with how IMAGINE PLASTICS, as a card-based discussion method, seeks to navigate them with a notably different approach to public engagement, are outlined below.

When discussing the first challenge of engagement methods, we should keep in mind that these methods often target specific technoscience issues. However, a major problem can be that the technoscientific issue wishing to be covered by such a method may not yet be widely present in the public discourse. At these early waypoints, these issues have not yet become mainstream and citizens can often lack broader frames of reference to such specific issues. Because of that, they can often be unaware of a variety of different stories and positions of various relevant actors and stakeholders, which circulate around a given issue. According to Felt, Schumann and Schwarz-Plaschg (2017), without a proper frame of reference, set of experiences, or examples at hand, engagement methods can experience substantial difficulties in getting participants to develop their thinking and move beyond vague reflections. In these cases, a participatory method with citizens would lack substantial depth. Furthermore, this challenge is not all or nothing. In the case of plastics, for example, there are some areas that are not heavily covered in the media nor in public discourse, meaning that citizens might not be familiar with some of the finer details of an issue, such as microplastics, nanoplastics, plastic additives, or bioplastics.

Thus, a lack of broader frames of reference on plastics can also pose challenges for participants to engage in more nuanced and deeper reflections on our lives with these materials. To nevertheless attempt to bring more depth into the discussion, with ready-made scenarios (Bennett, 2008), for example, would also yield criticism as these constructed scenarios bear the risk of limiting and pre-defining the issue for participants—nothing that would help foster participants' creative capacity to engage with the issue. Instead of ready-made scenarios, the card-based method IMAGINE aims to cope with these challenges by making a wide variety of positions accessible to participants vis-à-vis printed cards (Felt, Schuhmann and Schwarz-Plaschg, 2017). Each card attempts to provide participants with a point of departure to better engage with the new, complex, or controversial technoscientific issue at hand, whilst still keeping the topic open for more sophisticated discussions and reflections. These points of departure come from a multitude of different societal, scientific, technological, political, and environmental perspectives. The cards are a vital component of IMAGINE as they directly create the precedent for a hands-on engagement with the issue at stake and support citizens sense-making processes therein, as citizens are asked to reflect on, sort, categorise, order, or prioritise using the cards given to them.

The second challenge for engagement methods concerns the social dynamics that can unfold in participatory discussion settings. Many formats with public participation strive for a certain heterogeneity amongst the participating citizens. This heterogeneity can manifest in differences regarding "backgrounds, agendas, relations to the topic, and knowledge forms (e.g., professional expertise, experiential knowledge of patients)" (Felt, Schuhmann and Schwarz-Plaschg, 2017, p.1170). However, differences in age, gender, and level of education can also bring heterogeneity into discussion groups. On the one hand, this heterogeneity is something that is coveted. As researchers, it enables us to capture more diverse pictures of the manifold narratives, opinions, and stakes circulating in the public. On the other hand, it is precisely this heterogenous group diversity, which can raise burdens for the engagement of certain participants, limiting the ways in which their sense-making potential can unfold. Whilst some participants are more acquainted with discussion situations, are more at ease with partaking in debates, and do not have issues with voicing their positions, other participants less familiar with such settings can have major difficulties in doing so. Therefore, the heterogeneity of discussion groups can also help create varying degrees of participation, which Felt, Schuhmann and Schwarz-Plaschg (2017) call "participatory injustice". Quite plainly, some participants will participate less than others. Yet, to nevertheless create a space in which every individual participant gets their own time to express their position to the rest of the group (even those that are relatively contested or thought to be minor), the IMAGINE card-based discussion method targets a specific choreography. Within this choreography, participants are invited to first elaborate on their personal card choices and positions individually; it is only subsequently that the discussion is then opened to the entire group. The precise choreography of IMAGINE PLASTICS will be detailed later in this methodology chapter.

The third challenge of participatory discussion methods circulates around another social dynamic: the tensions between experts and lay people. In some participatory processes, aside from members of the public, thematical experts are included. These experts should provide participants with a diverse set of perspectives and insights. Thus, when politicians, members of NGOs, or expert scientists on specific issues are invited to participate, participating citizens are physically confronted with them. The inclusion of experts in public participation settings can fuel what MacLean and Burgess (2010: 487) describe as risks of expert or "stakeholder capture". In such encounters, some participants will find it difficult to openly express disagreement or to voice a position that opposes one of the experts (Felt, Fochler, Müller, &

Strassnig, 2009; Myers, 1998). The presence of experts can thus create intimidating situations that discourage citizens from genuinely engaging in discussing the topic at stake. However, this conglomeration of heterogeneous perspectives including expert ones is of great importance in illuminating technoscientific issues from different angles, enabling participants to balance and re-negotiate advantages and consequences, and allowing participants to develop their own positions. To balance this reality—to reduce potential tensions in the encounters between experts and participants whilst simultaneously providing participants with a wide array of existing perspectives, the IMAGINE method contains cards that help mediate expert positions. The cards themselves are thus a mechanism to cope with the potential tensions between experts and lay people.

It is in response to these three main challenges of engagement formats that Felt, Schumann and Schwarz-Plaschg (2017) developed the card-based IMAGINE method to try and better engage citizens in technoscientific discussions. The method attempts to cope with the challenges of many participatory methods by stimulating participants' rich and in-depth reflection on the issue at stake. Initially developed to research public engagement in the case of nanotechnologies, IMAGINE offers participants the opportunity not only to discuss related complexities but to still develop a position towards the issue itself (Felt, Schumann, et al., 2017). In doing so, IMAGINE already boasts a solid methodological framework (with, for example, discussion cards, different phases, a specific participatory choreography, physical absence of experts, introductory videos, and so on). Nonetheless, IMAGINE is not a ready-made methodological tool for any research pursuit. Instead, it must be tailored to each specific research topic and context. Previously, for example, it has been tailored to study cases like nanotechnology, responsible research and innovation, and research integrity. Furthermore, it has also been tailored for the participation of different audiences such as citizens or researchers (Felt, Fochler, & Sigl, 2018; Felt, Schumann, et al., 2017; Felt, Schumann, et al., 2014).

As a co-PI of the PLENTY plastic research platform and its research agenda, Prof. Ulrike Felt had anticipated that the IMAGINE card-based discussion method could serve as a suitable method for a public engagement format for Viennese citizens with plastics. Our team therefore tailored the methodological framework of IMAGINE to the issue of plastics and the context of Austria. The aim was to render the method specific enough to facilitate citizens' discussions and stimulate lively debates plastics, but open enough to let citizens bring in their own experiences,

narratives, and perspectives, and allow them to position themselves within the plastic debate. IMAGINE PLASTICS thus aimed to be a space where citizens were invited to make sense of their lives with plastics. How exactly we adapted the framework of IMAGINE for developing IMAGINE PLASTICS is elaborated on in the sections below.

4.2 IMAGINE PLASTICS: CHOREOGRAPHY AND FOCI

Like other methods for public engagement, IMAGINE PLASTICS is performative and contributes to the reality we as scientists aim to observe (Law, 2004). The ways of how we intended the discussion method to function, was deliberately built into the method (Akrich, 1992) and speaks to the methods' performativity. In other words, IMAGINE PLASTICS followed a certain script. In that sense, this method of engagement scripts the participatory event and sets rules and frames for its users, our participants. With its different phases and choreographed discussion sequences (see Figure 1), the methods' design shapes participants' discussions and their discursive foci.

The IMAGINE PLASTICS method generally follows the following script. First, citizens are invited to a discussion session. Eight recruited participants enter the venue, with all organisational matters having already been taken care of beforehand (see more details on recruitment and organisation processes in sub-chapter 4.4 below). Once all participants are seated, it is not the moderator who introduces the topic of plastics but instead a nine-minute introductory video. Using a video to begin the discussion session is aimed to circumvent the case that the moderator is interpreted as an expert and not as a facilitator of the discussion (Felt, Schumann, et al., 2017). Amongst other things, the video touches upon the history of plastics, the development of plastic production over time, different types of plastics, microplastics, plastic additives, waste management in Vienna, and uncertainties about impacts on human and environmental health. In doing so, it does not aim to provide a full picture of our lives with plastics. Instead, it is intended only to refresh participants' memories about the socio-technical issue being discussed, inviting them to acclimate to the setting of the discussion that is to come. The video ends with the stage for the discussion session being set with the question, "*How do you live with plastic?"* (German: *Wie leben Sie mit Plastik?*).

The session is facilitated by a moderator inviting them to look at the issue of plastics in four different discussion phases. Figure 1 shows the rough structure of these four phases. Each of IMAGINE PLASTIC's four phases engages citizens with plastics and our lives with these materials from a specific angle: Phase 1 (story cards): Broader narratives about plastics from different stakeholders; Phase 2 (context cards): specific areas, contexts, and applications of (micro)plastics; Phase 3 (responsibility/action cards): responsibilities and actions gravitating around the life with plastics at different levels and compartments of society; and phase 4 (future visions): future visions imagining prospective life with plastics.

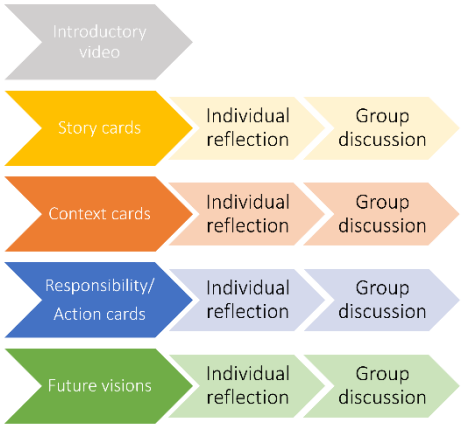


Figure 1 IMAGINE PLASTICS Session choreography

In the first three phases, a different set of cards is handed out to each participant whilst the last phase is guided by open-ended questions (see Appendix A, B, and C). Participants are asked to choose the card(s) most relevant, most contested, or most concerning to them. They are asked to place their chosen card on the discussion board in front of them (see Appendix D). The discussion board is a space where citizens can place their chosen card and keep an overview of which card(s) they chose in which phase. After choosing the card(s), each participant explains their choice. Starting with such individually oriented sequences ensures that each participant has space to elaborate on their chosen card(s). However, during these periods other participants as well as the moderator are not silent. Instead, after the individual explains their positioning, they are often asked questions to clarify certain aspects and to dig a little bit deeper into the card they have chosen. Here, other participants are able to share similar observations or raise critiques for the presented card. Thus, even whilst everyone is purposely afforded moments in which to elaborate on their chosen card(s), IMAGINE PLASTICS still allows space to be open for the moderator and other participants to interact dynamically.

After each participant can reflect on their choice, the moderator begins to move towards a more collective discussion of the respective card phase. In doing so, the moderator connects the individual positioning work in order to initiate more collective reflections and discussions. This sequential structure—of choosing cards, reflecting individually, and discussing collectively—is the same for the first, second, and third phases of the method, however, each phase follows a different topical focus. The dual structuring of each phase offers participants a structured way to reflect openly on different dimensions of plastics without the discussion being overly preconfigured. At the same time, this method also ensures that empirical material is generated no matter what, allowing us to gain insights into citizens sense-making from both the individual positioning work as well as the ensuing moments of collective negotiation and the collaborative recollection of underlying narrative resources.

Before the first phase started, the moderator elaborated shortly on the methods' choreography mentioned earlier. The moderator informed each participant that they have three sets of cards face down in front of them. Throughout the discussion, the moderator will explicitly ask the participants to take up a specific set of cards and choose one card or more from this set. To the participants, the narrator clarifies that *"[y]ou [participants] discuss with each other, not necessarily with me*" (G1_UF:1). This type of statement helps the moderator strengthen their role as the facilitator of the discussion and rebuts their position as an expert. Covering a broad variety of positions and perspectives on plastics, the moderator reminds participants that the discussion session itself is not about having the right or wrong opinion about plastics, but about expressing their own views and thoughts towards (living with) plastics. Furthermore, the moderator explicitly invites participants to voice minority or contested plastic-related positions.

After participants were asked to say a few words about their connection to the issue of plastics, why they were at the discussion session, and why they wanted to engage with plastics, the first card phase started. In the first phase, participants were provided with a set of eight story cards (see Appendix A). The story cards contained short texts that covered a wide spectrum of different perspectives from various actors in the plastic debate, including citizens, EU decision-makers, scientists, environmentalists, small business owners, and environmental experts. The moderator asked participants to choose the story card that spoke to them the most, aligned with their own opinion, or that they found the most concerning or worthy of discussing. Choosing just one story card was challenging for several participants. We frequently

encountered participants who would probe this request, to attempt to de-script the method's design in trying to choose more than one story card. Tobias[3], for example, asked the moderator, "*Can you link two stories together because they are actually inseparable?*" (G2_TO:5), whilst Bernd presented his fait accompli by sharing that "*I have to say, unfortunately, there are (laughter) five cards [...] Because there's always an interesting sentence and, and I couldn't decide*." (G4_BE:4). In the end, we left participants with the freedom to deviate from our intended choreography to choose more than one card, which, as researchers, also afforded us another opportunity to investigate how citizens see different positions and perspectives of their lives with plastics to be connected. Whether participants chose one card or more, they were always asked to explain and elaborate on their choice(s).

By picking up some of the issues that had surfaced in the individual positioning, the moderator stirred the discussion about the story cards with particular directions. For example, the moderator would ask something like, "*[...] you have been now also addressed again and again, [...] the citizen card A, the card 1, where yes it also addressed with what do we replace, if we begin to use less plastic, so to speak, with what we replace it?"* (G3_UF:25). Due to the openness of IMAGINE PLASTICS' collective discussion sequences, the moderator was able to stimulate participants for even deeper reflections or more nuanced clarifications. At the same time, the moderator was able to move the discussion along the lines of the story cards and their related perspectives on plastics, making sure to always move the discussion in directions that could bring up cards that had not yet received attention. In this sense, the moderator was able to use the cards to provide us with insights that would have otherwise remained undiscussed.

The second phase of the method focussed on different plastic applications and contexts. We provided participants with 12 context cards, which displayed pictures and texts about single-use plastics, medical plastics, electronics, games, food packaging, microplastics in the air, plastic additives in matrasses and more (see Appendix B). The participants were invited to choose two cards in which they considered plastics to be problematic, essential, reasonable, replaceable, or generally worth discussing in greater detail. Despite the openness for the underlying reasons of choice, this phase also confronted participants to engage in a form of classificatory exercise of the many different applications and contexts of plastics to come to a decision. One might criticise the fact that we limited these context cards to 12 contexts, applications, and areas

[3] The names of all participants are pseudonymised.

despite the existence of countless other contexts in which plastics are entangled. However, within the discussions prompted by the context cards participants would often be reminded of other contexts of plastic use, which, in turn, could move the discussion towards discussing other situated contexts.

After a short break to refresh, participants came back to the third phase, which focuses on responsibility and action around plastics**.** The 12 responsibility/action cards (and two empty ones) contain various plastic-related measures and actions, each speaking to a different set of stakeholders, area, or scale of responsibility. Examples here include fostering waste management structures, 'the polluter pays' principle, stopping littering, regulation and declaration, and scientific assessment. In this phase, the moderator explicitly asked participants to choose two responsibility/action cards they found most worthy of discussion in regard to the question of who should take which plastic-related actions and when. Importantly, this phase has one feature different to the other card-based phases: participants are given two blank cards. These blank cards are intended to create a space for participants to present their own suggestions for action and responsibility in the case that our pre-composed card does not fully suit their needs. Several participants made use of this opportunity. Discussing his decision to use the blank card, for example, Frank explained, "*Well, so I wrote on one card, prohibitions* [bans]; *so I think you can't get by without prohibitions*." (G1_FR:76). Writing their own cards not only provided participants with the opportunity to raise and discuss their own plastic-related actions and responsibilities, it also helped our STS team to cover potential blind spots.

Finally, the last phase of the method focused on future visions. In this phase, participants were not provided with any cards. Instead, the moderator invited participants to imagine what the relationships between plastics and society would look like in 2030—11 years from then. In turn, each participant shared their prospective visions, and the session proceeded once again into a more collective reflection of the issues at stake. After the discussion session was officially closed, participants received their monetary compensation and left the venue.

4.3 DEVELOPING ITS CARDS AND VIDEO

4.3.1 ANALYSING MEDIA AND POLICY MATERIALS

The cards described above are a key element of the IMAGINE PLASTICS discussion method. To create the cards' content and thereby tailor the original method to the issue of plastics and the case of Austria, it was essential to identify the entire spectrum of issues, arguments, opinions,

perspectives, key actors, and regulations in debates about plastics a priori. To do so, our team conducted (1) an analysis of Austrian newspaper articles to identify arguments about plastics in public discourse between 2010 and 2018, and (2) a document analysis of key papers from regulatory entities, position papers, and online informational materials from civic society organisations (including Greenpeace, Austrian NGO Global 2000, and the Environmental Agency Austria) to understand their positioning as well as their perspectives about our lives with plastics. As I was mainly responsible for and involved in the analysis of media articles about plastics, I am able to elaborate on this part of our preliminary analysis below.

Media are frequently conceptualised as spaces where members of the general public make contact with the publicly visible parts of issues. News media mediate important aspects of, for example, what citizens perceive or construct as a problem, which actors are identified as partaking, what potential actions and solutions could govern problems, and how responsibility is framed and distributed. Therefore, news media articles were important input materials for the creation of IMAGINE PLASTICS. To be clear, the analysis of news media articles did not aim to provide a complete picture of the issues around plastics. Instead, was used as a tool, which was "necessary to identify the spectrum of concrete arguments, explanations, actors, regulations, images, and examples that together constitute the topic" (Felt, Schumann, et al., 2014, p. 65). The media analysis should thus give insights into which (micro)plastic-related arguments, opinions, perspectives, narratives, and key actors are addressed and which are not.

Important to note is that the analysis was focused on more recent periods of print media and magazine reporting, specifically from 2010 to mid-2018. It included five Austrian national daily newspaper outlets and two Austrian weekly news magazines, *Krone* and *Kurier* as daily populist and central left-centred tabloids newspapers, *Der Standard* as a daily left-liberal quality newspaper, *Salzburger Nachrichten* as a daily regional Christian-liberal conservative quality newspaper, *Kleine Zeitung* as daily right-leaning newspaper and the largest regional newspaper in Austria, and *Profil* and *NEWS* as weekly news magazines. Both the wiso-net.de database and each newspaper's own website search engines were searched with set time filters and two keywords: "Mikroplastik" and "Plastik". With roughly 6,500 hits from the 7 newspaper entities for the set period of time, we decided to use several criteria to reduce the overall number of articles. Articles with less than 150 words were excluded from further analysis as were articles that only included the word "Plastik" but actually went on to describe something that was

placed, lost, or found wrapped in plastics—money, animals, body parts, and even corpses were discussed in these discarded articles. Additionally, articles written about art installations or exhibitions, which also contained the word “Plastik” (in German, the term can also be used to refer to art objects), such as in “soziale Plastik” of artist Joseph Beuys, were not included in further analysis.

Following this process, we were able to identify and download around 350 relevant articles for further analysis. From these articles, we created a core sample of 30 articles to be the main input material for IMAGINE PLASTICS. The core sample was composed of different newspaper outlets that covered the set time frame. To achieve a maximum level of diversity in terms of topics, stakeholders, and perspectives about plastics in the sample, we borrowed from the principle of maximum contrast as a mode of comparison used in Grounded Theory (Charmaz, 2006). Thus, instead of having three articles about PET bottle recycling from different newspaper entities from three different years, we emphasised that the articles have different topical foci. Analysing the Austrian media through the principle of maximum contrast resulted in the sample of 30 articles being quite heterogeneous in terms of the year of publication, newspaper outlet, topical and spatial focus, and which keyword brought the article to our attention: “microplastics” or “plastics”.

Structuring the further analysis of these articles were the same four main topical foci of each phase of IMAGINE PLASTICS: (1) broader narratives circulating around plastics from different stakeholders; (2) concrete areas or contexts of plastic applications and existences; (3) (potential) areas of actions, solutions, and related responsibilities; and (4) future visions of the relation between society and plastics. Even though these four broadly pre-defined categories indeed overlap, they nonetheless allowed us to approach our selected media articles in an organised manner. Following these four phases, the media articles were coded in Atlas.ti, which allowed us to identify the main elements present in the Austrian print media about (micro)plastics.

The analysis of both the media and policy material went into the development of the cards (see Figure 2). Together as a team, we went through several iterative circles of reading, discussing, revising, adapting, and refining the cards. As the first cards were being finalised, it was essential for us to reflect on whether the cards’ content was accessible to participants from various backgrounds and to assess whether the cards had adequately covered a multiplicity of the

major narratives, perspectives, opinions, contexts of uses, geographies of responsibility, and potential future processes regarding our lives with plastics. The cards were designed not to avoid overlap in terms of contexts but to be as diverse as possible. However, we also needed to ensure that there were as few cards as possible, as participants would have to read every single card for each phase before they made their selection(s). In total, IMAGINE PLASTICS had 8 story cards, 12 context cards, and 14 (two of them empty) responsibility/action cards that were evaluated. Various people contributed to the evaluation of these cards before we used them with Viennese citizens. To evaluate the final card sets, we not only relied on our own expertise but on the assessment of (1) experts in the field of plastics, including members of the PLENTY plastics research platform and (2) first-semester STS master's students and departmental colleagues who did not have prior in-depth knowledge about plastics.

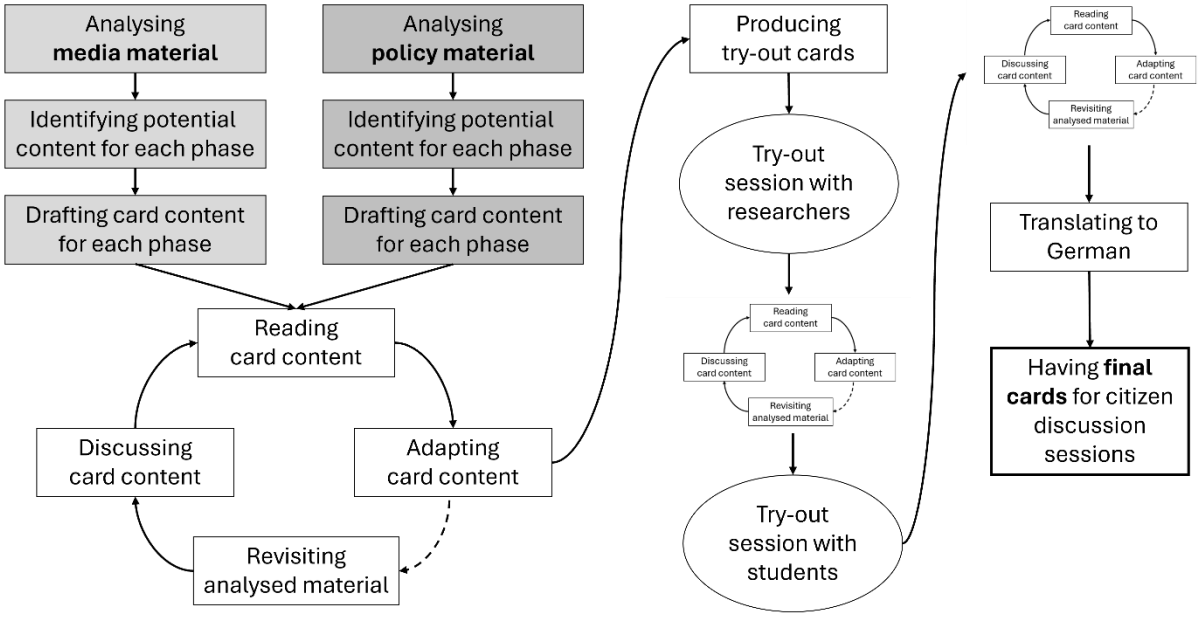


Figure 2 Iterative process of making the cards for IMAGINE PLASTICS

Within two try-out sessions moderated by Prof. Ulrike Felt, the individuals listed above were invited to examine the choreography of the method as well as the content of all IMAGINE PLASTICS cards and to evaluate whether the scope of our lives with plastics was being captured in a balanced and comprehensible way. Through the feedback process with the test groups, we received valuable comments on the content of the cards, identified textual overlap, redefined wording, and added missing arguments and positions in the plastic debate.

4.3.2 CREATING STORY CARDS

The story cards of the first phase covered a wide range of narratives and viewpoints of different actors that were frequently used in the political and media discourses circulating around plastics (see Appendix A). These debates around plastics are situated in both the global and the local. More globally oriented narratives often problematised, for example, the great amounts of plastic in the ocean with marine animals being entangled in plastics, the Great Pacific Garbage Patch or the illegal overseas waste exports and imports for recycling. Whilst there were arguments that "Austrian's share of the global plastic pollution is conceivable small" ("Tod durch Müll," 2013), locally driven narratives in particular supported the opposite position and often pointed to local plastic problems. For example, one dominant narrative that gravitated around the imagined non-functioning of current Austrian waste management structures because "many [Austrian] households do not separate their waste at all" ("Das stinkt der Umwelt! Plastik und Co im Biomüll," 2014). The analysed Austrian news media articles thus did not construct plastics as a spatially limited technology but instead, as one that reaches from the local to the global. Therefore, the story cards of IMAGINE PLASTICS purposely include both locally situated—waste sorting, local waste management structures, and littering—and more globally oriented aspects of plastics—the Great Pacific Garbage Patch, plastic waste exports and imports, and recycling streams.

However, certain narratives and actors were largely missing in the analysed media content. These absences became concrete following the analysis of policy documents, which allowed us to sketch out additional perspectives and positions in the plastic debate. For example, the analysis of policy documents helped to make visible the significance of European plastic production and plastic goods for the creation of jobs. This aspect was found to be important to our research for a number of reasons. For one, plastics are considered essential for the European economy and to stay competitive with other global economies and markets. In addition, banning plastics could threaten both workers' livelihoods and the existence of (small) businesses alike. The policy analysis was thus highly valuable in adding perspectives of people who, economically and financially, relied on the plastic industry. This is but one example of how analysing the policy material allowed us to add several perspectives to IMAGINE PLASTICS.

Even though both the media articles and the political materials contained overlapping perspectives and debates about our lives with plastics, the political dimensions certainly concentrated more on economic, financial, and industrial positions. Thus, a media analysis

alone would not have been sufficient in sketching the broad spectrum of plastic-related stories and positions necessary for the story cards in the first phase of IMAGINE PLASTICS. The need to use several different input materials to create the content of the cards is also something that has been detailed in the argument of Felt, Schumann, et al. (2014) when the first iteration of the IMAGINE method was laid out.

During the analysis, it became clear that certain perspectives were predominantly used by certain actors. For instance, whereas aspects about the uncertain impacts of plastic additives on health were mainly connected to actors in scientific arenas, the narrative of the plastic industry's ability to continue to provide jobs was generally used more by actors from economic arenas. Whilst these plastic-related narratives were not always exclusively linked to particular actors, these early results did provide us with some guidance in mapping out which perspectives and positions were often used by which stakeholders. In order to avoid overwhelming participants with such a multiplicity of stakeholder perspectives and positions, we chose to have eight story cards for the first phase of IMAGINE (see Appendix A).

The decision to provide only eight story cards for the beginning of the method made for an easier entry into the discussion. With the freedom of the IMAGINE method, we moved more complex aspects and elements into the introductory video. For example, information on the advantages and challenges of fossil fuel based, plant-based and bio-degradable plastics, the amount of plastic waste produced by Viennese households, the possible impacts arising with the use of different plastic types, plastic additives, microplastics, and persistent organic pollutants were all covered in the introductory video and not in the story cards. Instead, the story cards sought to give voice to a small business owner, a European policy maker, an environmental expert, an NGO advocate, scientists, and individual citizens. Each card and each person conveyed different positions on plastics and touched on the role of plastic bans, alternatives to plastics, employment in plastic sectors, livelihoods that were dependent on the plastic industry, plastic waste, the invisible presence of microplastics and microplastics being found in food chains, the need for scientific knowledge on plastics and its effects, the impacts of plastic additives on human health, the need for clear regulations, the conveniences of plastics, recycling as a solution, the urgency to act, the precautionary principle in regard to plastics, plastics as both a local and global issue, the short term use cases and long afterlives of

plastics, and more. The story cards functioned as a means to get citizens into a discussion and to position themselves in the plastic debate.

4.3.3 CREATING CONTEXT CARDS

The second phase engaged citizens with specific use contexts of and situations with plastics. Whilst there are countless contexts in which plastics appear, we limited the number of context cards to 12. This number allowed us to ensure that we had included a wide enough range of different plastic-related arrangements and that participants would not be overwhelmed with too much information. Accompanied by a picture, the context cards visualised plastic objects and entanglements in concrete situations and included short contextual texts and provocative questions (see Appendix B). Having both visual and textual information helped to make hidden or invisible plastic-related contexts more tangible for participating citizens with, for example, microplastics and plastic additives. Our descriptive texts allowed participants to *see* what can hardly be seen in the pictures. The texts therefore broaden not only the scope of the pictures and the context cards themselves but also the scope of what can be taken up and discussed by the participants. To stimulate a lively discussion with the context cards, we included a direct, sometimes provocative question at the end of each context card; these questions included, for example: "*How should we deal with plastics in this area?"* (card 2: health care); *"How to balance advantages and potential problems?"* (card 4: food packaging), and *"What would justify the wide-spread single use of plastics*?" (card 8: single-use plastics).

Overall, the main question in the development of the context cards was which situated plastics we would include. Having many potential contexts to choose from, we defined several characteristics the entire set of context cards should meet to increase the diversity of the plastic contexts and situations the cards would cover. First, we needed to have both problematised and publicly discussed plastics and plastic use cases (such as the context of takeaway culture), and plastics that were not the typical focus of public debate (such as plastics health care).[4] Second, we wanted both plastics and microplastics to be represented on the cards. Third, we aimed for cards that had both plastic arrangements that reflected more the collective use of plastics (such as transportation) as well as plastic entanglements that were more so situated at

[4] In 2019, when we adapted IMAGINE PLASTICS and conducted the citizen discussion groups (in October and November 2019), the topic of medical plastics and plastic in health care did not receive broad public attention. Therefore, the empirical material gives an interesting glimpse into people's sense-making of plastics shortly before the COVID-19 pandemic, which would have likely shaken up many of their relationships towards medical plastics in addition to their need for hygienically plastic-sealed food packaging.

the end of individual use (such as the proliferation of synthetic clothing). Fourth, we wanted plastic contexts that reflected both its short use (such as single-use plastics) and arrangements that had longer timeframes of use (such as matrasses). And fifth, we wanted to include both the more visible plastics and the more invisible and hidden ones (such as microplastics in the air or plastic-related chemicals).

After having decided on 12 plastic contexts that fit the characteristics mentioned above, we chose pictures that we considered most suitable in terms of representing the respective card topic and, in the case of two of the cards, the context of Vienna (context cards 9 and 10). The pictures themselves originate from different sources: some are privately taken (context cards 1, 3, 9, and 10), some images are sourced directly from the Web (context cards 2, 5, 6, and 12), and some have been adapted from the Web (context cards 4, 7, 8, and 11). All images sourced from the Web were carefully chosen and they alongside their references can be found in the Appendix B. We numbered the context cards in a way that made sure that the microplastics-related cards would not follow directly after one another. The 12 context cards were also tested in the two try-out sessions, which allowed us to refine some of their wording.

4.3.4 Creating responsibility/action cards

The third phase engaged citizens with the various responsibilities that gravitate around our lives with plastics. We choose to have 12 responsibility/action cards (and 2 empty ones), each with around 50 words (see Appendix C). The preliminary analysis uncovered a rich variety of responsibilities, actions, practices, habits, solutions, and measures around the governance of plastics in many different areas and at many levels of society: oil refineries, production facilities, distribution processes, (re-)use, disposal, waste recovering streams, multiple environments, both human and non-human bodies, and as a subject of media, regulation, or scientific knowledge creation, to name but a few examples.

On one hand, the analyses showed that certain actions for plastics were frequently associated as being within the responsibility of specific stakeholders or stakeholder groups. For instance, responsibilities for littering were frequently attributed to the individual person (see responsibility/action card 5). Yet, the choice (not) to buy everyday plastic products was mostly ascribed to *the* consumer, which appeared to be seen as more of a collective rather than an individual entity (see responsibility/action card 7). The need to have an intelligent product design and knowledge about the disposability of a product before it reaches the market was

mostly described to be in the hands of producers and consumers (see responsibility/action card 6 and card 7). Following this analysis, we included some of these main action-stakeholder packages in the responsibility/action cards.

But not all of the cards follow the logic of having an action-stakeholder package. Instead, we also have various cards that sketch out different actions and practices related to our lives with plastics that leave it open for the participants to interpret and negotiate to whom exactly they would attribute respective responsibilities. One example is card 4: the 'polluter pays principle' (see responsibility/action card 4). Whilst this card favours the polluter pays principle, it describes that it is not necessarily the ones that pollute but the ones who produce or use plastic that should take responsibility for its end of life. As the ones who produce plastics are not usually the ones who use them, it was thought to be interesting to see discussions unfold regarding the question of who should pay in the end for plastic pollution.

The final responsibility/action cards contained a broad spectrum of actions about governing the phenomenon of plastics, including regulatory measures, environmental initiatives, scientific practices, and individual engagement and practices; the cards thus distributed responsibilities to various stakeholders differently from case to case. Again, these responsibility/action cards were not intended to be a comprehensive list of all existing or possible plastic-related activities, measures, initiatives, and regulations. However, in order to prevent significant blind spots on our end, this third phase contained two empty responsibility/action cards. The empty cards allowed our participants to think about and write down their own actions, possible solutions, and related responsibilities. Taking the empty cards, eight participants from different discussion groups formulated 10 new responsibility/action cards with their own words and ideas. On the cards, Hendrik wrote, for example: "*Designing utopias: Plastic is just one symptom of many things. In the long term, we need to think about a lot of fundamental changes. We need to ask ourselves again what kind of world we want to live in*" (G4_HE). Meanwhile, Christopher called for: "*Plastic Avoidance Day: Permanent global education about the dangers and necessary measures*" (G3_CH). The ability to write their own responsibility/action cards and to bring them into the discussion enabled citizens to freely move away from perspectives given on the provided cards.

4.3.5 Creating future visions

This last phase of IMAGINE PLASTICS engaged citizens with questions about individual and collective futures with plastics and thus the prospect of society and plastics. It aimed to foster deeper reflections if and when citizens wanted to identify potential ways of intervening to re-think or re-do their or our current ways of living with plastics. To stimulate participants' imaginative capacities, we decided not to use any cards in this phase. Instead, it was guided by more general questions that encouraged participants to be open-ended in their reflections and imaginations about future developments in the relationships between plastics and society.

Building upon prior discussion points and thinking with them further into the future, the moderator introduced the phase about future visions by asking: "If we would meet again in ten years, thus approximately 2030, where would society be with plastics? Where would we stand regarding plastic problems and how would we think about plastics?" These questions stimulated individual discussions and collective reflections about prospective visions. Even more so, this phase connected the past and future of people's lives with plastics with the present—with our current infrastructures, habits, and ways of thinking that hinder or foster our development into specific versions of the future.

4.3.6 Creating the introductory video

After finalising the different card sets, we created a nine-minute-long introductory video, which is another essential part of the IMAGINE PLASTICS card-based discussion method. Participating citizens saw the video before starting the discussion session. As discussed, presenting plastics through an introductory video rather than an introductory talk by the moderator avoided the event that the moderator would be considered a plastic expert. However, the video also fulfilled other important functions. It set an inviting atmosphere for the upcoming discussion for participants who would be coming from their everyday lives and could have hundreds of other things on their minds. Additionally, it provided participants with a diverse range of plastics-related information, serving both as a reminder of what they likely already knew and as a prompt for new questions regarding their lives with plastics.

Some of the material for the video came out of the process of creating the cards. During the pre-analysis, we were able to identify several aspects, which, whilst important to the debates around plastics were too complex (differences between and difficulties with fossil-based, bio-based, and bio-degradable plastics) or too superficial (historically increasing production of

plastics and waste) to be on the cards. In turn, we wove these aspects into the animated and narrated video. The video begins by sketching out the history and development of Bakelite, and how it aimed to substitute more natural materials such as ivory or tortoise shells. It describes how plastics became more and more popular and spread into different areas of life. Subsequently, it illustrates that not only has there been a rise in global production of plastics during the last decades but that there are, in fact, tons of produced waste and recycling close by, in the Viennese incineration plant in Spittelau. After laying this out, the video then sketches the difficulties of recycling composite materials and explains the creation of toxic filter materials, which are eventually exported to German salt mines for further storage.

The video then turns towards more complex issues, frequently discussed as the problematic areas of plastics, including bio-degradable plastics, microplastics, and plastic additives. Instead of here bombarding participants with the scientific facts or studies that circulate around these issues, our emphasis is on the presence of broader scientific uncertainty regarding their impacts. Subsequently, the video shows how plastics and microplastics are not found only in the oceans or on the coast, but in cities, lakes, rivers, and mountains alike. The video thereby does not reduce the association of plastics to marine and aquatic environments but expands the spatial context to Vienna and Austria, to bring the issue to the doorstep of our participants. The video also introduces participants to several actors who are active in the plastics debate, including scientists, environmental NGOs, and policymakers. In that sense, the video shows that there are many voices in the plastic debate. The video ends by setting the scene for the subsequent discussion session with the question: "*Wie leben Sie mit Plastik?" ("How do you live with plastic?").*

4.4 ORGANISING PARTICIPANTS, COLLECTING AND HANDLING DATA

The IMAGINE PLASTICS card-based discussion method created a participatory space for Viennese citizens to make sense of plastics. The recruitment of participants was guided by the question of who qualifies as a legitimate participant. Instead of composing the discussion groups with a statistical representativeness of *the* Viennese public or *the* Viennese citizens, we aimed at creating so-called mini-publics (Goodin & Dryzek, 2006). According to Goodin and Dryzek, mini-publics should maximise people's differences in social backgrounds and positions towards plastics. Therefore, we aimed to create a heterogeneous group (in terms of age, gender, and education level) of Viennese inhabitants who were interested in discussing plastics.

Following this strategy, we expected to gain a much richer variety of citizens narratives, perspectives, and positions in terms of their lives with plastics.

We planned five discussion sessions for IMAGINE PLASTICS in the autumn and winter of 2019. To find participants for the discussion sessions, we distributed flyers in three different ways. First, we sent out approximately 8,000 flyers in bulk mail to households in certain Viennese districts. The households were chosen based on the greatest possible diversification of socio-demographic characteristics of inhabitants. The selection process was mainly informed by a map of socio-spatial clusters in Vienna provided by the City of Vienna. Second, we spread another 500 flyers at Viennese museums. And third, we posted a call for participation and the link to the flyer on our department's Twitter page. Regardless of how these flyers reached them, potential participants could fill out the participation form on the flyer and send it back to our department—we covered the cost of the postage to enable citizens without financial means to be able to respond to our flyer. In addition, we also established an online form, which people could fill out and send back to us (either by post or by digital means).

In total, 75 respondents responded with interest in participating in one of the IMAGINE PLASTICS discussion sessions. For each of the five discussion sessions, we selected eight participants. Based on prior experience, this number of participants seems to work best in this discussion format in terms of individual engagement and group dynamics. As far as grouping, we assembled the participants of each group to maximise group heterogeneity in terms of sociodemographic background: age (18 to over 65 years), gender (male/female/other), profession, and formal education. To illustrate this, one of our discussion groups was composed of participants with the following characteristics:

- Female, 18-30 years old, student, Matura
- Female, 31-45 years old, teacher, FH/Universität
- Female, 46-60 years old, translator, FH/Universität
- Female, over 60 years old, pension, Pflichtschule
- Male, 18-30 years old, student, Matura
- Male, 31-45 years old, partner manager, Matura
- Male, 46-60 years old, unemployed, Lehre
- Male, over 60 years old, retired health care worker, Matura

Even though we tried to establish the discussion groups to be as heterogeneous as possible, a great share of respondents, in addition to selected participants who also fit our quite general

criteria, had at least a high school diploma (Matura). In other words, most participants did have a higher formal education. Consequently, the narratives, perspectives, and positions of Viennese inhabitants with lower formal education or from areas that did not receive a high coverage of flyers are not as prominently shared in the discussion sessions.

Within the IMAGINE PLASTICS method, we collected and produced sensitive data of participating citizens. We handled participant data and information following the General Data Protection Regulation (GDPR) as well as the so-called Forschungsorganisationsgesetz (FOG). Explicitly, this means that after each discussion session was audio recorded, we transferred the recordings to a password-protected folder on the server of the Department for Science and Technology Studies at the of University Vienna. Transcripts were kept separate in an entirely different folder than the participants' contact data. After the recordings were transferred to the secured folder, we deleted the audio file from the recorder. Following this, we then forwarded the audio recordings of the discussion sessions to our departmental transcribers, who signed a non-disclosure agreement. Thereby, the transcribers obliged themselves to secrecy regarding participants' personal information, including the statements they made in the discussion groups. All files and information were not allowed to leave the Department of Science and Technology Studies. One exception, allowed due to the start of the COVID-19 pandemic and lockdowns between March and May 2020, was that our transcribers were shortly permitted to transcribe from home. After transcription was finalised, all data was to be given to the Department of Science and Technology Studies, and the transcribers were not allowed to make copies for their own purposes.

Once we received the transcriptions, we pseudonymised the participants by giving everyone a different name. Whilst we also stored the pseudonymised transcripts on the same server, they were saved in a different folder apart from the original transcripts and contact data. The empirical material will be stored on this server for an indefinite period. In the course of writing this research, I used the direct quotations of participants from the pseudonymised transcripts. Yet, in coordination with the project leader, I have ensured that each of these quotes has been anonymised in a way that does not allow for the identification of a participant.

Most of the aspects mentioned above have been included in the informed consent form given to participants. Before every discussion session, each participant was asked to read it carefully and, if they agreed to its terms, sign it. One copy was for them to keep, and one was for our

own records and to adhere to the standards of research prescribed by the university and by Austrian law. By signing the informed consent sheet, participants agreed to the previously described processing and storage of their data. Participants gave their consent to participate in the discussion group whilst knowing that their participation was voluntary. They were informed that they could terminate their participation without any consequences and without any reason at any time. In this case, the use of participant statements is carried out within the explicit agreement of our project's framework and its respective scientific purposes. Participants can revoke their agreement of data use at any time, even after the end of the discussion group. After the successful organisation of five discussion sessions, we deleted the contact data of every respondent who either did not participate in any session but responded to our call or who did participate but did not want their information to be stored.

4.5 ANALYSING EMPIRICAL MATERIALS

With the IMAGINE PLASTICS card-based discussion method, we invited a total of 35 Viennese citizens to discuss plastics at the end of 2019. These discussions are the main empirical material of my research. Specifically, they consist of five four-hour citizen discussion sessions. After gathering the empirical material through these discussions, analysis followed as the next step. Initially, this doctoral research was not planned as a monograph, but as an article-based dissertation. With my research interest in the role of time in citizens' sense-making of plastics, my supervisor Prof. Ulrike Felt and I aimed to write a co-authored article about the interlinkages between plastics, time, and society. However, once I began the analysis for our article, I noticed how the relations between time, plastics, and society were so rich and so manifold that they could scarcely hope to be covered in an 8,000-word journal article. Consequently, with my ongoing interest in these interlinkages and with the observation that little academic work exists on plastics with a temporal focus, I turned towards writing a monograph. This decision allowed me to dedicate my research to fully investigating the role of time in people's sense-making of (living with) plastics in a more sophisticated and detailed manner.

Therefore, the analysis for my research is partly informed by and expanded from the analysis we conducted for our co-authored article, "Plastic Time(s): The temporal choreography of plastics in citizens' narratives" (Bomm & Felt, forthcoming). Due to the tight entanglement between the article and my own research, I cannot and would not want to claim the results of *my* analysis as *my* own. Instead, the analytical results of the article were co-produced through iterative cycles of analysing, discussing, and reflecting with Prof. Ulrike Felt, especially during

the initial stages of the project. However, what makes the two separable, of course, is that this dissertation elaborates in more depth and with more detail about the analytical results than the article was capable of; in addition, this dissertation is also able to expand on the research with additional results stemming from analysing the relationship between time and plastics. Even though the empirical chapters of this dissertation roughly follow the same structure as our article, it has considerably more space for detailed insights into our empirical materials, to present additional findings, relate them with existing scholarly work, describe paths for further research, acknowledge the spatiotemporal situatedness of the content discussed, and sketch out the six paradoxes of our lives with plastics. Below, I will elaborate on my analytical approach to the empirical materials gathered during IMAGINE PLASTICS, which led to the results presented in this research.

The five transcribed discussion sessions with Viennese citizens are the core materials of this analysis. I analysed the pseudonymised transcripts following a constructivist, Grounded Theory approach (Charmaz, 2006) and strived to explore how time(s) matters in citizens' narratives about plastics. I began with an open coding procedure informed by a time-sensitive gaze on the first of the five transcripts. From the initial round of coding the empirical material, various codes related to temporal repertoires re-occurred. These codes included the durability of plastic materials, linear buy-and-throw-away rhythms, the planned obsolescence of artefacts, short-sighted thinking of political decision-makers, the persistence of microplastic particles, the need to take time, temporal conveniences of plastic packaging, potential long-term impacts of plastics, the bioaccumulation of plastics over time, fast and iterative consumption rhythms, quick material replacement, slow transgression of industrial branches, and short usage time of products, to name but a few examples. The codes thus stand in place of citizens' temporal repertoires, re-occurring throughout the empirical material. I used these initial emergent codes of the first transcript to code the other four transcripts. In doing so, I both refined already established codes and merged existing codes, and found that new codes had also materialised. Refining these through several rounds of selective and axial coding, I was able to specify the temporal repertoires used by citizens.

The temporal repertoires permeating our citizen discussions are not lost elements—they are inseparable from their narratives about (their lives with) plastics. Each temporal narrative does something. Each has a purpose and a function for its teller, and we are invited to investigate

the “possible functions of narrative[s]” (Merrill, 2007, p. 6). By doing so, by investigating how temporal narratives function for citizens, I am able to make tangible how citizens make sense of, understand, and negotiate their lives with plastics. To group these narratives, additional rounds of coding the empirical material revealed that they can be placed into three main functioning sets, which citizens use for different means: *diagnostic, justificatory, and anticipatory*. These three sets of narratives frame the three empirical chapters of my research (see Chapters 5, 6, and 7). Each one gravitates around one set of temporal narratives and their function, which served participants not only as essential sites for linking and incorporating but also for demarcating their individual narratives, experiences, and visions with plastics (in)to or from broader societal narratives entangled in wider systematic realms of life (with plastics).

For example, in citizens’ temporal narratives, we encounter temporal repertoires such as memories or recollections of past times, which they use to diagnose where society was coming from then and how life in the present is now. Temporal repertoires in citizens’ justificatory narratives gravitate around, for example, the temporal conveniences of using plastic packaging–allowing them to legitimise the (future) existence of plastics. Anticipatory narratives, on the other hand, might, for example, be interested in either the quick replacement of plastic materials or the need for slow and circular consumption rhythms—again, helping citizens sketch out certain future visions of our lives with plastics. The analysis in each empirical chapter investigates how temporal narratives assist citizens as referential points to develop, express, negotiate, and reflect the different roles, meanings, and values of (their lives with) plastics across time and space.

FINDINGS

The following three chapters empirically engage with and answer my research question, being *how do temporal narratives matter in how citizens make sense of plastics in society?* The empirical analysis will reveal how citizens' narratives are enmeshed with temporal repertoires, which I call *temporal narratives.* These temporal narratives came to life as citizens made sense of plastics and their lives in our society. The analysis will show how they fulfil different functions in citizens' sense-making and their ordering of the relationships between plastics and society.

In the empirical analysis, I will unravel how three main sets of *temporal narratives*—each with a different function—were omnipresent and recurrent across each citizen discussion session. The structure of the empirical chapters reflects these three sets of temporal narratives: *diagnostic*, *justificatory*, and *anticipatory*. Whilst most of the narratives are deeply, in some way or multiple ways, entangled with one another, I treat them as analytically separate to tease out their different functions in people's sense-making of plastics and how they live with these synthetic materials. The three separate narrative sets are thus divided accordingly. Before diving into the analysis, however, I would like to provide the reader with a first glimpse of what to expect in each chapter.

Chapter 5 visits the first set of temporal narratives, which are of a diagnostic nature. In these narratives, participants provide a diagnosis of contemporary life and, more specifically, how they consider the production, use, and disposal of plastics to be a mirror for our lives within societies. The chapter provides detailed insights into how plastics and the functioning of society co-produce one another. Ultimately, citizens' diagnostic narratives make concrete how different temporalities—material, object-related, social, political, economic, and more—contribute to shaping their understanding of our life with plastics. As the most extensive empirical chapter, Chapter 5 lays the foundation for Chapters 6 and 7 because the diagnostic narratives it describes are what will allow us to capture the wider contexts participants depart from when they construct justificatory narratives that (do not) legitimise the situated existences of plastics (Chapter 6) and the anticipatory narratives that envision and explore potential strategies towards futures with(out) plastics on different spatiotemporal levels (Chapter 7).

Chapter 6 examines the second category of temporal narratives, justificatory narratives, which participants employ to legitimise or challenge the use of plastics. The chapter visits three

different use contexts and classifications of plastics: plastics in health care settings, plastics as packaging, and use duration of plastics. The chapter explores how the use life and afterlife of plastics hold significant argumentative weight for citizens in how they justify or oppose specific plastic-related practices. Consequently, we will witness how plastics, depending on their use contexts and lifespans, are constructed either as more problematic or morally less concerning.

Chapter 7 gravitates around the last set of temporal narratives, addressing how citizens use anticipatory narratives for the future-making of prospective relations between plastics and society. More specifically, the chapter gravitates around a facet of temporally loaded strategies that citizens draw on in challenging how we live with plastics and exploring the related responsibilities of various stakeholders, both in the present and in the future in Vienna and beyond.

Each empirical chapter concludes with a remark that condenses the key analytical findings. By seeing my results in light of existing research, I not only refine and contextualise my conclusions but also outline potential directions for future studies, encouraging further exploration in the field. This approach highlights the broader relevance of my findings and fosters connections between my work and ongoing academic discussions.

Adopting a temporal perspective enables me to illustrate how citizens' narratives have various functions in their sense-making of our lives with plastics. In addition, focusing on time also illustrates how deeply paradoxical our lives with plastics are. Consequently, the findings and remarks from my empirical analyses close with the conclusion of this research, in which I will explore six interrelated plastic paradoxes inherent in our plastic-permeated society. These paradoxes shed light on why it is so difficult for individual citizens to critically engage with or question (our lives with) plastics. By explicitly articulating these plastic paradoxes, we will gain a better understanding of why many people continue to struggle to confront, rethink, and ultimately re-do their well-entrenched consumption habits and routines with and through plastics.

5. DIAGNOSTIC NARRATIVES: TEMPORALITIES OF PLASTICS AND SOCIETY

Citizens' discussions about plastics are loaded with a multiplicity of rich temporal narratives. These narratives contain the memories of past times, a fast throwaway society, temporal logics that orchestrate everyday life, rhythms of consuming, the durability of materials, the planned obsolescence of artefacts, the accumulation of plastics over time, and (un)certain legacies of (micro)plastics, to name but a few examples. Whilst some temporal narratives about plastics are closely tied to individual citizens, others more closely relate to the broader, widespread presence of plastics in society. Nonetheless, all of these temporal narratives allow citizens to make sense of their lives with plastics and diagnose the conditions of contemporary society. Capturing these so-called *diagnostic narratives* shows the co-production of plastics and society —how technological developments and social orders mutually shape one another. Citizens' diagnostic narratives offer valuable insights into how various temporal dimensions—material, chemical, social, political, economic, environmental, and so on—shape their understanding of our lives with plastics. Not only do these narratives carry citizens' diagnoses of our lives with plastics, but they also illustrate the complex entanglement between technology, society, and the environment, which contributes to the shaping of our futures.

In exploring these narratives, the chapter progresses as follows: the first diagnostic subchapter focuses on the co-production of plastics and society through a temporal lens, the second subchapter gravitates around the roles of different types of durability of (using) plastics, and the third subchapter attends to the legacies and afterlives of plastics to uncover how temporal (un)certainties come to (not) matter for citizens when diagnosing the need for action on plastics. Together, these identified diagnostic narratives allow us to better comprehend the wider contexts participants depart from when engaging in sense-making practices to (not) legitimise the situated use of plastics (Chapter 6: Justificatory narratives) and to envision potential mitigation strategies on different spatiotemporal levels (Chapter 7: Anticipatory narratives).

5.1 SLOW ENCULTURATION: CO-PRODUCTION OF PLASTICS AND SOCIETY

Today, plastic materials are widely recognised as ubiquitous in nearly every aspect of contemporary society—in Vienna and beyond. This is a point of broad consensus in the narratives shared by our participants. They illustrate how deeply embedded plastics are in a

wide array of relationships, processes, and practices, ranging from the socio-cultural to the political, economic, infrastructural, biological, environmental, and beyond. These polymeric materials are integral to the ways of life that many Viennese citizens and other members of Western societies have not only become accustomed to but seem to take for granted. Whilst plastics are (perceived as) omnipresent today, there was a time before plastics came to permeate our ways of life. By continuously tapping into narratives that contain recollections and stories of past times, our participants make sense of and diagnose the role and meaning of plastics in and for contemporary society.

5.1.1 Living differently: Recollecting a plastic-reduced past

> *I remember, I was maybe ten years old. Back then there wasn't much plastic. At the local Greißler nothing was packed. Everything was in these large brown bags or wooden crates. And you would tell the woman behind the counter what you want. And she would weigh the mixed meat for you, take a paper, a waxed paper, and wrap it. And whilst you wait, you would chit-chat with other customers about the newest gossip. And I remember, we brought our own bags from home to carry everything home again. And also, the milk. We transported milk in aluminium containers. Each day, we got it directly from the farmer and there was no packaging. And there were also not always fresh fruits and vegetables, but we cooked and preserved the fruits of the season in glass containers and stored them. But then, and I do not know when that was exactly, but I remember that somewhen everything was packed in plastics, milk was in plastic milk bags. Then, we could buy convenience food and deep-frozen meals and not only raw foods such as potatoes, wheat, and sugar anymore. And now I just realised how much plastics there are in my life. And I mean not only in the supermarket but everywhere. I mean, you cannot always see them, because plastics always look different. But they play a big role and have huge advantages. Today, plastics are basically everywhere, and we cannot avoid them.*

Vignette 1 A past without plastics and a present with plenty

In the first vignette[5], we encounter one of the most frequently used temporal repertoires in citizens' narratives: their recollections of past times. Recalling memories in retrospect and re-constructing past realities are important practices of a collective life (Halbwachs, 1992). Indeed, in our discussion groups, recollections of the past serve as important repertoires from which our participants pulled to build a collective memory—to make sense of how the relationship between plastics and society came to be. The past, however, is not a single version of everything that has been. Our participants connected to a multiplicity of pasts. Through their

[5] Chapter 5 is supported by vignettes situated at the beginning of some subchapters. Thereby, their content aims to illustrate the different temporal repertoires, which are discussed and elaborated upon in the respective chapters. Their content is not composed of direct quotations, but these vignettes function as analytical results.

various narratives, participants can share memories and experiences of former times. As such, they can situate their own and other peoples' pasts in the wider context of Western industrialised society. In understanding and making sense of former times, they draw not only from their pasts but also from those of the broader collective or society. Thus, what life and living were like in former times became something that was told, revisited, and constructed in each discussion group. In sharing individual memories with the group, participants attempted to build collective memories of what life was like in past times. These collective memories serve as an important ground for meaning-making in the present, as they tell us how ways of life, values, and norms of the past become accepted or contested in the present (Wertsch, 2008). It is with these collective memories, that citizens can begin to discuss and re-construct the social realities of prior times. In every discussion group, there is one period of the past that is especially present in emergent narratives, receiving frequent attention from participants: a past time when the widespread use of plastics was absent from everyday life.

Whilst older participants often narrate their personal experiences and memories, younger generations recall knowledge about the past based on hearsay, often echoing their grandparents' stories, for example. This point illuminates how there is no need to have lived in a time with fewer plastics to know of that time. People's past experiences, memories, and stories become shared even with those who were not there to witness or experience the conditions of those times. Even though many stories about personal pasts are tied to one individual storyteller or protagonist, they nonetheless contribute to constructing collective memories of a past with fewer plastics. Constructing and tapping into collective memories allows our participants to build something that Durkheim (1915) would have likely named a shared past, a collective back then, a mutual understanding of former times, in which societies lived differently with less or no plastics—even if sometimes, as we will see later, it is in a highly romanticised way. Many of these narratives, which highlight the way of living without a great abundance of plastics, are temporally situated in the mid-20th century.

When making sense of a time without a lot of plastics, citizens' temporal narratives frequently tend to revolve around everyday sceneries, especially around food: its processing, transportation, consumption, and storage. Indeed, food, as an essentiality of life, plays an indispensably important role in how citizens make sense of where our society has come from. As Bernd, one of our older participants, remembers:

> *[I]n the 60s, there was no fridge in some places, you did your shopping in a completely different way, you got the milk with a jug [...] and butter, I don't know what it was in, maybe you even bought as much as you wanted, I don't know if it was packaged back then—but I think it was wrapped in paper, wax paper like that, yes—and it worked, and you didn't need that many bottles because you drank water* (G4_BE:18/19).

Bernd's story, which illustrates what food consumption was like around 60 years ago, importantly describes how refrigerators—today, ubiquitous tools to cool our food—were not yet present in every household; he remembers that different packaging materials were used and that no plastic bottles existed. Bernd is one of several participants who remember the large absence of refrigerators in the 1960s, which is but one of many examples that citizens use to recall the general absence of plastics in the past. Before the widespread use of domestic electric refrigerators (whose interiors and electric cables are made of plastic), prolonging the shelf life of food, such as milk, for example, was much more challenging. It required regular care and attention to prevent spoilage. Without plastics, the preservability and storage life of most food items was thus much shorter than it is today. This meant that consumers engaged in more frequent practices of grocery shopping.

When reflecting on the past, many citizens thus speak of the need for regular and re-occurring activities around the organisation of food to ensure its supply, its quality, and its general safety. Whilst some remember annual practices to preserve seasonal fruit and vegetables in glass jars, others recall daily visits to local shops to get products like fresh milk. The process of obtaining fresh milk, for example, required daily visits to the store, often without the convenience of refrigeration. Indeed, it is the absence of refrigerators that necessitated daily procurement and milk had to be consumed quickly to avoid spoilage. Whilst these practices minimised plastic use and waste by relying on reusable containers like glass jars and aluminium cans, they were labour-intensive and demanded careful planning and regular attention. The introduction of refrigerators, in contrast, revolutionised food storage by enabling less frequent trips to the store and allowing for longer shelf life. Refrigeration reduced the immediate need for daily purchases, making food preservation more efficient, but also contributing to a shift away from often more time-consuming practices of the past.

Citizens frequently recall memories and experiences of visiting the nearest *Greißler*, the small, local store that served as a vital point of neighbourhood life. These stores are remembered as

spaces where goods like meat were freshly weighed, flour was scooped from large brown sacks, and butter was taken from jars. These practices stand in strong contrast to today's pre-packaged and pre-weighed food culture. A key feature of these recollections is the absence of plastic packaging, as seen in Bernd's previously mentioned memory of butter wrapped in wax paper. In contrast to modern convenience, citizens remember a time when little or no pre-packaged food was available. Instead, customers were required to bring their own bags and containers, which were often made of paper or textiles. As Tobias recalls, "*in the past, you went to the Greißler with your own boxes [...] and got the food*" (G3_TO:10). Highlighting the hands-on nature of shopping at the *Greißler*, Johanna similarly remembers how the vendor would scoop flour or skim milk from bulk containers into her own bags. "*It was really an important meeting place*", emphasising the social significance of these stores beyond their role in food provision.

Citizens' recollections not only emphasise the practical aspect of bringing one's own wrapping and containers, but they also illustrate how grocery shopping in the past was remembered as more deliberate and time-consuming. Without pre-weighed or pre-packaged goods, consumers had to plan ahead—anticipating their needs and preparing accordingly. This requirement for foresight made shopping a slower, more reflective activity compared to today's fast, convenience-driven culture of ready-to-go products. Additionally, the practice of shopping at the *Greißler* minimised spontaneous visits, as customers had to account for the time it took to gather the necessary items and interact with the vendor. Whilst these practices evoke nostalgia for a more personal and social shopping experience, where interactions with vendors and fellow customers are common, participants constructed also an understanding that a great deal of effort and patience is also involved. Consumers often had to wait for the vendor to prepare their items, further emphasising the more labour-intensive and time-consuming nature of these practices. Through these collective memories, citizens recognise that modern plastic packaging often eliminates the need for such waiting, making them a time-saving material. Artefacts like plastic containers, packaging, wrapping, nets, and bags are now deeply intertwined with the accelerated pace of contemporary shopping routines. As we will explore further in this research, plastic packaging functions as a key device that enables people to navigate the fast-paced temporal structures of contemporary society (see sub-chapter 6.2).

At the same time, citizens discursively revisit the past to diagnose how less consumption waste was produced due to people's past ways of life. For example, 30-year-old Lukas talks about the masses of diapers in today's health care institutions, sharing that "*[i]n any case, nappies, somehow, with small children, there are huge mountains of them—grandparents back then, they were just cotton nappies that were boiled and recycled (laughing)—they don't do that anymore, now there are disposable products" (G1_LU:33).* Lukas' reflection on the shift from reusable cotton diapers to disposable diapers provides a powerful lens to see the changing temporal dynamics of consumption and waste. In the past, the use of cotton diapers involved a cycle of washing, boiling, and reusing, which required considerable time and effort. This practice, whilst labour-intensive, reflects a way of life that was supposedly more adjusted to resourcefulness and sustainability. The time involved in managing cotton diapers, though demanding, was embedded in a more cyclical approach to material use. This was a time-intensive process, as parents needed to care for the diapers across multiple stages.

In contrast, disposable diapers, which Lukas points to as the norm in modern health care institutions—and to add, in many households with children as well—, represent a shift towards convenience and efficiency. The time saved by using disposable products is immediate: today, there is no need to clean or manage diapers. This time-saving reflects broader cultural trends in which convenient disposable products are prioritised over the time-consuming but more waste-reduced practices of the past. Yet, this shift comes with a significant cost. In critiquing this shift by mentioning the environmental consequences of disposable diapers, which create "*huge mountains*" of waste (G1_LU:33), Lukas provides a clear metaphor for the long-term environmental burden of convenience. Contrasting past and present practices, he aptly notes how societal shifts in time management, convenience, and consumption have significantly impacted waste production. Lukas' story not only highlights the changing temporal dynamics of consumption and waste but also prompts a critical examination of how our increasing demand for (temporal) convenience has come at the expense of sustainability, which shapes both our present and future environmental challenges. Many of the citizens' memories of the past remind us of how the conveniences of modern disposable plastics were largely absent.

Instead, their recollections narrate a way of life in which people prioritised resource conservation and the reuse of everyday items. Yet, it is crucial that we recognise that the past was not experienced the same way by everyone. Citizens' stories of living with less reveal two

different perspectives. One is a nostalgic version characterised by a nostalgic-sounding past, where families had time to grow their own food, cook together, and repair or reuse household goods: "*In the past, people used to make their own food [...] and maybe we'll get back to that again, that would be great*", explains Bernd (G4_BE:2). Nonetheless, these somewhat romanticised memories of the past are sometimes subjected to criticism. As one participant notes: "*I think it's always seen a bit through retrospective glasses, that everything used to be better and simpler. I think that's very strongly socialised, somehow, something that is glossed"* (G1_LU:110). Ultimately, many of these idealised visions of past times can be countered by reflections on harder times, such as the war and post-war periods. Christopher, for example, recalls his early life before and after World War II:

> *[b]ecause there was this time, I was born [...] before the Second World War and after the Second World War, after the [19]45, we all had nothing. [...] We had to provide for ourselves with the smallest things. We had a small farm, part-time farming, where we lived halfway. But back then, recycling and reusing what you had was a top priority because you had nothing else* (G3_CH:16).

Christopher offers a different vision of the past—one that is shaped by scarcity and necessity. Indeed, in many discussion groups, citizens shared this version of the past when they described how reuse and recycling practices of war and post-war times were not a choice but a necessity of survival, as acquiring new goods was often impossible (see Chapter 2. State of the art). Reusing items like cotton diapers or aluminium cans was thus a practical response to the constraints of limited resources, not a voluntary lifestyle decision. This emphasis on sustainability through necessity highlights how survival strategies and limited resources are remembered as a defining characteristic of the way people consumed in the past. Citizens often link the scarcity of material goods in the past to the absence of plastics, suggesting that fewer resources entailed a more sustainable, resource-efficient way of life. Whilst plastic materials were indeed largely absent in the past, it is as important to keep in mind that also the concept of disposability was yet largely absent from society. Unlike in today's world, past generations often relied on reuse and repair because they had no other option. The scarcity and reuse of resources were common denominators in citizens' contrasting versions of the past.

Nonetheless, their narratives—both the nostalgic and difficult versions—allow citizens to make sense of plastics in the present, as each of these historical perspectives plays a role in their future-making practices. Many citizens share a view that, in the future, they do not want to

eliminate plastics entirely; as one participant put it, "*we don't want to go back to the Stone Age*" (G1_FR:101). Others, on the other hand, try to envision a future with plastics where sustainable practices from the past might be integrated into modern life without necessarily returning to the scarcity that once defined those times.

Thus, drawing on narratives from the past, when plastics were largely absent, enables citizens to make sense of how the existence of plastics sustains ways of living in contemporary times. Thereby, citizens' collective memories of life without and with fewer plastics in the past build a strong foundation to imagine the future of plastics and society. The last empirical chapter (Chapter 7: Anticipatory narratives) will explore how citizens' ideas of life in the past serve as temporal repertoires to negotiate future paths for plastics and society. This includes strategies for reducing consumption and embracing slower and more circular consumption rhythms whilst also ensuring that present living standards and well-entrenched routines are maintained for the future.

5.1.2 Slowly, yet suddenly: Plastics permeating the present

Narratively speaking, our participants regularly jump from memories of when plastics were largely absent from society to a present that is perceived to be characterised by an abundance of plastics. Unravelling citizens' narratives allows us to learn more about how they see the making of our plastic-permeated society. For example, take the memory of Björn, who, in the introductory round of our card-based discussion, explains that

> *I came to plastics relatively early on through my private observations, namely through my father, who was a technician and used Bakelite to make circuits for radios and the like. And Bakelite was not to be killed. You could light it on fire—nothing happened. Yes, and now in the present, we are obviously all surrounded by all kinds of plastics* (G5_BN:5)

Interesting is his immediate shift from a specific memory of Bakelite (a type of plastic) in electronics to the present marked by a general abundance of plastics of various types. Like Vignette 1, shared at the beginning of the previous subchapter, this quote exemplifies how people tend to jump from specific situated plastic-related examples from the past to a plastic-permeated present. Whilst personal stories often begin with a specific applicative area, their ending often diagnoses plastics as being everywhere, tied to almost every practice, habit, and area of contemporary life. However, what often remains open is when and how we came to be such a plastic-permeated society and how plastics became such a widely used material.

Citizens' attempts to temporally pinpoint the exact time when plastics became an inevitable part of society and people's daily practices are quite laboured. This becomes especially evident in one discussion when one participant asks the moderator if they are also going to discuss the implementation of plastics. After the moderator answered the question negatively, he took it upon himself to explain,

> *[I] witnessed it in the agricultural sector, because I come from an agricultural family, and I observed that even before the post-occupation period, which was 1955, plastics leaked in, in the form of parts for tractors, for example. [....] That was the first infiltration, but it happened quite quickly, suddenly everything was filled with plastic milk cartons and stuff like that* (G4_OL:31)

Using the word "infiltration" in this context suggests a gradual, almost unnoticed intrusion of plastics into the agricultural sector. The term evokes a sense of something foreign and unwelcome slowly permeating a previously natural or traditional space, highlighting both the rapid spread of plastic materials and their pervasive, invasive impact on everyday life. Infiltration then may convey the idea that plastics entered the sector subtly, almost unnoticed at first, but quickly grew to dominate, signalling a shift in materials and practices. Attempting to understand the starting point from which plastics infiltrated or manoeuvred into different agricultural artefacts, the participant, Olaf, draws on the occupation period after World War II as a temporal marker. Indeed, different historical markers such as post-war times, industrialisation, or the industrial boom to grasp the rise of plastics are repeatedly used in each of the discussion groups.

Whilst citizens do not have an exact temporal consensus about when and how plastics became such an integrated part of society, our participants broadly agree with each other that the rise of plastics is closely intertwined with the rise of what is occasionally labelled as "*consumption society*" (G5_WI:33). Our participant, Inge, for example, remembers that:

> *the credo of the 80s, so to speak, was growth, growth, growth—because how many McDonald branches, where we had all these wonderful cups and packaging, how many did we have back then? And it was just more, more, more, more—and now we're actually at a point where we have to say: 'well, maybe we could do with a bit less, couldn't we?' Maybe that would still be possible* (G4_IN:155)

Taking McDonald's—one of the most prominent poster children of fast-food consumption—as an example, she describes a strong link between plastics and the premises of growth and accumulation. Whilst she points her fingers at the link between plastic packaging and the

development of mass consumption (and the urgency to rethink it in the present), one process that is crucial for the mass consumption of plastics escapes her attention: the commodification of goods.

Inge is not alone: how the use of plastics fuelled the commodification of goods seems to escape the attention of most of our participants. Yet, this part of the story is nevertheless crucial to better understand why so many plastic artefacts exist en masse today. Largely through the power of retrospective investigation, the work of various authors and journalists helps to paint a clearer picture of how plastic material allowed society to commodify goods to the extent they are today (Belndorfer, 2019; Freinkel, 2011; Meikle, 1997). Still, most of our participants have difficulties recalling these processes: of commodification, material and product innovation, and improvements and inventions that have led to the ubiquity of plastics in almost every area of contemporary life (be it communication, agriculture, electronics, interior design, transportation, food, and more). With its relatively easy production— cheap and lightweight (aside from many other characteristics)—plastics have been an ideal material to create artefacts that were not imaginable before. Plastics have allowed manufacturers to replace many materials; often those that are classified to be more natural and more valuable, such as tortoiseshell, jade, and ivory, which has only further enabled people in the industrialised world to possess more things than they ever have before. Yet, we must keep in mind that the introduction of different types of plastic materials, plastic applications, and plastic objects into various spheres of society did not happen overnight. Indeed, the commodification of plastic goods progressed much like any other new entity. The development and innovation of new plastic products was a long-term endeavour, a time-intensive process. Slowly but steadily, however, synthetic polymers came to replace many other materials such as wood, paper, and glass. Before too long, plastics became encultured into our society.

With their diverse forms, shapes, and materials, plastics seem to constitute most of the ways of life people know today. One participant, Björn, points to the unavoidability of plastics in the present, "*the use of plastics is just something you can't avoid as an individual*" (G5_BN:8). Integrated into and enabling new routines and habits, optimising working processes, and improving existing practices, as they became encultured, plastics also became important for the ways society functions. Perhaps it is, in fact, this slow enculturation that leads people to see plastics as irremovable parts of various infrastructures, organising and sustaining today's

ways of life. Thus, as societies are performed through the multiple uses of plastics and because plastics enable contemporary routines, habits, and standards of life, members of contemporary society in Vienna do not regularly critically reflect on plastics; in fact, they often do not even seem to notice them.[6] As our participant Lukas describes below, seeing and reflecting on plastics and plastic artefacts is simply not a daily routine for most in a world where plastics are ubiquitous and omnipresent. His story points towards two entangled aspects that regularly come to the surface when participants make sense of their (non-) awareness of plastics. On the one hand, their narratives point to how plastics become perceptible when categorised as matter out of place (Douglas, 2002: first published 1966), yet, on the other hand, they also describe how certain plastics are less noticeable because they vanish into 'regimes of imperceptibility' (Murphy, 2006).

> *So, when you [...] somehow see pictures of some beaches or something that are completely covered in plastic waste, you suddenly realise: uh, okay, maybe it's not so great; but before that, the awareness was somehow not there if you weren't confronted with it.* (G1_LU:94)

Here, Lukas touches on a widely held image shared by our participants: beaches in distant places filled with plastic waste (see sub-chapter 5.3.1 for further elaboration). Along with their frustration about stranded plastics, many Viennese citizens express confusion over how plastics end up in such places and show concern for people in those distant communities who are affected. This highlights an important point, namely that certain forms of plastic, such as plastic waste on beaches, have the power to awaken people's awareness of such pollution. He further emphasises that, when people are not directly confronted with plastic waste, their awareness of the problem may remain limited. Indeed, especially in places where plastic waste is not so visible, the existence of plastics often goes unnoticed in the flow of daily life—it blends into societal routines and evades our attention. Across each of the discussion groups, we hear similar stories in which plastics suddenly enter people's awareness. It is in these moments that

[6] Aside from the slow enculturation rendering the presence of plastics less tangible, other processes contribute to plastics becoming barely questioned or noticed. One process is related to ever-new technologies and material innovations that continuously develop plastic materials further. Pointing to the multiplicity of plastics, our participants sketch how plastics do not have a universal appearance. Instead, plastics can come in various forms, haptics, and surfaces. Plastics can even appear as non-plastic materials. These camouflaging characteristics of plastics make it extremely difficult for many participants to notice plastics at all. For example, as our participant, Björn, sketched, "*I don't even know where everywhere there are things that look like stone, but it's not stone, it's some kind of plastic and it's used everywhere. It's used in armatures, and I don't know what it is. Roofs, for example, aren't all stone, they're also mixtures. I'm not a specialist in that area either*." (G5_BN:63)

people typically come to recognise plastics as they categorise plastics as waste, debris, litter, or pollution—elements that seem out of place and disruptive to the environment.

When participants consider plastics to be 'out of place', as Mary Douglas (2002) might describe, plastics become more visible to them. These acts of classification become key moments in which citizens realise and even question the existence of plastics. Through these sudden moments of realisation, plastics, which have been encultured over several human generations, are thrown into the spotlight of participants' attention. David, for example, points to plastic bags in the stomach of a whale as something that is obviously out of place: "*I mean, that [...] is shocking when you see pictures somewhere of how a whale has died and then the stomach is cut open and you see these 40 plastic bags or something like that*" (G1_DA:44). Yet, plastic bags are a regular companion and organiser of the order of people's everyday lives. Despite environmental awareness campaigns and increasing price tags, plastic bags allow us to transport heavy groceries, they protect their content from getting wet, and increase food safety. However, when they are found in the stomach of a whale, the well-encultured existence of plastic bags becomes disrupted. Suddenly, plastic bags receive David's attention and even lead him to wonder about plastics in the human body: "*[...] that it somehow gets into the body, [...] yes, we ingest so many grams of plastics every week*" (G1_DA:44). For some citizens, discussions about plastics in the (human) body are key moments where they start seeing plastics as being out of place and question the presence of plastic materials. For other citizens, these key moments are not related to bodily existences, but to the environment more broadly. Especially in narratives about out-of-place plastics situated in environments associated with being clean, natural, or pristine (such as forests, mountains, lakes, rivers, islands, or beaches), plastics are regularly imagined as infiltrating the beauty of nature, threatening the environment and its inhabitants (see sub-chapter 5.3).

Lukas makes a second point related to the (non-)awareness of plastics that re-occurs in citizen discussion groups. Without being constantly confronted with out-of-place plastics, people are barely aware of where plastics exist:

> *So, you don't see it or you wouldn't necessarily think about it on your own: oh, plastic bottle, what happens to it, right? It's an object that's just there, that you have for a certain time and then you don't have it anymore.* (G1_LU:94)

Lukas explains that plastic bottles, rather than being consciously noticed or considered, simply exist for a brief moment of use before disappearing from view. He emphasises that consumers rarely question the use or fate of plastic objects, allowing their presence to slip beneath the surface of awareness. Beyond the slow enculturation of plastics, one could argue that they have, over time, faded into what Michelle Murphy (2006) calls 'domains of imperceptibility' - a concept linked to the study of Sick Building Syndrome. Murphy's work highlights the institutional, social, legal, and epistemological frameworks that shape what we perceive and fail to perceive, revealing how certain materials, like plastics, become both ubiquitous and invisible. Often seamlessly integrated into our daily practices and habits through processes of slow enculturation, many plastic artefacts remain largely unnoticed and unaddressed in citizens' daily lives.

Being uncritically accepted and continuing to be consumed without question, the fate of plastics also remains largely speculative for citizens—whether that is how they are managed by waste facilities, discarded into the environment, repurposed, or subject to other processes. As it took several human generations for plastics to become encultured, they have thus, for many, become imperceptible. In other words, whilst some human-plastic interactions draw citizens' attention, others remain outside their focus. Thereby, the imperceptibility of plastics affects how people perceive and address plastic-related issues and influences their understanding of our future with plastics. It is thus usually only when plastics become labelled as 'matter out of place' (Douglas, 2002) or when their legacies and afterlives become matters of concern that their existence is challenged by citizens. How plastics—and the issues and concerns related to them—are imperceptible or rendered imperceptible to our participants, shapes not only their diagnosis of plastic-related problems but also how they imagine a future with plastics and the functioning of society.

5.1.3 Temporal orchestration: On some temporalities of contemporary society

Our consumption society is connected to the throw-away society. Our continuous and steady consumption only works because you can quickly throw something away and buy a new item immediately afterwards. Almost everyone can afford everything in a short amount of time because things are rapidly produced, and quickly available. You do not need to wait until the next tree is grown like in former times. With plastics, everything is mass-produced. In turn, everything is mass-consumed and thrown away. This is an endless cycle. It is endless because things break down fast and one is forced to purchase replacements. I need a functioning laptop for work, without my water cooker I could not enjoy tea, without my hairdryer, every day would be a bad hair day, and today I need my smartphone for everything: calling, banking, navigating, and so much more; without my smartphone, I would be lost. When these things break, I need new ones. But if we are to keep this rhythm, what will the world look like in 20 or 30 years? We simply do not think in these long periods, nor do our politicians. They simply consider short legislation periods, which are how long? Periods of somewhere around four years? You cannot change our consumption and throw-away society in four years. Often, you cannot even pass legislation or create regulations in only four years. Instead, politicians strive for short-term benefits. But for a real change, they should strive for short-term drawbacks and long-term benefits. But surprise! No one does that because politicians want to be re-elected. And the political short-sightedness starts anew, and our consumption society continues.

Vignette 2 Temporalities orchestrating contemporary living and consuming

Turning towards the present, Vignette 2 illustrates how our participants narrate the many different temporalities that structure the functioning of contemporary society and people's daily lives. This entanglement and orchestration of various co-existing temporalities also contribute to how citizens diagnose their lives today. Omnipresent in all discussion groups is a general feeling of an accelerated way of life. As our participant, Anna points out:

> *[...] for a long time technological development has overtaken us. If you look at human evolution, we need centuries to adapt to something, until it adapts to some environmental condition via genetic development and the like—but we, we have accelerated the whole system.* (G1_AN:114).

Here, Anna explains why she believes that fast technological developments (including plastics) are the reason for the acceleration of life. However, like others, she does not consider humans to be equipped to adapt to rapidly changing technological advances at such a fast tempo. Indeed, like Anna, many participants share how the present is well characterised by feeling that they are living in "*a fast-living time*" (G2_WE:166). Many citizens, for example, identify the acceleration of communication and transportation technologies and note how their own lives feel increasingly fast-paced (see sub-chapter 7.4), marked by a quicker spread of information and knowledge (see sub-chapter 7.2), amongst other factors. However, in thinking about this acceleration, what we must take seriously is Ulrike Felt (2016b) prescription: to carefully

untangle which segments of society citizens perceive life to be accelerating and which do not. Whilst many aspects contribute to citizens' perception of an accelerated way of living, our participants give special consideration to the temporalities of economic and political logic that inform contemporary ways of life and their stability. At the same time, however, it is the stability and robustness of these economic and political temporalities that make changing the ways we consume difficult to imagine. Economic and political temporalities are closely intertwined. Both shape the rhythms and patterns of modern society. Economic temporality, with its emphasis on continuous growth, consumption cycles, and short-term profits, often drives the pace of innovation and resource use whilst political temporality influences the timing of policies and their implementation. Political systems, with their electoral cycles and policy agendas, can either accelerate or slow down changes in response to economic pressures, such as calls for sustainable consumption, resource efficiency, or market regulation.

In citizens' diagnoses of contemporary society, various economic temporalities are often seen as key factors contributing to social order. Some of the most prominent economic temporalities discussed by citizens include continuous growth and accelerating logic, consumption cycles, and throw-away culture, rhythms of consumption, short-term economic interests, and planned obsolescence and product durability. A very prominent temporality citizens cover in their narratives is bound to continuous growth, ongoing progress, and accelerating logic. For example, our participant Friedrich shares:

> *And I would just like to say that I would like to throw the buzzword into the round, about the logic of increasing our economic system, so as not to use the evil word capitalism. [...] And we have to say goodbye to this logic of growth. So these lines of plastic production, [...], not even in ten years, if things continue like this—and they will continue like this—we will be producing twice as much plastics worldwide. [...] In 2018, more plastics were produced than ever before [...] and the curve is going steeply upwards. [...] I mean, we're so caught up in constraints and can't seem to get out* (G1_FR:12).

Friedrich is one of many discussants who argue that the present economic system is coined by a certain "*logic of growth*", by continuous growth and profit, by striving for ever more, ever better, and ever faster. To his understanding, these capitalist logics of the economy have contributed and continue to contribute to the continuous increase in plastic production. Yet, these capitalist logics of the economy are largely considered as so normal and unquestionable given informing also people's future vision. In Friedrich's case, this is a future where more and

more plastics will undoubtedly be produced. It thus becomes very interesting then how capitalist logics under our current economic system are regularly seen to form a robust framework that limits the scope of change and the actions regarded to be doable or realistic when it comes to plastics (see Chapter 7. Anticipatory narratives).

Because plastics are a type of material that allows us to strive for continuous production and consumption, citizens regularly imagine plastics to support the capitalist imperative of growth and often foster (individual) consumption. With consumption people thus not only feed their needs, demands, dreams, and wishes, but also the growth logic of our economy. Thereby, various participants perceive members of our society to be united by at least one commonality: "*[W]e consume, we consume, we consume things that we don't need*" (G1_LU:19). This directly relates to the fundamental question of what necessities mark a good life: what we need or do not need, which our participants connect not only to contemporary mass consumption but also to society's throw-away mentality more generally. The manifestation of today's throw-away culture has transformed our ways of living into an iterative rhythm of purchase and disposal, as Karl describes: "*You have to buy short-lived products, like today, sales are very high—buy, throw away, buy, throw away, buy, throw away"* (G4_KA:44). Karl's observation thus touches on how many of today's artefacts are used in a manner that is quite linear; that is, that they are produced, bought, consumed, and thrown-away—over and over again. This creates an iterative and repetitive rhythm of consumption.

Indeed, much like Karl's observation, citizens in each of the discussion groups point to what Lefebvre (2004) would likely characterise as a linear repetition of consumption. Confronted with continuous and repetitive buy and throw-away practices, Jan reminds us "*[t]he truth is that it works so well because if I can get rid of something quickly, I can also buy something new quickly. [...] For me, the money and throwaway society is almost synonymous with the problem that we are stuck in the capitalist system*" (G2_JA:21). Pointing towards mass consumption and disposal of goods being preconditioned by the mass production of artefacts, Jan draws on the capitalist system in which society and economy functions. Like Jan, many participants diagnose the specificities of the capitalist economy as key culprits that inform the disposable ways as well as the fast and iterative rhythms of (plastic) consumption in contemporary society. In diagnosing these economic temporalities that help shape the present, citizens recognise various mechanisms that together not only ensure the capitalist economy's survival but feed

its growth. In discussing how disposability, as well as fast and iterative rhythms of living and consuming (with plastics), come into being, some of the temporal narratives that citizens share include planned obsolescence, the durability of artefacts, ever-new trends, and changing desires (see sub-chapter 5.2). These narratives raise relevant questions about who carries responsibility for the lives of plastic artefacts—ones that are deeply embedded in fast rhythms of linear consumption—and about how up-to-date convenience as well as a continuous need for profit and productivity limits Western societies' ability or desire to morally reflect on the speed in which everyday goods are consumed.

Another economic temporality that frequently appears in citizens' temporal narratives about contemporary society is tied to the short-term horizons of economic interests, which are often characterised to be driven by immediate gains. One participant, for example, describes how, "*in the end, the economic interests are simply the strongest and the rest doesn't matter—again this [...] short-term acting, thinking, which is not really long-term"* (G1_LU:88). Whilst economic actors are perceived to be universal—essentially faceless entities grouped under labels such as 'producers', 'businesses', 'markets', or 'industry'—their economic interests are nonetheless regularly characterised to predominate other interests, including human wellbeing, work safety, sustainability, and environmental health. At the expense of other interests, the majority of discussants perceive economic interests and their associated profits to be oriented along short-term horizons rather than long-term ones.

It is thus the case that within citizens' diagnostic narratives, the existence of plastics is regularly imagined to facilitate certain temporalities of disposable (plastic) consumption and to support the growth logics of our capitalist-oriented economy. Powerful economic actors with short-sighted interests, even whilst usually remaining faceless, are often perceived to be the ones who pull the strings—the ones who make fast, linear, and iterative rhythms of purchasing, using, and discarding plastic (and other) artefacts the norm. Citizens criticise these short-sighted economic interests, as they understand them to fuel harmful modes of plastic production, consumption, and disposal whilst neglecting potential long-term impacts. As such, a great number of citizens worry about the dominance of these economic temporalties given how they are seen to enable disposable plastic consumption patterns that they believe will undoubtedly impact both human and environmental health in distant futures. Notably, these temporalities inform citizens' imaginations of how our lives with plastics will be governed in the

future: what they believe will be possible and what they think will be impossible (see Chapter 7. Anticipatory narratives).

At the same time, however, next to economic concerns, as they make sense of contemporary society, the temporalities of another realm emerge from citizens' narratives too: the political realm. Here, political temporality refers to how time is structured within political systems: how time influences the rhythms of governance, policy-making, and social change. This structure determines the pacing of many actions in our society, including elections, legislative processes, and policy implementation, which shapes and is shaped by societal priorities, public engagement, and political decision-making. The political realm and its temporalities are discussed as particularly significant because political decisions, legislative measures, and regulatory incentives provide a crucial framework within which our participants understand society and its potential for change and action on plastics.

Citizens of Vienna, as is the case in much of the world, are met with many different political levels: the local level (districts of Vienna), the municipal level (Vienna), the national level (Austria), and the transnational level (European Union, United Nations). With most of these political levels come different election years, different legislation periods, and different political agendas, plans, and promises. Yet, despite these separate political levels and time periods, citizens find consensus in one thing: "*[P]oliticians only think in terms of one legislative period*" (G4_SI:68), Silvia points out, only for her co-discussant, Karl, to quickly respond, *"[t]hat is unfortunately a problem*" (G4_KA:68). In contrast to Karl's rather unspecific critique of the problem, Lukas attempts to put his finger on it in a more general sense:

> *You notice this perhaps short-sighted approach of politics in general, which is perhaps also a bit in keeping with the spirit of the times, because you actually look at your election period—I don't care what happens in ten or fifteen years, I'm not interested in that anyway; who knows if I'll live to see it? I want to have a good time now and I don't really care about anything else. So, this very short-sighted thinking, which unfortunately is probably rooted in human nature.* (G1_LU:7).

In describing the dominance of short-sightedness of political actions, politicians' focus on short-term benefits, and their seeming unwillingness (or inability) to anticipate the consequences of the political activities and measures they bring into being, Lukas candidly reveals his belief that this political thinking fits the overall shortsightedness that can be found not just in politics but

in society more generally. Politicians are often imagined to work only for short-term benefits. "*But the politicians actually have to make sure that there are disadvantages in the short term and then advantages in the long term. Of course, nobody does that, it makes no sense"* (G5_KI:14) argues one young woman, whose reflection is indicative of the broader shared tenor of each of the discussion groups. Instead of long-term planning, anticipatory scenarios, and future-oriented visions, participants describe how the society they live in follows political thinking, acting, and decision-making bound to short temporal horizons.

In diagnosing another political temporality of contemporary society, citizens frequently characterise the political system in Austria (and beyond) as reactive and sluggish, reflecting their broader perception of slow governmental action on society's most pressing issues. Instead of being proactive and making nimble and quick decisions that would fit the urgency concerning our lives with plastics (not to mention other issues), citizens describe a political system that is much the opposite. The current actions of the political system, as some participants criticise, can only be expected once they have been pressured by civil society. To be heard by political decision-makers requires action from ordinary people, notes Christopher. "*How do I want to win someone over, now I have to go on the streets again and demonstrate but still put pressure on politicians? Because politicians only react to pressure. And when they realise that they are losing, they will either withdraw or change something*", he reflects (G3_CH:82). Pressure from civil society through, for example, demonstrations, petitions, and exercising one's ability to vote are considered to be the main ways action can be demanded from today's political systems.

Ultimately, citizens' diagnostic narratives reveal that they do not see today's political system to be capable of fast changes—something that clashes heavily with their overwhelming feeling of "*living in a fast-living time*" (G2_WE:166). Amongst citizens, the political realm is thus not grasped as fast, but as slow and reactive. Due to this slowness in responding to urgent and pressing issues, participants often believe that it is their responsibility, as individual citizens, to give politics a wake-up call in hope that they might take action. Consequently, to some extent, this transfers political responsibility to care for urgent issues like plastics to individual citizens.

Participants express cautious hope that pressure from civil society could drive political action, leading to new legislation to curb plastic use. However, their narratives also reflect deep scepticism, drawing on past governmental shortcomings in areas such as smoking regulations,

air pollution, emissions scandals, and climate change. This scepticism is reinforced by the perception that political structures move too slowly, often aligning with economic priorities rather than addressing urgent environmental concerns. Citizens describe today's political temporality as characterised by short legislative cycles, short-sighted decision-making, and a failure to anticipate long-term consequences.

As a result, political action is often seen as reactive rather than proactive, responding only when civil society exerts significant pressure. This disconnect between the urgency of environmental issues—such as plastic pollution and microplastics—and the sluggishness of political institutions creates frustration among participants. While these doubts make it difficult for them to imagine concrete alternatives to current consumption patterns, they also highlight an urgent need for political systems to become more adaptive and responsive in reshaping how society produces, consumes, and disposes of materials like plastics.

The intertwinement of political and economic temporalities in citizens' narratives highlights how short-term economic interests and reactive political systems reinforce the ways of consumption that we know today. Citizens perceive economic imperatives—profit maximisation, perpetual growth, and accelerating consumption cycles—as deeply embedded in the capitalist system, not only driving plastic production and disposal but also shaping consumer habits and fostering a culture of disposability. At the same time, citizens describe political structures constrained by short legislative cycles, reactive decision-making, and a lack of long-term vision, making meaningful intervention difficult. The alignment of these temporalities creates a feedback loop in which rapid consumption persists unchallenged, while political action remains sluggish, responding only to intense public pressure rather than proactively addressing sustainability challenges. As a result, many citizens feel powerless, recognising the urgency of challenging plastic consumption yet seeing political and economic systems that prioritise immediate gains over long-term responsibility. This fosters frustration but also reinforces awareness of the systemic nature of the problem, reinforcing the need for structural change.

5.2 BOON AND BANE OF DURABILITY: THE USE DURATION OF PLASTICS

Today, numerous products and items are made from plastics. This is not per se a bad thing. Theoretically, plastics are extremely durable and long-living materials. House insulation stays intact for decade, trains and cars work for a long time, my 20-year-old Tupperware is still functionable. This is great. But at the same time, many plastic products do not last for a long time. They break down and they are thrown away quickly. This is an endless cycle. It is endless because things break down fast and one is forced to make a new purchase. Especially with electronics with set breaking points or system updates that make the phone slower and slower. These things are not made to last long. Instead, they are made to last for a small period of time until they become unusable, and I need to buy it anew. And this is also where I see the next problem: people keep buying new things because trends are changing. How fast is fashion release these days? Today's marketing has many tricks, all of which lead people to continuously buy stuff—more often than not, this stuff has some form plastic in it or its production. People do not want to feel outdated. It's a prestige thing. So, each year, people jump on a new trend, they purchase the next phone, the next winter coat, the next deco trend, and get rid of the old one. So, we have plastics, a great durable material, which sadly seems to create many short-living products to which the consequences and impacts will be left with the coming generations.

Vignette 3 Plastics' durability paradox

Vignette 3 points to one of plastics' core strengths and weaknesses: durability. Whether it be plastics' ability to endure extreme climate conditions, survive significant temperature changes, and retain their strength under high pressure, it is clear that the durability of plastic materials is critical to many of their applications. As a robust material, plastics are highly valued for industrial, construction, military, packaging, clothing, and many more purposes of various sorts. However, whilst this durability has brought a multitude of plastic artefacts to life that will have long use lives, it is the same materials that are also used to create disposable plastic products, which will only be used for a short time—sometimes even just once. Plastics' many different durations of use are recurring themes in citizens' temporal narratives; often, they seem to serve as diagnostic ground from which citizens think the story of plastics further.

Therefore, this sub-chapter will be about the boon and bane of durability; it will look closely at how participants' diagnostic narratives revolve around several of the temporal tensions that surround plastics' material-object relations, which both shape and are shaped by human action. The sub-chapter first engages with the actual duration of an artefact's use life, as this appears to be a central component in participants' diagnoses of them as problematic or unproblematic—indicating the significance of plastics' durability paradox in citizens' sense-making. Second, it explores how citizens develop a diagnosis of so-called planned obsolescence, which is one of the key mechanisms they discuss that reduces the use life of plastic artefacts.

Third, it will describe another key mechanism that citizens believe impacts the pace of consumption and the use duration of artefacts: ever-changing consumption trends and desires. Generally, this sub-chapter elaborates on how citizens diagnose the (functional) durability of (plastic) artefacts, paces of consumers' purchases, and capitalist-oriented market logic as entangled and, moreover, as endorsing elements of today's fast rhythms of buy-and-throw-away practices. In doing so, it provides valuable insights into how our use of plastic materials and our ways of life are co-produced.

5.2.1 Double-edged durability: Durable plastics for long- and short-living artefacts

The rise of plastics brought the world a new type of material with outstanding characteristics: versatile, lightweight, inexpensive, and durable. It is the latter characteristic that is the most frequent in citizens' diagnostic narratives. Due to their long molecular chains of polymers, plastic materials are incredibly robust and durable. Most of them last several decades and even several human generations. Instead of rotting away or oxidising like other materials, they are resilient and long-lasting. Today, we do not know how long the plastic insulation of electronic cables, glass fibres, plastic window frames, sneakers, tents, flowerpots, or other plastic products will last in their specific socio-material entanglements with certainty. However, there have been many attempts to provide such an estimate. For example, the World Wide Fund For Nature (WWF) estimates that disposable diapers need up to 500 years, about 20 human generations, to decompose. And this is when they are exposed to sunlight and oxygen. If they are not, they will exist much longer (WWF, 2021). By the same measure, the WWF believes that plastic bags will decay much quicker, estimating that it will only take about 20 years before they fully decompose. The time various plastic products are estimated to need to fully degrade varies amongst different scientific models and calculations. These numbers are thus only approximate predictions for the future. Still, such high numbers speak to plastics' incredible and unmatched durability. Confronted with the length of time plastics are imagined to exist— not just in their use but in their afterlife— the durability and robustness of plastic materials are frequent subjects of our participants' narrations.

One of our context cards aims to foster discussions around plastics in the transportation sector. It asks: "Isn't it great that we have such long-lasting materials?" Choosing this context card, our participant Theo describes how vital he considers the durability of plastics to be for transportation: "*So, for example, there's this transportation card where you can see how plastics is just an incredibly great material for […] and transportation in general. Let's imagine*

there were wooden benches in all these underground trains or I don't know, cars. That would be completely nonsensical just because of the weight and durability" (G3_TH:37). In another discussion group, Kira shares a similar argument: *"Yes, I think it's actually quite important for transportation. In particular, it has the advantage that it is extremely durable and I have to say, I really enjoy sitting on these plastic chairs and wouldn't want to sit on a wooden bench."* (G5_KI:30). Comparing plastics to wood, Theo and Kira point to the fact that durable plastics are their favoured material used in public transportation. Choosing durable plastic materials for matters of transportation—both public and private—is regularly regarded as an important choice that ensures people's mobility in the city and beyond. Whilst the question of how long plastics in public and private transportation will be used remains open, citizens usually categorise these objects as long-living artefacts, which, in turn, must also be built from long-living materials. Most citizens endorse using durable and long-lasting materials to create durable and long-lasting products that will be able to be used for a long time.

In citizens' narratives about the transportation sector, durable plastic materials are often imagined as being part of busses, metros, and trams, which are not only durable but are imagined to be used for longer—yet often undefined—periods of time. In these cases, citizens do not consider durable plastic materials to be problematic. Whilst transportation helps highlight this point, the insight is not exclusive to citizens' stories about plastics; this reaches beyond specific contexts of use. Instead, it seems that it is the idea of a long use life itself that leads citizens to see plastic artefacts to be less problematic. As our participant Tobias puts it: "*[l]ong-living products like armchairs and mattresses are actually not our main problem*" (G2_TO:57). When the durable plastic materials are used to create artefacts that will be used for a long time, most citizens diagnose plastics' durability as something that benefits our lives with conveniences, such as travelling, sleeping, or sitting comfortably. In the next chapter, we will learn in more detail about how citizens justify these long-living plastic artefacts to occupy a legitimate place in our lives (see Chapter 6. Justificatory narratives).

However, this enthusiasm about the durability of plastic materials quickly fades away amongst participants with their stories about many of today's plastic artefacts, which are not used for long periods of time at all. Wondering why durable plastic materials are used in artefacts that are not only known but designed to last for only a few uses, or to break down after a certain period of time, becoming unusable or unfunctional, plastics' durability paradox begins to gain

much traction amongst our participants. Our participant Theo, for example, is amongst the few participants who attempt to investigate why using durable plastic materials for short-living products continues to find success. Departing from the early years of plastics, Theo recalls one prominent stories illustrating the vision of industries and product designers to create long-lasting products from durable plastic materials: the story of the synthetic fibre, nylon.

> *[T]here is also the famous example of nylon stockings. So, that's somewhere in the 20th century, I think in the beginning they developed nylon and made the first nylon stockings. And they were so tear-resistant that they were used to tow cars. So, they used it as a connecting piece and towed cars. The same engineers, all the technicians who developed it, quickly realised, wow, we've just destroyed our entire business. Everyone buys it once and that's it. And then they immediately started to reverse the whole thing. And put in a lot of effort, time and money and technology and knowledge to make the whole material more fragile again*. (G3_TH:47).

Capturing some of the specificities of our economy's capitalist logic, Theo is one of the few participants who attempt to provide some historical context and details as to why durable plastic materials are used to create short-living products. In his discussion group, Theo shares how engineers developed nylon with polyamide fibres to produce extremely durable nylon stockings and joints that do not break and will remain functional for a long time. Realising that durable nylon joints do not break meant that, at some point, every citizen would have one, which Theo recalled as reducing people's demands for nylon joints. According to Theo, this would have contrasted the growth imperative of capitalist thinking wherein ever-increasing demand and production are needed to generate profit and keep the economic system running. Creating a long-lasting and functional product from durable plastics (and any other durable material as well) would thus have created tension with the capitalist ways of living that predominate Westernised societies. To ease this tension, Theo recalls how engineers' efforts to modify durable plastic materials by making them more brittle allowed them to shorten the time a nylon joint will remain operable.

Theo describes an economic strategy that is heavily debated and often criticised in all our discussion groups. This strategy then, attempts in some way to reconcile plastics' durability paradox. Deeply intertwined with the durability paradox of plastics, the short use inscribed into many plastic artefacts is diagnosed as one of the main problems of contemporary consumption. The next two sub-chapters provide a more fine-grained picture of how citizens see the use duration of (plastic) artefacts, consumers' purchases, and capitalist-oriented market logic as

entangled and how they are imagined and diagnosed to contribute to the fast, iterative, and linear rhythms of the buy-and-throw away practices that govern life in modern society.

5.2.2 "THE EXPIRATION DATE IS BUILT INTO IT": HOW THINGS ARE NOT MADE TO LAST

When citizens discuss their lives with artefacts, regardless of their material composition, the conversation often revolves around how long we have them and how long we actually use them. Citizens' narrative focus lays not on well-working (plastic) artefacts, but on those that become unusable, unfunctional, and undesired relatively quickly. In doing so, citizens often criticise artefacts that are used much shorter than initially expected. In developing their diagnoses, citizens touch upon two mechanisms that they frequently discuss in terms of shortening (plastic) artefacts' use duration: planned obsolescence and changing trends and desires. Whilst the first mechanism revolves mainly around (planned) material breakdowns discussed in this sub-chapter, the second is embedded in changing market trends, and consumer desires and needs (see sub-chapter 5.2.3). However, both contribute to and simultaneously become criticised for fuelling today's fast, iterative rhythms of consuming (plastic) artefacts.

One could well argue that plastics are a type of material that revolutionised the use of electronics. Indeed, most electronic devices contain plastics in one way or another. Plastic-coated wires, plastic keys on plastic laptops, plastic television frames, plastic phone cases, and numerous other plastic applications can be found in one's daily life. For electronic devices, plastics are a vital ingredient. Still, many plastics in electronics are not always so visible to the users' eyes and often remain unrecognised. Because of this, we explicitly introduced a specific context in our IMAGINE PLASTICS method about electronic devices. "Smartphones, headphones, TVs and laptops are almost unimaginable without plastic parts. They have become part of our lives. Should the use of plastics in this context be reconsidered?" (IMAGINE PLASTICS, context card 3: Electronics). With a quite general context of plastic parts in electronics, although the card did not explicitly touch upon the use duration of plastic-permeated electronic devices, discussions show that the use life of the electronic artefacts is a very prominent temporality, and one in which participants return to again and again.

Fridges, washing machines, televisions, laptops, radios, headphones, smartphones, and many other electronic devices are subject to the phenomenon, in which, as Lothar puts it, "*the expiration date is built into it*" (G3_LO:20). Many share this view: that electronics have a

designed expiration date. Olaf generally describes that this is evident in "*the development or design of a product that breaks down at precisely this point in time or during this phase*" (G3_OL:48). Another participant adds that "*all these electronic products are deliberately planned and designed in such a way that they have small predetermined breaking points or small parts that only have a service life of two years and then break down*" (G3_TH:37). Whilst participants explain the same phenomenon in different ways, they all point to what Lukas and many others refer to as "*planned obsolescence*" (G1_LU:19). This term describes a business strategy in which the obsolescence of a product and its process of becoming obsolete is intentionally planned and built into the product from its conception by the manufacturer (Kramer, 2012). In referring to planned obsolescence and emphasising the built-in "*expiration date*[s]" (G3_LO:20) and termination points of artefacts, they show that not only are the ways of use inscripted into devices (Akrich, 1992), but so too are their use durations, as different forms of planned obsolescence are inscripted into them.

To make sense of this phenomenon in contemporary life, participants regularly recall memories from the use life of artefacts in former times. Here again, we see how memories function as important temporal repertoires for participants to make sense of their lives with plastics. Participants regularly narrate about how the use durability or use life of electronic devices used to be much longer. Some of them suspect that the material shift from glass or steel to plastics is precisely one of the main reasons for the shorter use duration of devices. Other participants, however, engage more critically with their observations and try to explain why the breakdowns seem to occur so much faster; consider, for example, the following exchange:

> Johanna: [...] *I mean, my father, when he was, I don't know, 25, probably as a car mechanic, he put his, I don't know how many months' wages into it for his stereo system and he had it for 25 years at least.*
>
> Werner: *Wow, that's amazing.*
>
> Johanna: *And it's probably still running, I don't know*.
>
> Lothar: *That's included, the expiration date is built into it.*
>
> Johanna: *Exactly, but that's always, it's getting shorter and shorter with things like that, so things are made for that, mobile phones and so on, so that you have to buy a new one relatively quickly.*
>
> [M]: *Yes*
>
> Gaby: *Yes, so I think, I think*

Johanna: *They don't live that long*

Gaby: *I think the idea, ah, the throwaway society—well, that's a problem and we have to slowly get away from that, so* (G3_20)

Like in the exchange above, many participants narrate about artefacts being designed to become unfunctional after a certain amount of time or after a certain number of uses. In doing so, citizens' narratives diagnose contemporary consumption as being corrupted both by material breakdown due to predetermined breaking points as well as software slowdowns due to ever-new system updates and software versions. From my interpretation of citizens' narratives, many electronic devices are integral to people's daily routines and are therefore expected to function with a certain level of reliability and pace.

However, when material breakdowns or software slowdowns signal the end of an artefact's use duration, citizens describe a sense of loss, particularly regarding the convenience these devices once provided. For example, Anna explains: *"[...] I believe that the mobile phone manufacturers are already timing it precisely so that at some point the device is simply no longer usable, yes? [...] Of course I can say that I'm giving up my mobile phone now, it's really difficult these days, even professionally*" (G1_AN:52). Anna is one of many participants who describe how, at some point, most electronic devices, including mobile phones, become unusable and cease to work. Losing the convenience of a mobile phone is not a desirable state of life. Indeed, without a working device, most citizens would not see themselves as equipped to keep up with (the pace of) contemporary working or living standards. Aside from disappointment about the short use life of electronic devices, various participants expressed the feeling of being forced to buy a new device to reinstall the lost convenience and pace. Many participants criticise this phenomenon: that they feel they have to purchase a new device. Our discussant, Olaf, for example, also looks at the issue quite negatively but from an even broader perspective:

[...] *So, electronics. I think that's a big problem. We are computer-dependent, I hardly know anything about computers, I don't even have internet at home. And I don't have a smartphone either (laughs). The fact that you're dependent on Microsoft and so on, and there are always new versions of smartphones, and consumers are forced to buy a new computer or whatever. Or a smartphone and so on, so that it works again [...] with updates and so on. (laughs) But otherwise none of this will work. And, of course, it's all calculated so that practically millions of people have to buy something new every few years. It's all designed anyway, that after so and so many years it has to break. [...]. All this electronic waste ends up somewhere in Asia or Africa*. (G3_OL:29).

Describing his discomfort with modern dependence on technology, particularly computers and smartphones, Olaf criticises the phenomenon of planned obsolescence and frequent updates of electronics that urge millions of consumers to buy new devices regularly. Additionally, he expresses concerns about electronic waste ending up in Asia or Africa (see sub-chapter 5.3.1 for a more elaborated account). Many of Olaf's observations resonate with other participants too, who feel that their consumption of electronics (and other goods as well) seems to be "*consciously controlled*" by economic players (G1_AN:52). In the discussions, some participants develop a critical line of argumentation about artefacts' short usage time, which tends to open a much wider debate about how the market logic gradually corrupting our ways of living and consuming (with) plastics. Tapping into these economic temporalities, which we covered in the first diagnostic sub-chapter, our participant Lukas shares: "*[y]ou notice it in the most diverse areas of life anyway, whether it's electrical appliances that don't last three or four years, planned obsolescence, where you also have to say, as I mentioned earlier, this, this endless economic growth that we all pursue in a limited system"* (G1_LU:19). For Lukas and other participants, planned obsolescence is the poster child of today's capitalist market logics, which offer products with a limited use duration and thereby stimulate the next purchase and fuel continued consumption. Following the power of economic logic like a marionette, consumers are regularly constructed not only to be subject to constant consumption pressure but to have difficulties, even inabilities, to resist.

The narrative of planned obsolescence thus also highlights how contemporary market logic is seen to make it nearly impossible for individuals to independently govern the lifespan of their electronic devices or other plastic-permeated artefacts. Whilst some participants argue that there is a moral obligation for individuals to repair and reuse goods to avoid contributing to the logic of "*infinite economic growth, which we all pursue*" (G1_LU:19), they also construct a clear contrast between themselves and other general consumers. They often characterise an individual consumer who would be overwhelmed with repair tasks due to a lack of time, money, or the knowledge to repair broken artefacts and extend their usage time. This narrative constructs a distinction between the engaged, responsible consumer, who seeks to mitigate waste and prolong product life and the others, who, according to the participants, are too burdened by systemic constraints to take on such responsibilities. In doing so, citizens often

express a sense of limited personal agency to influence the functional lifespan of electronic devices and other plastic-permeated products.

Thus, quick material breakdowns of devices, which are seen to be induced by contemporary market logics, are imagined to corrupt peoples' ways of living and consuming into fast-paced rhythms of buy-and-throw-away practices. Temporal cues for breakdown, destruction, or slowdown are imagined to be built into a wide range of plastic artefacts. This highlights how powerful these devices have become in contributing to the predominant temporal realities and rhythms along which social life and society function. Thereby, the general consumer often becomes constructed as both the fuel for economic growth and the victim of immoral market agents and structural developments, which force a certain temporal logic of consumption onto them. It also raises important questions about who controls the lifespan of products, and the cycles of consumption. And about who holds power over the pace of purchasing and the resulting waste streams? Who is required to comply with and who has the ability to resist these fast and iterative consumption rhythms?

5.2.3 Changing trends: On desires for enduring consumption

In addition to mechanisms of planned obsolescence, shifting trends, desires, and needs are also diagnosed as playing an important role in shortening product use and accelerating the buy-and-throw-away cycle. In making sense of plastics in contemporary society, many citizens narrate how changing trends and desires shorten the use life of (plastic) artefacts. Whilst these stories speak to various areas and applications in everyday life, one especially present context in citizens' discussions is fashion and clothing. Being polymer-based, synthetic fibres such as polyester, acryl, nylon, and elastane allow the fashion industry to mass-produce clothes for a truly infinite number of consumers in each of the world's markets. This fast turnaround allows for new fashion trends to be released each season. Today, most of our clothing and fashion items are fully or partly made from synthetic fibres. However, the presence of plastics in clothing often goes beyond the gaze of the general consumer. As one of our participants, Lothar, explains: "*In the case of fibres, in the case of clothing, it's not partly, for the most part, all the different fibres listed here—I have no idea what this [...] is made of—is it polypropylene, is it polyethylene? I have no idea. [...] So, I have to say that the consumer is clearly overwhelmed*" (G1_LO:81). Despite consumers having a tag with information about the material composition of garments, Lothar points out that many people still do not know what fabric their clothes are

made of. This again points to the power of plastics' enculturation, which has made plastics—here, plastics in fashion and clothing—almost imperceptible and, in turn, unquestioned.

Nevertheless, attempting to draw our participants' attention to plastics in our clothing, we dedicated one of our IMAGINE PLASTICS to synthetic clothing: "Synthetic fibres can make our textiles and clothing waterproof, breathable or even fire-resistant. Yet, when washed they release small plastic fibres into our environment. Should we reconsider using them?" (IMAGINE PLASTICS, context card 11: Synthetic clothing). After picking up this context card, citizens narrating their perspectives on and experiences with plastics in clothing often captured temporal repertoires about, for example, their purchase frequencies, seasonal trends, and outdatedness.

Whilst participants certainly note that they enjoy many of the advantages of synthetic clothing, they also draw attention to what they perceive to be an increasing frequency of purchases. "*Clothing is also slowly becoming a problem, especially synthetics"*, notes Lukas, *"you buy at least 60, 70 items of clothing every year [...] and fashion is constantly changing*" (G1_LU:47). Lukas is one of several participants highlighting this feeling: that fashion today changes rapidly and constantly, with consumers buying more and more clothes each year. Some diagnose the relatively high frequency of purchasing clothes as generally problematic whilst others criticise the constant accumulation of unworn and outdated fashion items (see sub-chapter 5.3.1). Still, in some of their narratives, a select number of participants develop a more critical line of argumentation and try to identify what exactly brings people to follow the ever-changing trends that fuel continuous mass consumption. Relating to the phenomenon of fast fashion, which prioritises the rapid production of often inexpensive clothing both to fuel and meet changing consumer desires, Theo argues that businesses invest millions of euros each year into marketing new trends so that consumers buy their goods:

> *[U]sing a bunch of tricks to get people to buy things that make them feel bad, that don't make them feel beautiful. And also, I don't know, feel like they have to jump on a new clothing trend every season, because otherwise you're out […] or that you realise, ok, I need this perfume now, then I'll feel masculine or somehow a feeling is given that you need some kind of product. That all these resources are used so that we simply buy more and more, and I don't think the responsibility lies entirely with the individual, but rather with some hideous entities, institutions.* (G3_TH:48)

Here, Theo taps into the entanglement between seasonally changing market trends and individuals' inner drives to follow them. By highlighting that individuals' desires are often shaped by external institutions, Theo, like several other discussants, criticises marketers for evoking peoples' needs in the first place. In their diagnostic narratives, participants often blame businesses for creating ever-new trends and desires that pressure the general consumer to follow. They reflect on how the faceless market system imposes a constant desire to feel beautiful and up-to-date, even if those possessions do not align with one's personal identity. In this way, participants construct themselves as victims of a system that forces them to continually update their possessions, with businesses and marketing strategies seen as the architects of ever-changing needs and consumption rhythms. This construction reflects the tension between individuals' desires and the broader structural forces that drive consumption and leave them with a feeling of having little agency to resist the trends and rhythms imposed on them.

In contrast to planned obsolescence, which relies on purposeful material breakdown and software slowdown, participants' stories about ever-changing trends and desires describe how new fashion is bought because the old clothing feels outdated. Whilst there is not a direct indication of material breakdown, one could discuss whether changing trends and desires are a sort of planned obsolescence. In any case, instead of shortening the use duration of functional fashion pieces, ever-changing trends and desires promise the future buyer a new fashion item—often advertised as being better with updated features. Citizens' narratives that blame businesses, marketing techniques, and capitalist market structures for creating constantly changing trends and desires are frequent argumentative repertoires participants tap into to explain why fashion items and other items of everyday life are often doomed to have a short use life. Beyond the context of plastics in fashion, our participants regularly describe a general consumer who must endure a consumption logic and rhythm imposed from the outside by some invisible market-related agents. To follow today's changing trends often entails replacing still functional goods with new artefacts—ones that are permeated with plastics and with obsolescence dates inscribed into them.

In sum, both synthetic clothing and electronic devices are illustrative examples that make concrete how "[t]he everyday is simultaneously the site of, the theatre for, and what is at stake in a conflict between great indestructible rhythms and the processes imposed by the socio-

economic organisation of production, consumption, circulation and habitat" (Lefebvre, 2004, p. 73). Plastics in fashion and electronic devices draw attention to how citizens imagine the power of certain economic actors; often, they imagine them to be responsible for infusing individual and societal practices and even establishing our specific rhythms of consumption. Situated in a society that is associated with a strong buy-and-throw-away mentality, the iterative and fast rhythms of consuming plastics go hand in hand with their disposal and accumulation. This is true even if this disposal happens under the guise of reuse or recycling (see Chapter 6. Justificatory narratives). Indeed, as Lukas notes, "*the mountains of clothes are so huge that you actually have a problem with recycling in the end"* (G1_LU:47); to which Björn adds about plastic-permeated e-waste*:*

> *So, the generation before flat screens found a home in some African countries, as we know, there are enormous mountains of televisions and CD players there. [...] and the cable stuff, which is freed from the metals and yes, I was amazed to see how much profit is being made from Europe to the south of Africa or the centre of the continent* (G5_BN:38).

Lukas and Björn criticise the unsustainable and wasteful nature of our past and contemporary consumption habits. Whilst Lukas emphasises the overwhelming accumulation of clothing waste that challenges recycling efforts, Björn highlights the problematic disposal and profitable exploitation of electronic waste, which is often imagined as ending up in African countries. Many participants raise concerns about our continuing mass consumption, which creates ever more amounts of waste that need to be dealt with, allegedly in low-income Global South countries.

5.3 PERSISTING OVER TIME: LEGACIES OF PLASTIC CONSUMPTION

At some point in time, each plastic item reaches the end of its use life. A plastic bottle is empty and tossed into the container. A synthetic glove falls on the ground and makes new nesting material for the neighbouring sparrow. Four car tyres served well for several seasons and are now neatly stacked in the garage. A microplastic particle detaches from its synthetic mothership and flushes down the drain. An umbrella fights strong against the storm and is carried along. When the use life of an artefact ends another part of its existence starts. Thereby, plastic artefacts have "various modes of existences" (Bensaude-Vincent, 2018, p. 282). Indeed, citizens' multifaceted stories illustrate the countless ways in which these modes of existences can manifold: a paused life in the garage, a second life due to recycling or donation, a toxic filter

remnant that will be incinerated, microplastics in terrestrial or aquatic ecosystems, nanoplastic in someone's placenta, or plastiglomerate in rock layers, to name but a few possibilities. Each of these is undergirded by plastics' extreme durability. Yet, some of these existences remain unknown to us: they are situated in the futures that lay ahead. Nonetheless, the durable persistence of plastics points to the importance of acknowledging that plastics, no matter what action we take and which knowledge we currently have, will continue to exist beyond the present. In this sub-chapter, citizens' temporal narratives thus reveal that both the certain and uncertain futures—in which the material and chemical legacies of plastics are imagined to circulate—are important repertoires from which they can make sense of and develop positions towards plastics in the now.

Acknowledging the multiple modes of plastics' existence, this sub-chapter unravels citizens' diagnoses of the trajectorial aspect of plastic-related causes and effects. Keeping in mind that the effects and impacts of plastics may materialise in different times and places, this sub-chapter expands the analytical lens to a spatiotemporal perspective. Not only does this allow us to pose questions of when citizens see the consequences of plastic use (not) coming to matter, but also where and which communities are imagined to (not) be affected by the legacies of plastics. This sub-chapter first engages with the material legacies of plastics most associated with the presence or absence of accumulating waste materials. Exploring how fast waste is disposed of and managed, it points to how the accumulation of plastic waste becomes visible in some places and invisible in others. Many insights from this chapter flow into the plastic paradox that gravitates around the boon and bane of fast waste management. The second part of this sub-chapter circulates around the afterlives of plastic additives and microplastics. It investigates how citizens' concerns about the persistence of plastics and the irreversibility of their impacts are diagnosed and how they inform certain ideas they have about acting on and governing plastics.

5.3.1 How fast is waste managed? (Not) seeing plastics accumulate

> *You know, a massive number of plastic products are produced, purchased, used, and thrown away. This means more and more waste is created. We have all seen the pictures of plastic accumulating on beaches and polluted rivers in Asia and Africa. There are even whole islands of plastic waste in the ocean as plastic bags, cutlery, Styrofoam boxes, even car tyres, you name it. And they will stay there for a very long time. We do not even know yet for how long they will stay. But slowly and steadily these products will break down into microplastics. And then we have millions of tiny plastic particles in the ocean. When they are so small, there is no way that we can get them out of the ocean again. And here comes a problem: we do not know what consequences microplastics will have on the environment or on our bodies when we eat seafood from the polluted ocean. We also do not know all the ways in which toxic chemicals from plastics can harm us. Should we ban them before harm is done or should we wait for science to establish causality? Either way, with plastics outliving us, plastics and their consequences will be an issue that coming generations must face.*

Vignette 4 Continuing existences: Legacies of plastics

As Vignette 4 shows, with the continuous production and disposal of durable plastics many citizens' narratives also reveal one of today's more symptomatic problems: the accumulation of plastics. Within these narratives, which tend to circulate around a story that describes how plastics have accumulated over time, many citizens try (not) to grapple with the consequences of society's ways of living with and handling plastics. Our participant Karl, for example, considers that "*[p]lastic is always a problem, even if it has been in circulation for 20 years, if it is only after 450 years [...] completely degraded [...] then it is a problem of accumulation*" (G4_KA:47). Indeed, regardless of the exact time horizon, Karl, like many other citizens, see the cumulative capacities of plastics as a future problem—one that can materialise tomorrow, next month, next year, in 20 years, in 450 years, or any of the futures in between.

However, participants in some discussion groups see things differently. Countering Karl's position, some argue that the accumulation of plastic materials is not even something we should necessarily consider problematic. In this argument, however, the main reason the accumulation of plastic materials is not constructed as a problem is because accumulation is not always noticed or seen. As we have already discussed, one must remember that the enculturation of plastics was a slow process and has spanned several human generations. Because of this slow, albeit steady and pervasive enculturation, its presence has become highly camouflaged in our everyday lives.

At the same time, quick and efficient waste management structures can transform many plastics into different modes of existence, which renders their accumulation even less obvious.

In seeking to understand when and where accumulation and the accumulated afterlives of plastics become imagined as something problematic, we visit two sets of diagnostic narratives, each of which addresses the pace of accumulating plastic waste. On one hand, there are narratives of plastic accumulation in the Global South; on the other, there are narratives of absent accumulation in Vienna, a city situated in the Global North.

When citizens narrate about the accumulation of plastic waste, their narratives heavily revolve around places and spaces other than Vienna. A large part of these narratives is directed towards marine environments. Christopher, for example, shares that "*[e]ven now, the UN has created its own continent—and that's no joke—the plastic continent in the Pacific. It's so big that it has a volume larger than Europe. It floats and the ocean currents push it all together in the centre*" (G3_CH:18). What Christopher describes here is what is often referred to as the Great Pacific Garbage Patch, the largest and maybe most prominent marine site of ocean plastic accumulation, which floats between Hawaii and California. Whilst the Great Pacific Garbage Patch is not actually classified as a continent, the claim nonetheless aids Christopher in illustrating the sheer volume of the plastics that are accumulating in the Pacific Ocean. Whilst marine environments, including oceans, beaches, and coastlines are far away from central European Vienna, they nevertheless play a prominent role in citizens' narratives about the problematic accumulation of plastics.

Indeed, one of our participants' more unexpected sites for seeing the accumulation of plastics first-hand seems to be their holiday destinations, which tend to be the marine-type venues they would not usually have access to in their daily lives. Equally important, however, in citizens learning about this accumulation are the secondary stories they encounter, which are conveyed by many different forms of media. Knowledge, information, and images about plastic accumulation have been shared through films, documentaries, mass media, and social media. All of this information feeds into citizens' narratives about plastics in distant marine environments. Mediating the accumulation of plastics in distant places has a significant effect on citizens: it renders plastics more visible and tangible.

As our participant, Britta's story exemplifies, for example:

> *And the last one I have is about littering in general, for example in the Maldives. Many years ago, I saw a programme about the island of Talafuschi* [Thilafushi]. *I*

> *don't know if you know it. It's an island of waste, only the waste is dumped there, but it's getting bigger and bigger, the island is growing [...]* (G3_BR:57).

Situated in the distant Maldives, Britta describes how the continuous disposal of waste led to an accumulation of waste and, more specifically, the creation of a waste island. Associating plastic waste as being or becoming part of a waste island, Britta points to her main concern at stake: *"[...] and I saw that all the waste goes straight into the sea and a few islands further on there are tourists snorkelling around, catching fish and all these toxic substances go into the sea in Talafuschi."* (G3_BR:57). Britta is especially concerned that the presence of accumulating (plastic) waste on this waste island and in the ocean enables the leaching of toxic remnants into the sea around Thilafushi. For Britta, the release of toxic chemicals from accumulating (plastic) waste is a problem because snorkelling and fishing take place close to the waste island. In other words, it is a problem because toxic substances are imagined to reach both non-human and human life. Indeed, many of our participants diagnose swimming in water polluted with toxic waste substances or eating fish that live in the same waters as concerning. It is in this way that Britta too constructs the visible presence of accumulating (plastic) waste as a problem that must be solved to circumvent future harm to both human and non-human life in Thilafushi and beyond. Britta thus continues by suggesting several solutions to the visible accumulation of waste in Thilafushi:

> *And now I've thought about a solution, for example [...] if the tourists somehow make a small contribution or something to solving the waste problem, that it is taken somewhere else and disposed of, because I haven't seen any incineration plants there. It's just thrown there and that's it* (G3_BR:57).

Following Britta's thinking, moving the waste somewhere else is imagined to solve the problem of accumulating waste in Thilafushi. The idea of relocating plastic waste to a distant 'somewhere else' is a frequent suggestion our participants make. However, what usually remains unclear is where exactly these waste materials should be brought. Here, in addition to moving the waste, Britta points to the importance of waste incineration plants as an apparent measure of proper governance over the problems of such accumulation. Incinerating plastic waste is also a frequent association our participants make in describing their ideas to solve and prevent the accumulation of durable plastic materials. To incinerate plastics on the spot would supposedly allow us to immediately deal with and manage rising masses of disposed plastic materials. Yet, whilst each of these is regularly described as a solution, their consequences are

not often well engaged with; burning plastic waste in incineration plants, especially when facilities are not sufficient, for example, creates a myriad of toxic filter remnants, leaches additives into environments and releases toxic gasses into the air. Still, making accumulated plastic waste invisible through incineration or relocation is a frequent discussion point not just amongst our participants but also in society more generally—a quick solution to govern the visible problems of plastic accumulation on some distant islands in the ocean.

Yet, our participants' stories about plastic accumulation are not only situated in marine landscapes. Particularly prevalent are citizens' narratives of plastic accumulation in the Global South, especially in Asia and Africa. By pointing to the export of plastic waste, David explains that *"[f]rom Europe, for example, we basically send all or a lot of our plastic waste to poorer countries, not necessarily poorer, but [...] to developing countries in Asia or Africa*" (G1_DA:71). Like David, many participants connect to a widely shared narrative that countries of the Global North are sending their waste including plastics to regions in the Global South. Whilst some participants are under the impression that waste exports are a method of the past, other participants are convinced that exports of European waste to distant countries are still happening under the umbrella of recycling (see sub-chapter 6.3). This adds substance to a widely shared imagination wherein waste is amassing in countries and communities of the Global South. This is also compounded by the fact that participants imagine Global South communities to lack proper waste management infrastructures, which often leads them to diagnose the accumulation of plastic waste, albeit distant, as a concern. In the Global South, norms, standards, and controls regarding waste processing are all imagined to be missing; in turn, they are imagined to be less regulated and certain waste processing practices such as open burning are perceived as a concern. Discussing waste processing practices in Africa, for example, Lukas wonders:

> […] *and what then actually ends up in Africa, where the plastic is then burnt away with all the toxic substances that are in it; so now not only the indirect effects of small plastics, but also really simply toxic gases that people breathe in, that are then simply in the environment, in the atmosphere, that get into the sea and the whole thing, bisphenol A, etc., whatever is processed in there* (G1_LU:30)

Many plastic-permeated artefacts (computers, mobile phones, fridges, or car parts) contain valuable materials including gold or copper. To retrieve those materials, various parts of the plastic artefacts are partially burned. With practices of burning plastic artefacts, these plastics

do not accumulate anymore—at least not visibly. Instead, these plastic artefacts transform into toxic emissions, plastic remnants, or microplastics, which continue to exist and accumulate further—be it in the lungs of a human, the atmosphere, the sea, or other places and spaces. In this case, it is not only per se the accumulation of plastics that is constructed as problematic, but also the consequences of their burning and concerns about potential future harm to human and non-human health. Ultimately then, problems of plastics accumulating (due to low waste processing standards) are most commonly associated with distant communities and distant futures.

Citizens draw upon distant regions, countries, and communities, and use them a comparative background, to make sense of the plastic realities in Austria, and especially in Vienna. Yet, in contrast to stories situated in the Global South, the accumulation of plastics in the Austrian context is not often seen nor diagnosed as a concerning issue. For example, Oskar explains:

> *But this example also shows the different starting positions of the individual countries. If we imagine pictures that we know from the media. Polluted estuaries or beaches where there really are tonnes of plastics, waste and dirt lying around. We have different standards of hygiene here. [...] That's not really an issue for us at all. So, it's all in a different dimension. But that doesn't mean that what we have here is any less toxic. It's just that it's probably less visible.* (G5_OS:25).

Oskar suggests that in Vienna, higher standards of hygiene and cleanliness mean that there is less visible accumulation of "*plastics, waste, and dirt*" and in turn is not perceived as a pressing issue. This raises important questions: Why do Viennese citizens not see plastic waste as accumulating in their city, even though they continuously produce it? Does the absence of visible plastic pollution affect whether plastics are viewed as a problem at all? Furthermore, if the remnants of plastics are largely invisible, how does that shape citizens' understanding of their relationship with plastics — both now and in the future? These questions highlight how visibility or the lack thereof, shapes how people perceive environmental issues and whether they feel motivated to respond. By analysing citizens' temporal narratives about plastic accumulation in Vienna, we can begin to unravel these perceptions and better understand how the (in)visibility of plastic waste influences their views and actions.

Most participants consider Vienna to be a fairly clean city. As one participant explains: *"[...] if you look in public spaces, it's relatively clean compared to other cities. We have a relatively high density of waste bins—which I find particularly bad, especially with smokers, [...] so in*

comparison [...] in other cities it's difficult to find an ashtray anywhere in public. In Vienna there's one every 20 metres" (G1_LU:39). Cigarette butts are a re-occurring type of plastic waste in Viennese streets citizens narrate about. Still, despite their presence, Viennese smokers do not need to search long for a bin nor need to carry their cigarette butts a long way to the next container. Instead, a high density of bins allows people to almost immediately dispose of and distance themselves from their plastic products, including cigarette butts. This creates a temporal convenience of being able to detach oneself almost immediately from their own created waste. Things can quickly be thrown into the next bin and flow into the municipal waste streams. Unwanted plastic artefacts do not accompany their users for a long time. They are thrown out and become the responsibility of contemporary waste management infrastructures, which escort disposed plastics into their afterlife.

Whilst our introductory video informed citizens that Viennese inhabitants produced over 500,000 tons of household waste in 2019, including over 14,000 tons of plastic waste (Stadt Wien, n.d.), most citizens did not mention describe seeing any accumulation of plastic waste or waste in general in the city of Vienna. Yet, in most discussions, Vienna is broadly considered a rather clean and tidy city: plastics are rarely noticed as they are, let alone accumulating somewhere. Still, even though we tried to make plastics, especially microplastics, in the city more visible by including one card in our IMAGINE PLASTICS method, titled "Breathing plastics", which showed one of Vienna's most popular shopping streets, the Mariahilferstraße (IMAGINE PLASTICS: context card 10: Breathing plastics), citizens often leave the card unaddressed.

What seems to contribute significantly to Vienna's absence of accumulating plastic waste are the city's fast paces and frequencies of waste collection and waste management, including its waste incineration plant in Spittelau. Many participants consider Vienna's well-functioning waste management structures and standards as the city's normal living reality; a short exchange between participants Lukas and Friedrich exemplifies this:

> Lukas: *[...] Plastic is of course unfortunately there again, because there is so much of it […], and the bin liner is also made of plastic, you can throw it in the household waste anyway*
>
> *Friedrich: It will be incinerated anyway*
>
> *Lukas: Exactly; so it ends up outside in Spittelau anyway, that's all right.* (G1:39)

Despite having plastics and disposed of plastics en masse, our two participants talk about how the cleanliness of Vienna's everyday life is supported by the functioning waste management structures such as the high density of waste bins and the incineration plant Spittelau. The city's waste-collecting vehicles reach Spittelau every few minutes—an incredibly high frequency and one which I witnessed first-hand during a field trip there. According to Wien Energie (n.d.), around 250,000 tonnes of household waste are processed in the shielded halls of this incineration plant every year. The relatively rapid pace of waste collection and management in Vienna prevents the accumulation of plastics in streets and households, thereby contributing to the broad invisibility of plastic waste.

The city of Vienna is regularly imagined to have decent waste management infrastructures to govern the masses of disposed plastic artefacts in a comparatively short amount of time. Like Lukas and Friedrich, many citizens thus normalise the burning of waste as part of a functioning waste management system in Vienna. Not only is the incineration plant imagined to eliminate large amounts of plastic waste, but Spittelau is known and promoted for its ability to produce valuable energy and heat from this incineration. Vienna's energy company Wien Energie labelling Spittelau a 'waste-to-energy plant' further legitimises an understanding in which huge masses of waste (including plastic waste) can be transformed into energy for the city and its inhabitants. Additionally, by disposing of plastic waste correctly, participating Viennese citizens sometimes imagine themselves as helping to keep the city clean by circumventing the accumulation of plastics and contributing to the production of energy. Thus, disposing and incinerating plastic waste in Vienna in a comparatively short amount of time contributes largely to citizens understanding that "*that's all right" (G1_LU:39)* and that there is nothing wrong or concerning about these practices. However, what remains largely unaddressed by our participants are the potential consequences of incinerating (plastic) waste. As being informed in our introductory video, incineration produces toxic filter residues, which are transported from Vienna's four incineration plants, including Spittelau, to be stored in German salt mines. Even when plastics are incinerated in specialised facilities, their toxic filter cakes endure and require further management. Although the afterlives of incinerated plastic remnants pose uncertain risks for future generations and environments, participants rarely considered this mode of plastics' ongoing existence.

This contrast is striking, as the burning of plastic waste in the Global South was linked to harmful effects on communities and the environment, often raising images of people handling waste without proper safety measures, exposing them to toxic smoke. These concerns were notably absent from discussions about Vienna, where plastic incineration is seen as taking place in the midst of the city in specialised facilities with high safety and health standards. With no visible plastic accumulation in Viennese streets, the long-term consequences of incinerating plastic waste were largely overlooked. It is possible that the perceived benefits of Vienna's system—reducing plastic waste volume, preventing accumulation, and generating energy—outweigh citizens' concerns about incineration. However, these benefits shift the responsibility for plastics' afterlives onto the city's waste management structures, distancing citizens from the ongoing environmental impacts.

5.3.2 (Un)concerning persistence: Afterlives of plastics

Plastics have numerous forms, shapes, colours, haptics, and features. Their versatility is owed to hundreds and hundreds of different plastic additives. Different types of chemical additives shape plastics to different needs, demands, and areas of application. For example, in the context of polymeric plastic packaging, "[t]he most commonly used additives in different types of polymeric packaging materials are: plasticizers, flame retardants, antioxidants, acid scavengers, light and heat stabilisers, lubricants, pigments, antistatic agents, slip compounds and thermal stabilisers" (Hahladakis et al., 2018, p. 184). Before any plastic product leaves its manufacturer, a mixture of synthetic polymers and chemical additives is applied to it to ensure its desired quality, functionality, usability, and durability. However, whilst plastics are often argued to be durable and persistent materials, their chemical and material composition are not stable but rather change over time. At some point, in the life of any plastic artefact, its added chemicals and material structures will interact with its surroundings. Given this materiality (Gabrys, Hawkins, & Michael, 2013b), we should keep in mind that throughout their different modes of existence, durable plastics continue to interact with their surroundings not for years or decades, but for centuries to come: plastic additives will leach into human and non-human

bodies, POPs[7] (Persistent Organic Pollutants) will be absorbed by plastics, and small plastic particles will become detached form microplastics or even nanoplastics.

Because plastic artefacts do not stay the same, but change their chemical and material characteristics over time, they create new (direct and indirect) interactions with humans and non-humans. Inhaling small microplastic fibres, breathing residues of burned plastics, ingesting microplastics from cosmetic products, and absorbing plastic additives or POPs from food and food sources are but a few interactions between plastics and the human body. Yet most of these interactions between human and non-human entities and plastics cannot be seen. Not only are the substances incredibly small, but the effects and consequences of the interactions often come with a temporal delay. Temporal uncertainties that are associated with the unknown impacts of plastics surface regularly in each of our discussion groups. Citizens are found in balancing acts between the uncertain temporalities of persistent plastics and their consequences, between time-intensive scientific knowledge-making and political action to govern plastics. This sub-chapter explores how knowledge about the past and concerns about possible future trajectories inform citizens' diagnoses of their lives with plastics today.

Because it is known that plastics will persist for a long time, many participants wonder when they will become problematic. In addition, as our discussant Clara speculates, there are also many temporal uncertainties about the additives that accompany plastics, especially one called Bisphenol A (BPA). *"[H]ow can it be that additives are used and then ten years later you realise what effects they actually have on the human body, right?"* she asks. *"So, yes, it just shocks me that there is something like BPA [...] that is generally used and then later you realise: well, maybe not so good after all, or something, yes?"* (G1_CL:85). Pointing to the temporal delay between the initial use of plastic additives like Bisphenol A (BPA) and the potential emergence of health impacts on the human body, Clara is shocked that such a commonly used additive like Bisphenol A has been shown to have potentially harmful effects on the human body. Clara's questioning

[7] One phenomenon regularly picked up in the media about plastics are (micro)plastics' capacities to absorb persistent organic pollutants (POPs). POPs are referred to as "scientists have identified certain chemical contaminants that exhibit toxic characteristics and are persistent in the environment, bio-accumulative, prone to long-range atmospheric transboundary migration and deposition, and expected to impose serious health effects on humans, wildlife, and marine biota adjacent to and distant from their origin of emission" (Ashraf, 2017, p. 4223). Persistent organic pollutants are named as such because these chemicals (and other substances) persist after being released. POPs can be found in humans, biota, air, sediment, soils, and water. However, there is no consensus on how long POPs 'persist' as the half-time differs for every pollutant and environment and is argued to vary from days to several decades.

reveals a significant disconnection that other participants also noted: one between the time one is exposed to plastics and the time its impacts or consequences will materialise. Still, any precision about when in the future these consequences may materialise tends to stay rather open in exchanges between citizens. In any case, it is clear that the sheer temporal uncertainty about when these negative impacts of plastics might manifest strongly contributes to the concerns of our participants.

The same holds true for microplastics in citizens' discussions as many continue to wonder whether or not microplastics will actually become a problem—and if they do, then, of course, when?

> *Because you only realise much later what the actual influences are or what the effects are. [...] I can imagine that there is an incredible amount of microplastic in our bodies, simply because we constantly lick it off, maybe put it in our mouths or whatever. [...] Breathing it in, eating it—it's actually insane [...] Maybe in 50 years we'll realise what damage it actually causes.* (G5_KI:35)

Kira believes that the human body is filled with microplastics from licking, inhaling, and ingesting. Sharing that the danger of microplastics may take years to detect, her words resonated with many other participants. Today, consumers actually "*do not know exactly what the long-term effects will be*" (G1_AN:35) and the exact consequences, impacts, risks, harms, and dangers of persisting plastics are not fully known at the present moment. Thereby, the lack of certain knowledge—or knowledge that is certain—about plastic-related consequences only seems to feed into participants' concerns as plastic-related impacts are regularly imagined to materialise sometime else: distant times, coming generations, and futures ahead. Nonetheless, the known durability and therefore, the persistence of plastics, still leads many participants to stress the need to identify the potential future risks of plastics, including how they should be governed and how society should act. In the following, we will explore the two different sets of narratives around plastics' temporal uncertainties and legacies that unfold in our discussion groups, each with diverging calls for action.

To make sense of the temporal uncertainties and delayed impacts of plastics and to determine which actions might be necessary, many participants make historical analogies to other materials and substances. Connecting in many ways to a collective memory, they repeatedly share narratives about arsenic, asbestos, mercury, or the insecticide DDD. In their attempt to establish parallels to plastics, microplastics, and plastic additives, citizens describe how each of

these substances carried their toxic legacies into past futures. The fact that the toxicity of the substances they mention came to light years after their broader use, leads many participants to wonder whether microplastics and plastic additives might also carry toxic and dangerous capacities. Lukas, for example, sees the parallels between asbestos and microplastics as such:

> *So, I think microplastics in particular are also a bit too abstract, along the lines of: it kind of reminds me a bit of asbestos, because that's also a great material. You didn't know exactly what it does until you eventually realised: really stupid, we should dispose of it really urgently; and I also think that it's just too abstract because it's too small, you don't really notice the effects of it straight away; it's somehow illogical, you don't really understand it. You think, yes, what about those microbeads in the toothpaste, that somehow doesn't matter, but you're bound to swallow a few whilst you're brushing your teeth.* (G1_LU:45)

The story of asbestos and other materials that became heavily regulated once their harmfulness was proven seems to have sensitised several of our participants to the potential dangers of non-knowledge; in other words, just because we do not have knowledge about potential plastics' adverse impacts does not mean that they do not have any. Indeed, when participants compare plastics to other materials, they often speak about a situation of irreversibility: once these materials—especially microplastics and plastic additives—are out there, they are out there. Such as Johanna, who asks her co-discussant: *"[A]bout how do you do it when I brush my teeth and there's microplastic in there and it gets into the water—how do you filter it out (laughing) of the water, for example?"* (G2_JO:26). Whether they are brought into circulation intentionally or unintentionally, we learn that participants do not consider most of our current technologies—everything from sewage filters to ocean clean-up initiatives—to be equipped enough to entirely remove plastics from the environment.

One truly complicated component of citizens' concerns is about how other living beings ingest microplastics and additives. "*And, and this is then transferred to the food and the whole food chain with fish and, it becomes alarming [with another meat] for those who eat meat, what is added to one, to one body per day*" (G1_RO:49), estimates Robert. With these substances—microplastics and plastic additives—supposedly accumulating in the food chain and, ultimately, in human bodies, Robert emphasises the cumulative and long-term impact of consuming contaminated food. He highlights the alarming, ongoing risk posed to individuals who eat meat and fish, as they continuously ingest these contaminants on a daily basis. Robert is not alone in his concerns. Indeed, the bio-accumulative capacities of plastics and the afterlives of not only

their additives but also their microplastic offspring raise several concerns amongst our participants, especially when it comes to the possible effects of this process on our human bodies. Combining their worries about plastics' potential threat to health with historical analogies of other substances, they discuss humanity's capacity to learn from the past. More specifically, several participants argue that we must learn from analogous materials of the past to prevent microplastics and plastic additives from following a comparable trajectory to bring a potentially toxic legacy to human and environmental health. In turn, these citizens diagnose our present as an important moment in time in which urgent action is necessary to circumvent or even prevent the persistent and presumably irreversible consequences of microplastics and plastic additives in the futures that lay ahead.

Fuelled by historical analogies to other materials, various citizens diagnose the need for a precautionary principle when it comes to plastics. Understanding the need to act on plastics before it is too late, they also discuss who has which scope of action. On the one hand, ordinary consumers are mostly constructed to be (often unknowingly) exposed to and unable to avoid plastic-related substances. Of course, to construct consumers in this way—as powerless victims of the system—releases individuals from responsibility. On the other hand, citizens demand a suitable political frame that would foster action—individual, economic, and environmental—on plastics. In this regard, it seems apparent that many citizens have some concept of how political decision-makers base their decisions on scientific knowledge. Oskar, for example, reminds his discussion group: "*It is always the case that politicians can only react to this if there are sound scientific findings*" (G5_OS:69). Yet, as we have seen when it comes to the long-term impacts of microplastics and plastic additives on human health, scientific knowledge is quite sparse; in Oskar's model, it may not even be "*sound*" enough to politically act on.

As such, many participants spoke to the need to request long-term scientific studies to assess causalities between microplastics and plastic additives and determine potential risks to human and non-human entities; this was particularly demanded by the various citizens who chose the IMAGINE PLASTICS responsibility/action card on scientific assessment[8]. Whilst being aware that processes of scientific assessment and the establishment of any causal relationship and certainties is a time-intensive quest, some participants nonetheless worry that these impacts

[8] Responsibility/Action card 12: "Scientific assessment: We need to invest in a better scientific understanding of potential risks and harms of (micro)plastics for humans, animals, and the environment. Only then can we develop a long-term strategy."

might already (soon) be here. Armed with knowledge about plastics' material durability and persistence, some participants raised concerns that because impacts will only materialise slowly in the very near future, action will likely come far too late anyway.

Yet, at the same time, this lack of scientific knowledge—on the impacts of microplastics and plastic additives—paves the way for the second set of narratives, which our participants use to make sense of plastics' uncertain temporal legacies. Without sufficient scientific evidence about the negative impacts on human health and our environment, some participants wonder if microplastics and plastic additives are harmful at all. "*[W]e're all sitting there now and have probably all had softeners* [a type of plastic additive] *in our mouths. Are we all seriously ill now, is the next question?"* (G2_TO:59), Tobias asks his discussion group. In another discussion group, Karl wonders:

> *the medical effects of plastic, is there anything you can say about that? If you have it in your body now, you hear you have it in your body, but people still seem to live quite happily—maybe it doesn't do any harm (laughs) if we have a lot of plastic in us* (G4_KA:51)

Do plastics make us sick? Which impacts do microplastics have? Are plastic additives bad for our health or our well-being? These and other similar questions from our participants point to one important diagnosis: They do not know anyone who got sick from plastics. Not from whole plastics, not from plastic additives, and not from microplastics. So, maybe plastics are not and will not be so bad after all.

Without sufficient evidence about plastics' negative impacts, Karl raises another point. He argues that we are surrounded not only by plastics but by "*100,000 different environmental impacts. And even if the effect is only very small [...] it is very difficult to prove"* (G4_KA:106). Pointing towards the existence of other substances that our environments and bodies interact with, Karl, like many other citizens, notes that it will be difficult to ascribe the negative impacts plastics may cause to plastics exclusively. Lacking causality between plastics and potential harm, Lukas continues his story about microplastics in toothpaste:

> *[m]icroplastics [are] there for most people, then again like: ah yes, it can't be that bad and the little bit, I mean, yes, the quantity makes the poison, it's not that tragic, you don't have any of it and you can't avoid it completely; so I think that's just swept under the table a bit* (G1_LU:45)

Again, here, the fact that microplastics are essentially invisible to the human eye and moreover, that they are *made* invisible due to a lack of knowledge about their potential harm, shows how

Lukas like other participants have many argumentative resources available to them to downplay the urgency to deal with microplastics today. The lack of visible harm as well as the gaps in scientific knowledge about causal effects fuels much debate amongst participants. We can sense how they are torn between adopting precautionary measures to govern plastics and maintaining a status quo that involves rapid resource consumption and a fast buy-and-throw-away culture. Thereby, downplaying concerns about plastics' potential risks provides a fruitful ground to analyse the arguments that support continuing—even if just for the time being—our paces and rhythms of living with plastics today. In turn, durable plastics, including plastic additives and microplastics, continue to persist into the futures still unknown to us.

5.4 CONDENSING DIAGNOSTIC NARRATIVES

In this first empirical chapter, I analysed how citizens' temporal narratives establish a diagnosis of how they consider living with plastics in contemporary times. This chapter demonstrated how plastics, people's lives with them, and the functioning of society work along specific, sometimes contradicting temporalities. Plastics are not only a product of our society, their use also contributes to fostering its specific paces and rhythms, in both individual and collective life. As we have discussed, this points to the co-production of plastics and society.

In making sense of our lives, routines, and habits with plastics in the present, citizens shared individual narratives of the past—a past when plastics barely existed. They thus built, as Halbwachs (1992) would explain, a collective memory of life in past times. Through their own lived experiences and passed down stories, citizens recalled visits to local stores where food was freshly prepared and packaged without plastics, which often required them to bring their own packaging materials like bags and containers. These memories highlight how grocery shopping in the past is remembered to have needed more planning and anticipation, which sharply contrasts with today's spontaneous and convenience-oriented consumption culture. In the next chapter (see sub-chapter 6.2), we will see how plastic packaging even works as a device that empowers people to pace along fast-living routines and rhythms.

Reflecting on the life of previous generations, citizens diagnosed how not only fewer plastics existed, but also how less consumption waste was produced, as it was a life with fewer possessions and one that necessitated people to reuse goods. Citizens' diagnostic narratives about life in past times allowed us to understand how the enculturation of plastics into people's everyday lives did not happen overnight but over several decades and human generations.

Through the gradual commodification of (plastic) goods and their slow enculturation, plastics became an almost invisible infrastructure that nonetheless underpins our individual and societal life in the present. Today, often camouflaged and well-integrated into our everyday practices and habits, the existence of many plastic artefacts is mostly taken for granted and is rarely questioned critically. As we have seen it is often in moments when they become seen as a 'matter out of place' (Douglas, 2002) or when widespread concerns about their legacies or afterlives arise, that the existence of some plastics becomes a matter of concern and are challenged with seriousness.

In grasping the role of plastics in society, citizens repeatedly point to the importance of one temporality: plastics' durability. Whilst the relative durability of plastic materials has often been praised as one of its most positive characteristics, depending on its intended use duration and use context, for certain plastic artefacts, durability has come to be understood as problematic. Still, most citizens tend to think that longer-living plastic artefacts are generally less problematic and less of a concern than single-use or short-life plastic artefacts. Yet, especially when single-use and short-life plastic products are made from durable plastics, the durability paradox of plastics becomes something that is highly criticised (see 8.3 for further elaboration).

The lifespan of plastic artefacts was seen as artificially shortened by various market-driven mechanisms, such as predetermined use durations, planned obsolescence, and constantly shifting trends and demands, resulting in fast and iterative rhythms of material consumption. Participants' narratives reveal how consumers diagnose, accept, or challenge these predefined lifespans and how plastic artefacts, in turn, shape and reflect the dominant temporal realities, paces, and rhythms through which social life and society are imagined to function.

With plastic materials being described as a relatively cheap and easily manufactured resource, citizens regularly diagnose these synthetic materials to be fuelling the capitalist growth logic of our economic system. What Lefebvre (2004) would likely describe as a linear repetition of consuming sheds light on the power of certain economic actors who can supposedly infuse individual and societal practices that establish specific rhythms and other temporal agendas for consumption. Nonetheless, the temporal focus of this analysis reveals how the ongoing desires and needs of individual consumers to buy new (plastic) products are also driven by their limited capacity to repair broken items. This creates a system where the fast rhythms of linear and iterative buy-and-throwaway practices are normalised. Ultimately, it is these fast and iterative

ways of linear consumption that are diagnosed as defining—yet problematic— characteristics of the present and future.

This linearly oriented throw-away society of consuming plastics (and other materials) also raises citizens' concerns about plastic accumulation and its uncertain impacts. Yet, citizens' perception of plastic accumulation as a health concern is dependent on the existence and pace of waste management standards and structures. The temporal asymmetries in the pace at which waste is (imagined to be) managed and made (in)visible, reveal the importance of considering spatial specificities and give rise to a paradoxical situation (see sub-chapter 8.2 for further elaboration). When narratives described waste management to be situated in regions known for fast waste processing (alongside their high health and safety standards), the incineration and afterlives of plastic waste are perceived to pose fewer (future) risks to human and environmental health. In the Global South, where waste management was often imagined to be slow and inadequate, citizens saw plastic (waste) accumulation and related environmental and health concerns as a greater issue than they would in Vienna. This aligns with Nixon's (2011) concept of slow violence, in which harm occurs gradually and out of sight. In other words, there is a clear temporal and spatial disconnection between the causes and effects of plastic consumption in distant futures and communities (this will be elaborated on further in sub-chapter 6.3). It is therefore crucial to consider both temporal and spatial dimensions when we assess the relevance of plastic legacies.

Regarding the (in)visibility of accumulating plastic waste, we learned that Viennese citizens appreciate the city's waste management strategies, which are fast and efficient. Citizens do not see the afterlives of consumed plastics as a major concern; rather, they see them as a contribution to the city's energy production. This shows how the individual disposer does not (want to) see where or for how long the consequences of our consumption remnants will stay with us. Keeping the afterlives of plastic waste out of sight and placing the care for the afterlives of consumed (plastics) remnants into domains of imperceptibility enables people to continue with an out-of-sight, out-of-mind mentality, "… a self-deception—that allows us to live in a fool's paradise" (Bensaude-Vincent, 2013, p. 14) of consumption.

Nonetheless, the uncertainties around plastics associated with their long and persistent afterlives and related compounds opened discussions about when to act on them. Narrating about historical analogies of other substances that were proven harmful after widespread use,

are concerned that the ubiquity of plastics might not be reversible and many participants diagnosed a need for immediate action to govern microplastics and plastic-related additives and prevent potential harm to future generations. At the same time, however, a lack of visible impacts or clear causality of plastics harming human or environmental health reduced potential concerns, yet still fuelled much debate amongst citizens. These ambivalences seem to stand between adopting precautionary measures to govern plastics or maintaining a position to not resist disrupting our well-entrenched routines, habits, and conveniences afforded to us by plastics (see sub-chapter 8.3 for further elaboration).

Whilst encountering both calls for immediate action on plastics and arguments to maintain business as usual, our participants found it difficult to envision change due to the stability and robustness of current political and economic structures. A temporal perspective on plastics and peoples' consumption highlighted the tension between the present and future implications of living with plastics. To preserve our contemporary practices—to safeguard the great conveniences plastics enable—was imagined to carry a likely negative impact on the environment and human health for future generations. Still, to prevent potential future harm related to the consumption of plastics would require individual and societal change of well-encultured consumption habits and rhythms as well as convenience-oriented lifestyles associated with plastics.

Thus, a temporal perspective on citizens' narratives helped us to identify their struggles to understand the present as a moment for rethinking our future relationship with plastics. The temporal narratives of this first empirical chapter serve as a diagnostic departure to begin to grasp how our participants justify when and where plastics have or do not have a reasonable place in society. The next chapter will elaborate on some segments of society and use contexts when participants consider the existence of plastics as (not) legitimate and how this informs windows of potential change. At the same time, the diagnostic narratives function as ground for participants' ideas about the future relationship between plastics and society. Thereby, Chapter 7 circulates around anticipatory narratives and focuses on how our participants explore the responsibility for our future with plastics by discussing future pathways for living with them across various spatial and temporal levels.

6. JUSTIFICATORY NARRATIVES: MORALITIES OF DIFFERENT USAGE TIMES

Whilst citizens associate plastics with our convenience-oriented ways of life, they also associate them and their use with potential impacts and risks to human and non-human health. Thus, both with their advantages and drawbacks, plastics are a quite ambivalent type of materials. This curious ambivalence invites us to investigate more precisely how citizens consider some plastics to be problematic. Therefore, one of our IMAGINE PLASTICS discussion phases invited citizens to reflect on concrete existences and use contexts of plastics (e.g. matrasses, toys, microplastics in bodies, transportation, health care, electronics, cosmetics, or synthetic clothing; see Appendix B). In asking citizens to reflect on their views of plastics—whether they consider them problematic, unproblematic, essential, or redundant—what we were most interested in observing was their classificatory and justificatory practices. As we will see, what we come to find in citizens' narratives, which justify the (non)use of plastics is that they are tacitly interwoven with different temporal repertoires.

This chapter thus explores how temporal repertoires matter in citizens' narratives that (do not) justify and legitimise the use of plastics in various settings. These narratives help make tangible the ways in which citizens draw from temporal repertoires to justify keeping some plastics in some segments of society to sustain certain norms, values, and imaginations of living standards. At the same time, for other segments of life, citizens too draw from such repertoires to classify and justify plastics' redundancy, denying them a future in our society. In this sense, this analysis seeks to unravel how citizens do not understand or construct all plastics as equally problematic. Both individually and collectively, participants are quite clear in identifying certain segments of contemporary life that they cannot and do not want to imagine without certain plastic artefacts. Thereby, citizens' justificatory narratives form an important ground from which to better understand how they consider where a rethinking of plastic use should (not) happen, as these considerations inform the windows of potential change and ultimately, the future functioning of our society.

The justificatory narratives described in this chapter revolve around three different use settings and classifications of plastics in which certain temporal repertoires serve as important elements in how citizens legitimise certain aspects of (consuming and living with) plastics. The first sub-chapter discusses how participants identify and encourage a one-time use of disposable plastics

in health care settings. In such cases, most citizens grant disposable single-use plastics a legitimate existence as their immediate disposability becomes a desired characteristic by helping to sustain contemporary hygiene standards. The second sub-chapter explores how citizens regard settings associated with a high abundance of plastic packaging, namely supermarkets and drug stores. Part of today's disposal culture has been marked by the widespread use of plastic packaging, which has become legitimised due to its time-saving properties that empower the consumer to pace along certain temporal structures of life. Finally, the third sub-chapter moves away from concrete use settings and turns towards citizens' struggles to find an acceptable balance between plastics' relatively short usage time and the relatively long afterlife of many of its forms. Pointing towards the practices that prolong or extend the use life of various plastic artefacts—through, for example, reuse and recycling practices—helps citizens morally justify their practices to turn them into a less problematic category.

6.1 DEFENDING THE ONE-TIME USE OF PLASTICS

This first sub-chapter revolves around participants' experiences with a specific context card from the IMAGINE PLASTICS discussions: Plastics in health care. Indicating how strongly many wanted to discuss this particular context, the card was picked by a quarter of all participants. This was the only context in which almost every participant fully embraced the use of single-use plastic artefacts. In terms of appearance, this context card, which again, is what brings themes into the discussion sessions in our methodology, features a person wearing a white lab coat holding some pens and a name tag (see Appendix B). In their plastic-gloved hands, they are carrying what looks like a laboratory pipet and a small reaction vessel. The text under the picture reads: "*To fulfil the hygiene standards, much of the equipment used in hospitals and doctor's practices is made from plastics. They are used once and then thrown away. How should we deal with plastics in this area?"* In each of the groups, this question almost immediately stimulates discussion amongst the participating citizens.

In one of the groups, a participant, Christopher, points to the health care card in front of him and declares, "*Health care. The question: we do not need to, I do not want to discuss*" (G3_CH:31). For Christopher, much like other participants, plastics in health care are not even something that needs to be discussed. Elaborating on the statement he has just made, Christopher explains: "*My eldest son is the head of a clinic where a lot of plastic is used. He has*

huge dialysis departments and nothing works there without plastics" (G3_CH:31). Making his example quite particular—dialysis treatment—Christopher's statements carry great weight, as plastics are well-entrenched materials for all things medical. Like Christopher, many participants leave their interactions with this card at such statements without considering alternatives to plastics in this field.

Indeed, the majority of citizens do not initially elaborate or justify why plastics are essential in the medical sphere. They instead speak about this essentiality as if it were common knowledge. However, to approach plastics in this manner—as part of our common knowledge—also entails the assumption that we also know *why* plastics might be crucial in dialysis departments, hospitals, blood donation centres, and other medical facilities. This was not the case. Treating the importance of disposable plastics in medical fields as shared knowledge and to grant them such an essential situated existence, gives little ground to other participants who may want to debate and criticise the use of plastics in such domains. Furthermore, this argumentative prework lays the ground for several participants to be able to rebut attempts to question and challenge the existence of plastics in these fields later in the discussion. Ultimately, treating the existence of plastics in medical settings as common knowledge profoundly overshadows any of the underlying temporalities that may contribute to citizens' justifications.

However, there are still several underlying temporalities that are prevalent enough that we can feel confident to associate them with using plastics in the medical sphere. These temporalities, which support citizens' justificatory work on behalf of plastics' medical essentiality can be seen in the countless plastic products in health care and medical settings that are *"[d]isposable products*" (G1_LU:33), which emphasises that they will be used for a very short time, usually just once, before they are discarded. Medical plastics are thus associated with serving a single, one-time use. *"[T]he disposable products [...] I also find it difficult, how can you avoid that in health care? [...] the tubes and the whole things—and some materials are made of plastic that are really good, [...] they have to be disposable simply for reasons of hygiene*" (G1_LU:33), explains our participant Lukas. Tubes, syringes, bandages, infusion bottles, and diapers are amongst the most prominent plastic artefacts our participants narrate about as important single-use artefacts in the medical sphere. Like Lukas, most citizens have hygienic worries high on their list of concerns when they narrate the necessity of single-use products. The need to ensure almost pristine hygiene creates a powerful temporal logic, as most participants are not

only aware that these products will be used only once before being disposed of but believe that it is vital that they are disposed of after one use to ensure proper hygienic conditions. Such beliefs further reinforce participants' justification for the short-lived nature of medical plastics.

In a world where bacteria, pathogens, fungi, and viruses are an everyday companion, most participants treat disposable plastics as the poster child of hygiene and cleanliness. Here, it is the one-time use of plastics that sustains the idea(l)s of hygienic and sanitary conditions. Many participants tap into a temporality linked to infection control and patient safety, in which the immediate disposal of used products minimises the risk of contamination and the spread of infections. Thus, in contexts when diseases, operations, wounds, and other health issues disrupt human life, our participants construct disposable plastics as artefacts that ensure hygienic settings. In this sense, these artefacts enable an environment in which the human body can heal and recover, as clean or virgin plastics are imagined to reduce the number of potential external intruders into the human body. Thus, in social sub-systems associated with health care and medicine, citizens legitimise the one-time use of plastics because they create hygienic conditions that they argue, work for a greater good, namely the saving and prolonging of lives.

Whilst almost every participant demands the use of disposable single-use plastics in said contexts, we must also be aware that using medical plastics is embedded within regulatory frameworks. Following European legislation, for example, many medical devices (including plastic ones) are subjected to very strict regulations, standards, and measures (such as Regulation (EU) 2017/745 on medical devices (2017) and Regulation (EU) 2017/746 on in-vitro diagnostic medical devices (2017)). In most medical environments, health care workers and personnel must follow strict requirements for general safety, accountability, performance, and risk management. Insuring those and avoiding contamination, infection, or worse in medical contexts, many medical protocols require that plastic artefacts be used only once. After one single use—or, with error, after opening the artefact's sterile (plastic) packaging—most medical plastic artefacts become regulatory defined as unusable. Our participants' demand for single-use medical plastics is thus embedded within broader legal frameworks of hygienic and sanitary regulation that require health care workers to use disposable plastics. This regulatory framework, which is filled with idea(l)s of and demands for hygiene, therefore also helps our participants to justify the need for new and pristine plastics to interact with people's bodies.

However, even though this was the ultimate conclusion the majority of participants came to, it does not mean that single-use or disposable plastics for medical purposes went completely. Indeed, some of our participants expressed concerns about the extensive use of single-use medical plastics and often proposed ideas for reuse or multi-use. Yet, entertaining such ideas and being comfortable with what they might look like in practice are two very different things. In discussing the viability of alternatives to disposable products in medicine, Paula, for example, voices her doubts, wondering aloud,

> *[t]he question is whether there are realistic alternatives for disposable products in medicine. I think that's a very difficult topic [...] so I don't want to have a syringe from a patient who was ill and that even if it's somehow burnt or somehow bacterially cleaned, you just don't know [...] I see few alternatives, especially in medicine, so not necessarily going back to 1900 with all the stories, yes?* (G4_PA:41).

Reusing medical plastic products is for Paula, like many others, a highly challenging concept to sit with. To be injected with a used syringe, maybe even from an ill or infected person, is a non-starter for many discussants. Using an item, which has been designed and communicated as a single-use product, more than once immediately strips away the advantages and benefits of its one-time convenience for many participants.

Several participants express this discomfort and their concern about reusing single-use items, especially in health care settings. For Paula and other discussants, even thorough processes of cleaning and sterilisation cannot bring back and reclaim the hygienic properties virgin single-use plastics carry. To even think hypothetically about such reuse unleashes concerns and feelings of disgust, uncertainty, and doubt. For example, Paula is concerned that not using single-use medical plastics would set society back to the 1900s. Whilst it is highly unlikely that eliminating disposable plastics in the medical field would reverse a century of medical advancements that support our health today, participants' concerns and discomfort with reusing medical plastics often serve to generally justify the continued use of single-use plastics in health care settings.

Resonating with Paula and others, Valerie, from a different discussion group, emphasises with the challenges of considering material alternatives to single-use plastics in medical contexts. She shares a similar concern about hygiene and safety, stating: "*[M]aking every blood container out of glass or a higher-quality material, because you can't use it again for these hygiene*

reasons" (G5_VA:32). Like Paula, Valerie finds it difficult to imagine a viable alternative that would uphold the stringent health and safety standards required in medical settings. This perspective further underscores participants' broader hesitation when it comes to rethinking the role of disposable plastics in health care. Glass and other valuable materials (e.g. stainless steel) are not per se associated with throw-away practices; instead, because they are perceived as more valuable, they are associated with reuse. However, for many citizens, including Valerie, reuse of any kind in medical settings raises hygienic concerns regardless of the material used.

As elaborated above, ideas to not use disposable plastics but alternatives that would have to be reused and therefore would have to interact with different human bodies are not popular amongst participants. Many admit to not being able to wrap their head around having materials other than plastics in medical sub-fields of society. Indeed, very few of our participants are open to giving up the bodily and mental conveniences disposable plastics bring to health care and medically related fields. Citizens instead use the need to maintain hygiene standards and sterile conditions as a moral rationale to defend the essential existence of disposable plastics. Not only are single-use plastics welcomed in medical fields, but they are also demanded—individually and legally.

Whilst this broadly acknowledged consent—that disposable plastics in medical spheres should have one life only—still provoked serious discussions amongst participants, what is to happen to such artefacts after they are used is barely brought to the fore. This lack of any true debate becomes concrete in an exchange in one discussion group, after the moderator asked which cards participants chose to discuss in the context phase:

> Hendrik: *Yes, I've only chosen one particular one so far [...] that's the health care system [...] I just think it's incredibly important that things like that somehow just run smoothly and I don't want anything to be used more often, to be honest. […]*
>
> Silvia: *I agree with him, and besides, I don't think it's a problem, it really does go into the recyclable cycle, so I think it's well organised.* (G4:38)

Whilst Hendrick declares the general importance of single-use plastics in the health care contexts—a common general feeling the vast majority of our participants have—Silvia suggests that upon their disposal medical plastics enter a well-organised "*recyclable cycle"* (G4_SI:38). Silvia's argument assumes that medical plastics will flow into existing recycling cycles; because of this, she feels that they are less problematic. Silvia's argument is thus quite interesting in

that it seems to go against the doubts and concerns of citizens mentioned previously about the reuse and multi-use of medical plastics. Whilst the reuse of medical plastics is perceived as concerning, their flow into recycling streams is not. Aside from reuse and recycling being understood as two different concepts, we are therefore left to wonder why recycling is imagined to make medical plastics and, to an even greater degree, their afterlives, less problematic. This curious situation raises several questions about what lies underneath citizens' perceptions and about what information or aspects contribute most significantly to citizens' many different views on reusing versus recycling medical plastics.

Engaging further with the afterlives of medical plastics, our participant Nele compares Silvia's medical context to laboratories for scientific research. In each of these situated contexts, hygienic and sterile working conditions are crucial to ensure good results—to heal the human body without complication and generate sound, replicable scientific results. As we have seen, Silvia initially considers the afterlives of medical plastics as well-managed and not problematic; however, in engaging with Nele, we can see how she steadily begins to request more information about the afterlives of these disposable plastics in scientific settings.

> Nele*: I do believe that a lot is thrown away in research and medicine—and I think that's important, because I did a science degree and we used an incredible number of pipette tips in the exercises, so really a lot, and of course that was already a problem.*
>
> Silvia*: And what happens to them then?*
>
> Nele*: Well, sometimes you can reuse them if you clean them, it's not such a big problem, especially in the exercises, but when you're really doing research, you don't necessarily want to take risks and you're more willing to throw away something that might still be good, but …*
>
> Silvia*: And where does it end up, that's why I'm asking?*
>
> Nele*: Well, it's not just thrown away, if it's contaminated*
>
> *[...]*
>
> Silvia*: Can you find out more about that?*
>
> Nele*: Well, if it's contaminated, it will be incinerated.*
>
> Bernd*: It will probably be burnt*
>
> Silvia*: I think so, right? (G4:38)*

In this exchange, Nele emphasises the high volume of single-use plastics like pipette tips in scientific practices, noting that whilst some can be reused after cleaning, the risk of contamination in research often leads to the disposal of plastics even if they might still be usable. Imagining that they are not simply thrown away, Silvia starts inquiring about the paths of these disposed plastics until Bernd suggests that these plastics are likely incinerated. This exchange is one of the rare moments in which some of our participants insistently probe to grasp the afterlives of single-use plastics. Whilst participants tend to treat the use of disposable plastics in medical and scientific contexts as common knowledge, amongst them we actually encounter very little knowledge about disposal processes and afterlives of single-use plastics. It thus seems that as soon as medical plastics are disposed of, they enter opaque waste management streams that make it challenging for citizens to trace what happens to them.

In other words, the afterlife of these medical disposable plastics can be described as a black box for many participants, as the ultimate fate of these plastics remains unclear once they are disposed of (see sub-chapter 6.3). Nonetheless, the strongly moralising argument to save lives (and establish adequate scientific knowledge) requires the help of disposable plastics thus seems to outweigh any issues or other moral concerns that may emerge during such discussions; questions that include: What happens with disposable plastics from medical and scientific settings? Where do they go when they are thrown away? How are contaminated single-use plastics managed in these systems? To even engage with these questions at the surface level usually tends to exceed the knowledge of the individual citizen. Instead, our participants justify the one-time use of plastics in these social sub-systems of life because they work for the greater public and scientific good—a good that is tacitly expected through its entrusted systems to also take care of the plastic waste and remnants they produce.

6.2 WEIGHING TEMPORAL (IN)CONVENIENCES OF (NOT) USING PLASTIC PACKAGING

There is another area of life in which the underlying temporalities of plastics are woven into citizens' justificatory narratives. Neatly lined up on each shelf, plastics provide a safe home for hundreds of products in supermarkets and drug stores. When citizens talk about supermarkets or drugstores and their everyday practices of grocery shopping, they regularly point to the great abundance of plastics. "*For example, when I go shopping in a supermarket now, there's plastic everywhere"* (G2_WE:2*)*, notes Werner; *"Packaging, so there's so much packaging in the supermarket*" (G4_NE:10), says Nele. Indeed, for most participants, if the omnipresence of

plastic packaging does not become visible directly in the supermarket, then it does as soon as they unpack their groceries at home and become flooded with discharged plastic packaging. Many different types of plastic artefacts, fall under the larger umbrella of plastic packaging: vacuum packaging, plastic wrapping, plastic stickers, plastic banderols, plastic nets, and plastic bags, to name a few of the most prominent examples. Each of them helps protect their content from contamination, humidity, and pests. By shielding their content and prolonging shelf life, plastic packaging adds to the freshness and safety of many products. In addition, plastic packaging also makes the transportation, storage, and handling of products more efficient. Beyond these qualities, plastics also offer a practical way to identify products through, for example, labels and barcodes, which provide a space for information about ingredients and nutritional values. Our participant Lothar sums up the impact of plastic packaging in the supermarket quite nicely: "*Without plastic packaging, our current supermarket culture would simply not be possible*" (G1_LO:87). How we perform our daily shopping practices is deeply intertwined with the presence of plastics. The temporal lens of this research shows that citizens frequently justify plastic packaging as an important material that contributes to several of the temporal specificities of our society today.

For many participants, our context card 4 showing a supermarket shelf (see Appendix B), serves as an entry point to discussing the proliferation of plastics more generally. For example, after our participant, Doris, elaborates on the practices and temporal implications of buying pre-packaged cheese, it takes only a moment for Oskar to pick up from her story and make a larger point about our society's temporalities more generally:

> Doris*: For example, when I buy a cheese [...] if you buy a packaged cheese wrapped in plastic, you can finish your shopping faster. But compared to queuing at the counter [...] Then I might have to wait 10 minutes or five minutes during rush hour (G5_DO:16)*
>
> *[...]*
>
> Oskar*: "[w]hen you pick up the cheese at the counter, I can come there with my glass jar and say please put it in there, but I'm standing in the queue and I'm much quicker if I take the pre-packed one. And nowadays nobody has time to wait, or let's just say a fraction of society, or if you have a spare moment and you're relaxing, then maybe, but you're always in a hurry and you always, always have too much to do. That's simply state of the art.* (G5_OS:18)

This exchange about pre-packaged cheese serves as a great example in illustrating the intertwinement of two different temporal repertoires in citizens' justification of plastic-packaged foods in the supermarket—speed and spontaneity.

First, pre-packaged goods allow for faster grocery shopping; as Doris puts it: "*If you buy a packaged cheese wrapped in plastic, you can finish your shopping faster*" (G5_DO:16). Like Doris and Oskar, the narratives of many participants reveal that pre-packaged goods are regularly imagined to make the handling and organisation of goods, especially food items, much faster and efficient, a fact that participants routinely use to justify the existence of plastics in this area of life. Pre-packaged products along with the widespread availability of plastic bags, nets, or other devices for carrying goods, streamline the process of acquiring food in supermarkets and reduce the time one spends on weighing or scooping items at counters. This preference for a fast pace in one's grocery shopping reflects the generally fast-paced rhythms of our contemporary society, where efficiency and time-saving practices are highly valued. By choosing pre-packaged goods, consumers thus align their shopping habits with societal expectations for speed, completing their tasks quicker and more effortlessly than they would without such goods. As Doris and Oskar note, avoiding long queues and the time-consuming process of counter purchases helps them finish their shopping faster; as Oskar puts it: "*that's simply state of the art*" (G5_OS:18). This statement reinforces the idea that our fast and efficient shopping experience is today not just a choice, but a felt standard in contemporary life.

In a world where time is perceived as a limited and precious resource, the use of pre-packaged goods becomes a way to navigate the time pressures of our everyday lives. Choosing pre-packaged options reflects a broader societal trend in which time constraints and the demands of modern living where one is "*always in a hurry*" (G5_OS:18). The symmetry between plastic convenience in the supermarket and our broader societal imperative thus makes it all the more difficult for citizens to opt for slower, more sustainable practices, like shopping with reusable containers or buying unpackaged products from counters. As Oskar states, "*nobody has time to wait*" (G5_OS:18). This sentiment highlights the urgency that citizens feel characterises contemporary life and suggests that time scarcity has come to influence even our most simple decisions in life—here, our grocery shopping towards more convenient choices. However, what

this preference for convenience also reinforces is a certain way of life—one that prioritises fast and easy consumption often at the expense of sustainability.

The second thing we learn from our participants about plastic packaging is that there is no longer a need for people to plan ahead. In today's supermarket culture, consumers do not need to anticipate or prepare as there is no need to bring clean and sufficient containers to the supermarket. With plastic packaging and plastic carrying equipment provided by the supermarket, citizens can engage in spontaneous purchase activities. *"[I]m now thinking about disposable plastics, for example the plastic bag, right? It's very, very convenient, so you go shopping, now I don't have anything with me, I quickly take a plastic bag*" (G2_GA:44), reflects Gaby. Plastic packaging allows individual consumers like Gaby to shop spontaneously without the need to plan or bring their containers, which, participants note, makes grocery shopping more convenient and more flexible. This convenience, however, in reducing society's need to plan or prepare, contributes to a culture of to-go consumption. The demand and dependence on plastic packaging thus enacts a tension between plastics' immediate convenience and generations of plastic waste. Citizens circumventing planning and utilising the factor of rapidity plastic-packaged food gives to shopping is therefore deeply intertwined with societal ideas of temporal efficiency.

Indeed, citizens regularly tie the use of pre-packaged goods to the argued need to be more spontaneous and efficient, as bringing their own packaging equipment, like glass containers, is said to take much more time and planning. As Oskar pointed out, "*hurry [is] state of the art*"; only a few people have a "*spare moment*" (G5_OS:18) to dedicate to practices that would reduce their plastic use. Instead, the widespread desire amongst citizens to save time and avoid waiting makes space for and enacts plastics in specific time-saving ways. Our society is thus reflected in the time-saving characteristics we have come to rely on plastics to perform through. For many citizens then, being able to avoid waiting and to save time are sufficient enough justificatory grounds to legitimise the use of plastics and plastic packaging despite the environmental concerns they pose.

This justificatory work becomes even more concrete in another discussion group, in which Hendrik shares how plastic packaging enables him to make the best of the little time he has on some of his busier days:

> *Well, I often have days where I have an hour to cook, eat and wash up and then have to carry on, so I don't have the time to prepare my 13-euro steak or [...] sometimes I just need ready-made stuff or something.* (G4_HE:34).

Hendrik's everyday life, much like nearly every one of our other discussants, is orchestrated by various temporalities. Work, study, and family; different obligations set specific paces and rhythms for the individual citizen. Subjected to such temporalities that structure their everyday lives leaves many citizens like Hendrik with precariously little time for certain tasks like more time-intensive cooking or extensive grocery shopping. Hendrik, for example, explains that when he is short on time or has none at all, he needs convenience food. Pre-prepared and pre-packaged in plastics, convenience food requires minimum effort from the consumer for further preparation; it is often ready to be eaten as it is. With only one hour to not only consume food but also prepare, Hendrik thus justifies his choice for picking convenience food—even if it is packaged in plastics. When discussion group participants explain that they, like Hendrik, do not always have enough time to both prepare and consume their food, their narratives regularly convey that intervening with, changing, or even adapting their plastic consumption patterns is—if possible at all—not desired whatsoever.

Hendrik's story is one of many examples that illustrate how citizens do not want to miss the time-saving conveniences of plastics, especially in an everyday life that is paced by the rhythms of contemporary life we have discussed previously, as using goods wrapped in plastics helps citizens feel that they are keeping up with "*a fast-living time*" (G2_WE:166). Indeed, packaged convenience food and to-go products both morally and physically relieve citizens from time traditionally dedicated to grocery or cooking-related practices. Citizens are more able to do other activities today simply because of the time they save by using plastic packaging. Thereby, participants regularly construct plastic packaging as devices through which they can regain a sense of ownership over their time. In other words, we can thus see a very strong entanglement between the perceived ownership over one's temporal resources and the perceived (non-) capacity to challenge their own patterns of consuming plastics. To remove plastics from one's life, many of our participants would sympathise, would entail becoming even more obedient to the dominant temporalities perceived to structure their everyday lives. For many, the advantages, benefits, and time-saving conveniences of plastic packaging help them to morally look beyond the temporally and spatially distant consequences that will come once used plastic packaging is discarded.

Whilst most participants view plastic packaging as a time-saving device, they also explore what it might mean to forgo it. Many discuss alternatives within the context of supermarkets and drugstores, imagining practices that avoid plastic waste after each purchase. These scenarios often involve visiting local businesses, zero-waste shops, or farmers' markets, places participants associate with infrastructures designed to minimise plastic packaging. I will refer to these as plastic-reducing infrastructures. Key to these is the expectation that consumers bring their own containers, sacks, and boxes to carry goods. Christopher notes: *"[…] there are such small shops [...] [I've] already read that in Vienna too. And then you can take your own bowls for nuts or whatever*" (G3_CH:24). Many participants view shopping at places with such plastic-reduced infrastructures as more circular and sustainable alternative to the linear buy-throw cycle (see also Chapter 7: Anticipatory narratives), associating it with reduced waste and resource use, as bringing their own packaging is imagined to directly cut plastic waste.

However, on the other hand, using plastic-reduced infrastructures to perform the recurring task of grocery shopping is often seen as a much more time-intensive practice. One specific exchange between several participants in one of our discussion groups represented many of the contours of this issue. The moment came after discussing food packaging, when one participant, Lukas, began to argue that using plastic packaging is entangled with a "*Convenience-Factor […]*" (G1_LU:9). He then elaborated, referring to the drugstore chain, dm, which had been testing out a service in four of their stores where customers could (re)fill washing detergent into reusable containers for purchase.

> *[...] there is already the possibility, I think dm is testing it, of buying detergent in refillable [...] packaging—yes, that's quite nice, I would do it too, but I have to say: driving halfway across the city to pick up my detergent, that's certainly not going to happen (laughs).* (G1_LU:9)

In principle then, Lukas welcomes the idea of refilling his washing detergent at a dm drugstore branch. What dissuades him are the lengths he would have to go through to use the service, making explicit that he would never go "*halfway across the city*" just for some detergent. He thus hesitates to even think about engaging in such refilling practices. Whilst it would reduce the amount of plastics and plastic waste we produce, investing what one considers a lot of time to participate in plastic-reduced grocery practices is not feasible for many participants. Without using linear throw-away plastic packaging, which they imagine improves their speed and their

efficiency, when it comes to reusable containers, participants see a more time-intensive act in more regards than one.

To even start to engage, rethink, or re-do one's well-entrenched consumption habits seems to be yet another time-intensive obstacle standing before citizens: where will I buy my favourite shampoo, detergent, apples, toothbrush, herbs, milk, or any of the other everyday goods if I have to think about how much plastic might be in them? To not only avoid the temporal conveniences of plastic packaging but also establish brand new consumption habits that rely on less linear plastic packaging requires substantial efforts from the individual consumer. In a society that people feel is orchestrated by several interrelated temporalities—time pressure, a lack of time, and never-ending deadlines—the temporal inconvenience of reusing and refilling containers is thus often strong enough for citizens to reassure themselves and justify their continued use of convenient single-use plastic packaging in fast and linear rhythms. The perceived challenge to use alternatives to convenient plastic packaging therefore makes it easier for citizens to morally accept the use of plastic packaging.

Nonetheless, in responding to Lukas, another participant, Friedrich, adds a fact that allows Lukas to see the situation in a different light:

> Friedrich: *I'd like to interject briefly, […] there are now four dm branches that offer these refillable detergents—one, how could it be otherwise, in the 7th district in Lerchenfelder Straße.*
>
> [...]
>
> Lukas: *Yes, that, that's feasible again, if it's somewhere on everyday routes, because [...] because that's just the way, when it was first introduced, I went to the 5th district, and from the 15th to the 5th to buy washing powder, no* (laughter). (G1:9)

Thanks to Friedrich, Lukas learns that there are four different dm stores in Vienna offering this refill service. One of them immediately seems to be more convenient and, after learning this, Lukas responds positively. He notes that he would be much more willing to engage in refilling practices if it was available along his daily routes—he was still not open to travelling far distances. Thus, when plastic-reduced infrastructures are situated on "*everyday routes*" (G1_LU:9), engaging in more circular practices of consumption becomes more feasible for Lukas. The exchange above highlights a larger point about citizens and their well-entrenched consumption habits or routines.

In each of our discussion groups, we can see that individual consumption behaviour is heavily influenced and, eventually, justified by the (non-) packaging options available. The nearby availability of plastic-reduced infrastructures—a *Greißler*, a farmers' market, or a zero-waste shop, for example—reduce perceived barriers for citizens to be able to give up their use of linear and time-saving plastic packaging. Having these plastic-reduced infrastructures along people's everyday paths is imagined to support citizens' habits and routines so that they can still shop in a way that is temporally convenient and effective whilst also reducing plastic waste. When needed temporal efforts are low and obstacles few, citizens seem more open to using plastic-reduced infrastructures, practices, and products and changing their consumption habits. Justificatory grounds on the temporal (in)convenience of (not) using plastic packaging thus form an important basis from which citizens will construct future visions of the future—with or without plastics (see sub-chapter 7.4).

6.3 BALANCING USE LIFE AND AFTERLIFE: REDUCING PLASTICS MORAL BURDENS

With their justificatory narratives, our participants try to grasp, make sense of, and justify which plastics they consider to be more problematic and which less, which plastics they deny a future to, and which plastics they consider essential. Aside from single-use plastics in health care and supermarket settings, citizens' narratives cover countless other examples of plastics in various everyday contexts: plastic straws, smartphones, cars, eyeglasses, toothbrushes, underwear, matrasses, toys, trolleys, rain jackets, and backpacks, to name but a few examples. Some of these artefacts are made entirely from plastics. Others contain plastic components. What all plastic artefacts have in common, however, is that they are imagined to have both a use life and an afterlife. In their narratives, citizens balance the timespan of a plastic's life with its afterlife from three different angles. First, they do classificatory work and attempt to find an acceptable duration of use for the artefact. Second, if the artefact has a known long or extensive use life, it can then be easier justified as unproblematic. Finally, third, they attempt to classify both shorter and longer living plastics as less of a problem when reuse or recycling practices are perceived to be able to adequately prolong the artefact's use life to govern its afterlife.

Most participants contrast the life (usage time) of plastic artefacts against their afterlives to find a balance between the two. As our participant, Doris, explains: "*I have to say [...] that you use plastics, for example, disposable tableware, for ten minutes, but it takes 450 years for it to degrade*" (G5_DO:15). Here, Doris points to the temporal divergence that accompanies most

plastics: they are used only for short time, often just minutes, but take several hundred years to degrade. In another discussion group, Inge relates to the same temporal dissonance when she points towards one of our story cards and says, *"[S]ome things we only use for ten minutes and it takes 450 years to break them down; so that's the kind of knowledge you don't realise, right?"* (G4_IN:10). Seeking assurance from her co-discussants, Inge describes that the temporal divergence between plastics' short use lifetime and long afterlives is not always at the forefront of our conscious mind.

In any case, duration of use (usage time or use life) has a strong influence on how citizens' (do not) justify the use of certain plastic artefacts. As we have already covered in discussing their diagnostic narratives (see sub-chapter 5.2), citizens often carry out classificatory work in which they differentiate between single-use, shortly-used, and longer-used plastic artefacts. The differences in artefacts' usage times illustrate how citizens construct the problem of plastics. This work was on display, for example, in an exchange between two of our participants, Tobias and Werner, during the context card phase:

> Werner: *I have [the card] toys.*
>
> Tobias*: Yes, but it's long-lasting [...] you don't knock a toy away, for example, 'Mensch ärgere dich nicht', who knocked away one of our 'Mensch ärgere dich nicht'? I give it away when someone wants to play it*
>
> Werner*: Yes, yes, that's the next thing, yes*
>
> Tobias*: But that's, that has a longevity, I say. [...] Cosmetics and care products are something for me again, because you might not even have them for a month, toothpaste or something, you need a new toothpaste every two weeks. These short-life things are our main problem. The long-life products like armchairs and mattresses aren't really our main problem, that's how I see it. (G2:56)*

In this exchange, Tobias and Werner distinguish between long-lasting and short-lived plastic products and Tobias makes it clear that he considers short-lived items like cosmetics and personal care products to be the main problem. With this, Tobias taps into the previously discussed diagnosis many discussants shared, namely that durable items, including toys, chairs, and mattresses are less problematic because they are used for a long time—often passed on or repurposed rather than discarded altogether. Indeed, for many citizens, plastic artefacts with longer usage times are seen to be less problematic and less morally concerning than products with shorter usage times.

This belief becomes also tangible in other narratives about mattresses, when Robert points to the mattress context card and says: "*If you consider that you use such a mattress for several years, it is not necessarily surprising now how much material, plastics you find"* (G1_RO:48). Like many others, Robert sees plastic-permeated mattresses as things that will be used for several years. Several other participants add to this justification by describing that mattresses will also have a high use intensity not just in the overall period of time they are owned but also during the day—they will be used several hours per day. Indeed, there were various moments in each discussion group in which the extensive and long usage time was used by citizens to construct such artefacts as less problematic. In the discussion group mentioned previously, for example, Tobias uses the long and thus seemingly unproblematic usage time of a plastic artefact—a mattress—as a justificatory ground to exclude them from further discussions:

> Werner*: Or what now also [...] older lady, for example, my mum, if she needs care, a proper mattress so that she lies really well, [...]*
>
> Tobias*: She'll have it for at least ten years, won't she?*
>
> Johanna*: Rather longer, actually*
>
> Tobias*: Longer—and you have these strange lemon pieces in plastic, you have a few minutes in the plastic, or if I compare that in terms of time.* (G2:57)

Reassuring himself that Werner's mother has used the mattress for at least 10 years, Tobias closes the conversation for good. We see similar instances to this one in each discussion group. It is thus clear that an extended or long use life frequently leads citizens to construct certain long-lasting plastic artefacts (e.g. mattresses, toys, metro seats) as less problematic—sometimes even unproblematic enough to exclude them from any further discussion. This could have significant consequences. When certain plastics are exempt from further discussion it helps citizens justify continued use without thinking about changing any of their consumption habits.

It is not just Tobias who gauges the problem of individual plastics based on how long they will be used. Through exchanges in each of our discussion groups, it emerged that when participants think the use life of a plastic artefact is 'long enough', its use becomes seen as less concerning. However, because we lack a clear framework to balance the duration of plastic use with its environmental footprint, we are left questioning whether short-lived plastic items can be considered 'long-lasting' if used for a sufficiently long period. Why people tend to construct

longer living artefacts and justify them as better and less grave is tightly intertwined with plastics' durability paradox (see sub-chapter 8.3). As we have discussed, because of plastics' incredible durability, the plastic materials used to construct plastic artefacts—regardless of type or application—will endure a long afterlife. A product with a long use life is often believed to somehow help balance this long afterlife as the plastic materials will be put to use for a longer amount of time. This insight also helps explain why citizens discuss and justify different reuse practices as being a way of extending the use life of certain short-living plastics.

Many participants narrate about practices of reuse and thereby justify the use of plastics that are classified as single-used or short-living. It should be noted, however, that amongst participants there is not a universal understanding about what constitutes single-use. Some classify plastic artefacts as single-use plastics when they are meant to be used a single time and then be disposed of (e.g. most disposable to-go-coffee cups). Others classify things as single-use plastics when they have a single functional lifetime, in which they will be used multiple times before they are disposed of (e.g. a shampoo bottle, which is generally used multiple times before it is empty and thrown away). Thus, to use the term 'single-use plastics' does not always imply that a plastic artefact is used only once. For many citizens, single-use plastics are therefore not a clear-cut category, largely because many believe that single-use also includes artefacts with multiple usage times that are, ultimately, still enacted in an artefacts' situatedness.

Many participants share stories about their experiences and practices of reusing plastic artefacts that are generally prone to being used just once. After revealing how her mother always has a plastic bag full of yet more plastic bags to be reused—a phenomenon other participants seem to be well-familiar with—Marie describes how she reuses plastic packaging that was initially designed for containing tomatoes:

> Marie: *For example, even when I was still, yes, never really paid attention to it, I always had the tomatoes in a plastic tray, but I never actually threw them away, I always reused them. Now it's in the fridge and everyone has their own compartment.* (G1_MA:35)

Marie thus reuses the plastic packaging of tomatoes by re-purposing it. Instead of it being thrown away after the tomatoes are consumed, the packaging is assigned a new functional task a type of ordering device for the fridge. Like Marie, many citizens have stories about

repurposing and reusing the same artefact over and over again rather than disposing of it once the perceived expiration date of its intended use life arrives.

Alongside citizens' prominent diagnosis that "*short-living plastics are our main problem*" (G2_TO:56), extending the use life of plastic items, particularly single-use items, through reuse practices thus appears to be particularly important to our participants. Why such practices seem to be even more important for single-use items is an interesting question— why do single-use plastic artefacts become the most prominent poster children that provoke such justificatory ground for these practices of reuse? Again, it may be the simple fact that citizens are already trying to compensate for the strong temporal divergence between an artefact's relatively short usage time and the long duration of its afterlives. In any case, participants' justificatory narratives for reuse exemplify citizens' moral work to legitimise also the consumption of shorter-living plastic artefacts. These narratives and the practices attached to them are prevalent in many areas of contemporary life. The narratives function as an important justificatory ground from which citizens can argue for even more widespread strategies and measures to extend the usage time of plastic products (see sub-chapter 7.3).

Repaired, gifted, repurposed, donated, or recycled; participants sustain an imaginary that plastics become less of a concern when their use life is prolonged. The most prominent of these pathways discussed amongst citizens is recycling. However, citizens' justificatory narratives reveal that recycling is imagined to be much more than a mere life-extending mechanism. Instead, citizens' idea(l)s about recycling help them to rethink the purpose and value of certain plastics to put them into less problematic categories. The consequence of these idea(l)s, by extension, unfortunately only seems to be another step in legitimising our further consumption, as the knowledge that something can be recycled allows individuals to shift care for the afterlives of disposed of artefacts onto something or someone else. The role of recycling in governing the afterlives of plastics or plastic-permeated artefacts becomes especially obvious in citizens' exchanges about the Austrian "Ö3-*Wundertüte"* (Engl. wonder bag) program.

"*This is how the Ö3-Wundertüte works", describes* the organisation, Caritas Austria, which organises the program:

> *Find old mobile phones, put them with or without accessories in the Ö3-Wundertüte and hand them in postage-free at the post office. The mobile phones are recycled*

> *all year round at the Caritas used mobile phone centre in Vienna. The devices are tested and sorted, broken mobile phones are recycled in an environmentally friendly way and those that are still working are refurbished and can be reused. In this way, the [...] campaign has already turned around 7.4 million old mobile phones into around 10.5 million euros since 2005. Thousands of families with children in acute need are supported with this donation money from the Ö3-Wundertüte* (Caritas Österreich, n.d., own translation).

Caritas' advertisement frames the act of giving away old mobile phones (artefacts that are highly permeated with plastics) as something good to do: one can properly dispose of their old phones, support the environment with correct recycling, and help Austrian families in need all in one good. Still, in our discussion groups, the Ö3 Wundertüte often becomes the subject of debate. Such debate can be found in the exchange below in which Britta, after criticising the planned obsolescence of plastic-permeated electronics and the concern that they will be exported to the Global South (see sub-chapter 5.3), reminds her fellow discussants of Caritas' program:

> Britta*: What's with the Ö3 Wundetüte? Isn't that a company in Austria that takes it apart? I think that is, that's what they advertise on Ö3.*
>
> Ursula*: yes yes, that's Ö3 Wundertüte every year.*
>
> Britta*: And that's what I think, but it's an Austrian company.*
>
> Ursula*: I also had faith.*
>
> Christopher*: They take it apart, it obviously doesn't go to Kenya. [...]*
>
> Moderator*: But what do you know about Wundertüte, for example? Wundertüte collects old mobile phones. That has to be said.*
>
> Britta*: Yes, you can hand them in at the post office.*
>
> Moderator*: Good. What do you know about what happens to it once you've handed it in?*
>
> Britta*: The recyclable ones are passed on or resold and the broken ones are, the parts, the components are taken apart and probably recycled again.*
>
> Christopher*: And someone does that in Austria, right?*
>
> Britta*: I think so.*
>
> Ursula*: Exactly, but that. That would be interesting to find out.*
>
> Christopher*: Yes, we hope so.* (G3:39)

Britta introduces the Ö3 Wundertüte program as something she believes is operated by an Austrian company. Some discussants immediately seem to express a certain level of trust in the program, assuming that the collected phones are processed locally and responsibly. Still, despite this trust, most are unsure about the exact details of what happens to the phones once they are handed in. This uncertainty is highlighted by both Britta's and Christopher's questions and assumptions as well as Ursula's suggestion that it would be interesting to verify these details. Their discussions imply that participants prefer disposed of electronic (often plastic-permeated) artefacts to be handled locally. Such narratives, loaded with trust, curiosity, and concern about recycling processes, show how many citizens justify their disposal of artefacts with expectations, assumptions, and hopes that extending an artefact's use life will be possible because of the effectiveness of recycling structures (like the Ö3 Wundertüte). The belief that the afterlives of disposed artefacts are governed through recycling thus not only allows citizens to turn used plastics into a less problematic category but also helps them to legitimise their decision to use plastics in the first place.

However, whereas some participants seem to tacitly trust recycling systems, especially Austrian ones, and generally hope that the process will be carried out correctly and efficiently, other participants add a more cynical tone. Johanna from another discussion group, for example, adds:

> *I mean, it's an interesting aspect anyway, that you don't know that, because it's so - actually, it's suggested to you without really saying it, as if it's something super great. And recycling, yes, we recycle now, it's reused—but nobody tells me whether it doesn't end up in a pile (laughs)* (G2_JO:67)

Like other participants, Johanna is sceptical about the transparency and effectiveness of recycling processes. She points out that recycling efforts are often promoted as positive and effective without clear evidence or assurance that artefacts are indeed being recycled as promised. Along similar lines, various other participants are too convinced that recycling does not necessarily happen in Vienna or even Austria, but somewhere else, somewhere *away*. One prominent form of *away* in citizen narratives is foreign countries, especially those in the Global South, to which European (plastic and plastic-permeated) waste is (assumed to be) exported, often with the claim that recycling will happen *there* (see sub-chapter 5.3). Our discussant Theo critically reflects on this as such:

> *[O]ur European garbage, also from Austria, is then sold to some companies, so to speak, which whitewash our conscience, [...] from Graz or Vienna this electrical waste is then sold to some company [...] then not too many questions are asked anymore; and this company then ships it to Kenya for example. (G3_TH:38)*

Like Theo, participants in all discussion groups have difficulties reconstructing what they think happens with their disposed artefacts beyond the waste container: they simply seem to observe that recycling can mean either everything or nothing. Such conversations make evident that the recycling of used goods is a black box to many citizens. As input, people give away or discard the used artefacts they desire to give a longer life; the output is a "*white-washed conscience*" (G3_TH:38), which imagines that we have done something good. Theo's quote is thereby one of many that illustrate how contemporary waste management and recycling structures—the black box of recycling—render the pathways and afterlives of disposed artefacts imperceptible to the individual disposer. In other words, when artefacts are thought to be "*properly disposed*" of (G2_m3:2), they seem to simply disappear into obscure management schemes, invisible to the average citizen.

Citizens place a great deal of trust in the recycling system and its structures, believing that their waste is being managed responsibly. At the same time, they also hope that recycling processes function as intended and that their discarded items are handled locally, within Vienna and Austria. However, they are aware—mainly through films and documentaries such as *Sodom*—that recycling does not always take place locally and that plastic waste might as well be exported to countries in the Global South (see sub-chapter 5.3). Despite this awareness, participants do not actively connect their own recycling habits with these global waste flows. Instead, they continue to see recycling as a way to govern the afterlives of their discarded plastics while distancing themselves from the environmental and health consequences that arise in distant regions. By relying on the idea of a functioning recycling system, they shift responsibility onto structural systems and avoid acknowledging their own role in this black box.

Instead, by preserving the idea(l) of a functioning recycling system and making the *away* of disposed waste untransparent, many participants are hindered from developing a clear idea about the temporal connectedness between their consumption habits and disposal of (plastic) products and the long-term consequences for spatially distant communities due to imported waste. This, in turn, allows citizens to avoid uncomfortable questions about environmental or social injustice related to their own consumption practices. Thus, quite contrarily, keeping the

hopes alive that there exists a well-functioning recycling system also helps to render the use of plastic artefacts morally less grave. By holding onto the narrative that plastics will be recycled and therefore have an extended life and well-governed afterlife, citizens can justify their continued consumption of plastics.

6.4 CONDENSING JUSTIFICATORY NARRATIVES

Citizens' justificatory narratives make it tangible that plastics are not one clear-cut category of materials or artefacts. Instead, plastics is an umbrella term that encompasses a "multiplicity of plastics [... with] a plurality of different plastics and their related objects" (Gabrys, Hawkins, & Michael, 2013a, p. 4). With this understanding, our participants engage in various classificatory practices that justify where and where not certain plastics should be used and where a rethinking of our use of plastics is needed. Citizens' justifications for the (non)use of plastics in our lives are thus tacitly interwoven with different temporal repertoires shared in their narratives.

For instance, in social sub-systems associated with health care and medicine, citizens legitimise the one-time use of disposable plastics because of their hygienic conditions that work for the greater good of saving lives and preserving health. Situated within existing legislation and regulations around hygiene, sterility, and cleanliness, single-use plastics are constructed as a vital ingredient for maintaining contemporary standards for medical care. With citizens' emphasis on the importance of such artefacts being single-use and disposable to guarantee clean and sterile settings, they become constructed as vital to ensure the human body heals and continues its life. The need to save and prolong human life is thus an important repertoire for citizens to justify and defend the one time use of disposable plastics in the medical sphere. At the same time, by treating the importance of these disposable plastics in medical fields as common knowledge, potential debates that would rethink the use of disposable plastics in some of these situations are silenced as they are instead afforded an unquestioned and justified place amongst us.

Whereas scholars like Jody Roberts (2010) and Susan Freinkel (2011) have balanced their reflections on medical plastics in hospitals, citizens seem to focus only on the benefits of medical plastics, showing very little engagement with their potential toxicities and risks. Although citizens regularly bemoan how various chemical additives from plastics may leach into our bodies and interfere with our cellular, endocrine, and reproductive systems in other

contexts, when it comes to disposable medical plastics citizens see only benefits. This reality raises several questions. For example, does the absence of causality or direct effects from plastic-related chemicals on human health make it easy for citizens to oversee potential consequences? Are the benefits simply imagined to outweigh (even thinking about) the potential impacts of medical plastics? Finally, what role do non-knowledge and ignorance play in this disregarding of medical plastics as a human health hazard? Whilst this research cannot explore each of these questions in detail, they surely deserve a spotlight in future studies.

In sum, whilst citizens generally support the idea(l) to prolong the usage time of artefacts, this is not the case with disposable plastics used in medical spheres. Thinking about reusing medical plastics unleashes citizens' concerns, uncertainty, doubt, and even feelings of disgust. On the other hand, however, even though reusing medical plastics is perceived as uncomfortable and concerning, their flow into recycling streams is not. Even for medical plastics, recycling is still imagined as an important process to turn such plastics and their afterlives supposably less problematic. In any case, the fate of these plastics often remains unclear for citizens when they are disposed of, as they enter opaque waste management streams that make it quite the challenge to trace them. Thus, with very little critical engagement with the disposal and afterlives of medical plastics, citizens tacitly trust larger medical systems to take care of these disposed artefacts. In turn, this allows citizens to continue legitimising the use of disposable plastics in the medical sphere—a sphere of life where hygiene and sterile conditions are not only demanded individually but also legally.

Another segment of society in which many citizens also justify the use of disposable plastics and plastic packaging is supermarkets and drug stores. Whilst citizens certainly criticise excessive plastic packaging, they nonetheless welcome and appreciate the time-saving benefits plastic packaging provides, as it reduces the need to plan or anticipate their shopping practices. Instead, plastic packaging facilitates fast and spontaneous consumption: a grab-it-and-go culture. This appreciation, especially in terms of plastic packaging as a time-saving device, functions as one of the justificatory grounds citizens use to legitimise the use of plastics and the creation of plastic waste, thereby defending business-as-usual consumption patterns. However, here, we must be careful: we should take care to decipher whether it is actually the packing of the goods or the plastics they are packed in that citizens appreciate. In other words, goods being packed in other materials like paper may just as well become associated with the

same time-saving characteristics if they were swapped for plastics. Future research may therefore want to investigate whether it is indeed the plastic material or the fact that goods are packaged or pre-packaged more generally—or perhaps even an interplay of both—that enables consumers to justify and pace along with our contemporary consumption ways and rhythms.

Whilst plastic packaging is seen as convenient, not using it is often seen as inconvenient. Indeed, citizens' narratives reveal that efforts to reduce plastic use and, consequently, its waste—by shopping at zero-waste stores, bringing one's own packing material, or various other refilling practices—are largely perceived as overly time-consuming. As it stands, the need to invest more time only to use less plastics discourages many citizens from using plastic-reduced infrastructures, leaving most to continue onwards with our linear consumption of disposable plastics as the most convenient current option. For effective change to happen, plastic-reduced infrastructures would thus need to integrate seamlessly into people's everyday routines and paths. Alongside other important aspects, like, for example, financial affordability, convenience appears to be an important precondition for many participants to even begin to rethink any of their well-entrenched routines that rely on time-saving plastic packaging.

Another important way citizens classify plastic use through justificatory narratives is revealed in their attempts to balance the short use life and long afterlife of plastic artefacts. Whilst there are exceptions, long-lasting plastic artefacts are generally justified to have a more legitimate existence than short-lived items. Often by pointing to a smaller temporal divergence between the life and afterlife of plastics, long-lasting plastics are regularly constructed and legitimised to be morally better. In addition, to reduce plastics' durability paradox (i.e. durable plastic materials being used to produce single-use or short-living artefacts), citizens' narratives around practices that extend the use-life of certain plastic-permeated artefacts (e.g. reuse, repair, donation, recycling, etc.) function to morally justify their existence, especially in artefacts that have only be used for a short time. Ideas about practices and mechanisms intended to prolong the usage time of plastic artefacts seem to diminish citizens' cognitive dissonance that could arise from the awareness of how long (remnants of) these artefacts will persist in the environment long after they are used and disposed of. Furthermore, most citizens hope such life-prolonging practices will help transform consumption into slower, more circular rhythms that reduce the need for new resources (see sub-chapter 7.3). This points to one of the six

paradoxes in our lives with plastics: Citizens often welcome or even demand fast, linear consumption whilst simultaneously seeking out slower, circular consumption patterns through reuse and recycling (see sub-chapter 8.5).

Whilst recycling is one of the most widely recognised ways to extend the lifespan of plastics, citizens' justificatory narratives reveal that it is often imagined as more than just a life-extending mechanism. Instead, recycling serves as a means of delegating care and responsibility for discarded artefacts to larger waste management systems and distant communities—while simultaneously legitimising continued consumption. Whilst some participants trust and hope Austrian recycling structures to remain local, most believe that European waste is exported under the guise of recycling. As a result, citizens frequently construct recycling as a black box, obscuring the pathways and afterlives of disposed plastics imperceptible to the individual disposer.

This lack of transparency still seems to foster trust that waste is managed responsibly, enabling citizens to disengage from their role in plastic consumption. By believing in a functioning recycling system, they absolve themselves of responsibility while continuing to consume. As waste becomes invisible—whether through removal or relocation—the recycling narrative reinforces this detachment, allowing individuals to overlook the long-term consequences of their consumption. In doing so, they not only shift responsibility across geographies but also onto future generations, becoming complicit in what Giddens (1991) describes as the colonisation of the future.

Many participants see proper recycling as part of 'the solution'. Yet, under this premise, responsibility for plastics' afterlives is routinely deferred to opaque waste management structures. This highlights a central paradox of plastic consumption: the convenience of fast waste disposal versus the hidden, enduring consequences of that waste (see sub-chapter 8.2). The individual disposer does not—or does not want to—acknowledge where, or for how long, these remnants persist. By pushing plastics' afterlives into an imperceptible domain, we sustain an "out-of-sight, out-of-mind" mentality—what Bensaude-Vincent (2013) calls a self-deception that allows us to "live in a fool's paradise" of consumption.

Alongside the diagnostic narratives discussed in the previous empirical chapter, citizens' justificatory narratives show how their classificatory work is an important ground from which they can legitimise the future existence and use of certain plastics. In this chapter, we have

seen how, in some social-sub systems, plastics are categorised as unproblematic or essential due to, for example, their need to be a single-use artefact (e.g. for medical purposes), their extended long-term use (e.g. through being recycled or donated), or their time-saving capacity (e.g. plastic packaging in the supermarket). On the other hand, we also learned that many plastic artefacts are argued to be outright problematic or redundant together; this includes many single-use plastics, plastic artefacts with imagined planned obsolescence, or various known microplastics, to name but a few examples. In any case, the plastics that citizens do consider essential or reasonable are granted a future existence because the utility they provide is thought to outweigh their risks. They enjoy thus a certain form of protection at a societal level from attempts to curb their proliferation by various anti-plastics movements. Ultimately, however, by justifying these plastics as unproblematic or essential—and, in turn, protecting their proliferation—citizens are more empowered to continue with their current consumption habits without any pressure to change them. Thereby, both citizens' diagnostic and justificatory narratives contribute to shaping their future-making practices of our lives with, without, and with fewer plastics in the years to come.

7. ANTICIPATORY NARRATIVES: EXPLORING PATHWAYS TOWARDS MAKING FUTURES WITH(OUT) PLASTICS

Citizens' diagnostic and justificatory narratives to make sense of their lives with plastics are woven into their visions of how our relationships with plastics could look like in the futures to come. Sharing narratives that envision the futures of our lives with, without, and with fewer plastics thus shapes citizens' anticipatory narratives. Narrating future visions and ideas and bringing them into the present has powerful consequences for the (non)enactment of respective futures (Jasanoff & Kim, 2015; Oomen et al., 2022). Through citizens' future-making practices, we also learn about their (un)willingness and (in)capacity to contribute to these futures in the now. Thereby, citizens' anticipatory narratives are entangled with a broader question of how they, as individuals and as a part of a broader society, want to and can live with(out) plastics in the futures to come. Still, because such future-making tends to circulate around questions of who, when, and on which scales citizens can act, our participants also explore the time horizons of other actors shaping our societal futures with plastics.

Our participants' anticipatory narratives speak to a multitude of futures with many different temporal horizons: futures tomorrow, futures in 10 years, futures in 200 years from now, and every horizon between. At the same time, these futures are also spatially different: they are situated at the level of participants' own households, other people's households, in Vienna, in Austria, in Europe, in the Global South, and the rest of the world over. To engage with such a variety of futures in a sophisticated and yet situated manner, I would like to come back to one of my theoretical sensitivities: Mike Michael (2017) and his main differentiation between *Big Futures* and *Little Futures*. My analytical approach in this chapter also makes this differentiation. Analysing citizens' anticipatory narratives through Big and Little Futures allows me to make more concrete how citizens' Little Futures with tight spatiotemporal horizons unfold in their everyday lives; how these Little Futures have the potential to enact Big Futures; and, likewise, how citizens' ideas of, wishes for, and expectations of Big Futures simultaneously impact and even enact the Little Futures they often think to be independent and individual.

Before beginning with the analysis, I would like to highlight that citizens' anticipatory narratives often go beyond the topic of plastics to make bigger points about our society, ways of life, and consumption of goods. In doing so, citizens from each discussion group revisit many of the same pathways. This chapter is arranged accordingly, divided into five groups of anticipatory

narratives that stipulate five general citizen pathways in our societal future with(out) plastics. Each of these pathways attempts to challenge and sometimes even change our contemporary practices, standards, materials, artefacts, rhythms, paces, and levels of awareness. The first pathway citizens describe is to replace plastics with other materials, which would bring a quick win to the individual consumer. This idea is scaled up in their second pathway in which citizens' anticipatory narratives envision these material replacements on a larger societal scale, which describes a much slower pace at which material replacements for plastics are imagined to be realised. Next, the third group of anticipatory narratives are about the preconditions to challenging current rhythms of consumption: from linear to cyclical. The fourth group and fourth sub-chapter are concerned with individual efforts to take the time to consume differently and to therefore enact different futures with plastics. Finally, the fifth sub-chapter addresses citizens' anticipatory narratives about the need to raise awareness and education, especially for younger citizens who will ultimately govern not just the future of plastics, but their problems too. The chapter concludes by putting these five groups of narratives and future pathways in relation to existing literature to create concrete points of discussion points and orient possible paths for future research.

7.1 THE INDIVIDUAL CONSUMER: SIMPLY AND QUICKLY REPLACING PLASTIC MATERIALS

"How we can replace plastic with substitute products" (G4_KA:134), asks our participant Karl. This question echoes throughout each of our discussion groups. Time and time again, citizens' narratives illustrate where they have already replaced or plan to replace plastic artefacts with artefacts made from different materials—which, for the sake of simplicity, I will proceed to refer to as 'material alternatives'. The contexts in which our participants suggest, discuss, and negotiate the replacement of plastics with material alternatives as solutions are manifold, but mostly connected to people's close living or working realities. Plastics in interior design, public transport, food packaging, toys, office environments, kitchen supplies, and other everyday application settings serve as prominent examples of citizens' replacement narratives. What connects most of these narratives about material alternatives, however, is how fast they are imagined to replace plastics in people's everyday lives: they are imagined to be able to enact plastic-reduced Little Futures immediately.

I begin this analysis with one type of everyday plastic products that is particularly prevalent in citizens' replacement narratives: cosmetics and personal care products. To be sure, it is quite

likely that many of these discussions about cosmetics and personal care products were stimulated by our respective IMAGINE PLASTIC context card. The card is adorned with a picture of a drugstore shelf. It is filled with colourful packaging: toothpaste, shampoos, conditioners, bath supplements, oils, body lotions, washing detergents, and more. Accompanying the image is a caption: "*Numerous cosmetic products contain microplastics. They get in contact with our skin. When they are washed down the drain, sewage treatment plants cannot filter the microplastics out of the water. What do you think about this?*" (IMAGINE PLASTICS, context card 1). Whilst the card does not explicitly ask participants to consider possible plastic replacements, their discussions frequently go there. In each group, this conversation this card prompted would, in some way, come to revolve around the plausibility of replacing plastics with material alternatives in cosmetics and care products. In one of our discussion groups, for example, the conversation moved from the plastic packaging of shampoos and shower gels to toothpaste packaging before our participant, Jan, began to narrate about his toothbrush:

> Jan: *But I have now also found something, for example, [...] a toothbrush theoretically that works without toothpaste from a German developer—it's called SWAK and it doesn't have plastic brushes on the front, but it's a wood, it's a root, it's so fibrous you can imagine it—and it's like a natural brush, and you can even brush your teeth with it, without, without toothpaste.*
>
> […]
>
> Tobias: *I have seen that there are also bamboo toothbrushes.*
>
> […]
> Jan: *So, there are so great products there, but it's just still in its infancy everything.* (G2:72)

Jan's story is one of many in which citizens freely share their anecdotes about replacing plastics at home or work. Many of these replacement stories seem to be shared amongst participants—or at least seem to be taken up as ideas, inspiration, and suggestions for other discussants to reduce plastics in their own Little Futures. In doing so, these anticipatory narratives illustrate how replacing plastics with material alternatives is regularly imagined to prevent two previously diagnosed concerns with plastics: potentially toxic interactions with the human body and the accumulation of future plastic waste.

Concerning the first diagnosis, many participants share concerns about the potential—yet uncertain—impacts of plastics on the human body and its health. Narrating about the idea of

replacing (or already having replaced) plastics with material alternatives often relieves citizens from their fear of plastics' potentially problematic interactions with their bodies. About his replacement practices, Olaf, for example, shares:

> *I checked my kitchen once, yes. I hardly have any plastic anyway, only wooden furniture and so on, but then I discovered that there were a few plastic cooking spoons and so on, and I replaced them all. […] Because I thought to myself, if something is going to go down, then better wood in the stomach than plastic* (G3_OL:30)

Olaf thus sees his replacement practices (exchanging his plastic cooking spoons with wooden ones) as a personal precautionary measure: in the case that he ingests particles from the material used to build his cooking spoon, Olaf considers it better to ingest wood than plastics. That citizens' stories about replacing plastics in their own living environment are so numerous (including replacing plastics with wood in the kitchen, bamboo in the bathroom, or paper for what their food is packaged in), reflects a broader trend amongst citizens to reduce the use of plastics as a precautionary health measure. By substituting plastics with materials like wood, bamboo, paper, glass, cotton, wool, leather, steel, and others in their everyday lives, citizens also imagine that they are minimising their own potentially toxic interactions with plastics and microplastics. These are frequently perceived as healthier alternatives for the health of future human beings. Nonetheless, these replacement materials can also contain pollutants and contaminants (see sub-chapter 7.2). This, however, receives little attention in citizens' individual replacement strategies, which seek to deny plastics entry into their Little Futures in pursuit of securing less toxic futures.

Shifting to citizens' second main concern, their narratives show how often they view replacing plastics with alternative materials as a quick and easy solution to preventing the problems associated with accumulating plastic waste in the future. For the sake of this analysis, we will discuss the claim that the problem of accumulating plastic waste can be (at least partially) solved by replacing plastics with material alternatives. Turning towards social life in Vienna, Lothar remembers the material replacement of plastics at Viennese events:

> *[T]he glasses, they are collected, they are washed, the city of Vienna is the pioneer. They say [...] you get the wooden forks [...] the glasses have been changed [...] yes, every now and then a glass breaks, but the shards are less harmful to the environment than a hundred plastic cups somewhere in Rathauspark, being blown around by the wind* (G2_LO:153)

Replacing plastic cutlery with wooden alternatives or plastic cups with glass prevents plastic from being swept away by the wind. Like in Lothar's story, using non-plastic alternatives is often driven by a desire to minimise plastic waste and its environmental harm in both the short and the long run. Despite being an occasionally less convenient option due to durability, costs, weight, or hygiene, many participants associate a future with these material alternatives with the absence of plastic waste, as in these futures, plastic has been replaced. Thereby, the use of material alternatives is regularly constructed to be less harmful to and in our environments because it is imagined to lead us towards more sustainable futures. However, if these alternatives are to be consumed in similar linear, fast, and iterative rhythms as their plastic predecessors, we may want to question how sustainable our consumption rhythms are in the first place—regardless of the materials that fuel or will fuel them.

It is noteworthy that, in anticipatory narratives that circulate around the Little Futures of plastics in everyday life, our participants do not discuss the long periods of time required to grow, build, or otherwise make material alternatives available. Instead, alternative artefacts are largely imagined as already being on the market—simply awaiting the mission to replace their plastic counterparts. The bulk of citizens' narratives paints a picture of a world in which almost everyone can simply and almost immediately replace plastics with other materials in their everyday environment. Indeed, replacing plastic materials with material alternatives is regularly constructed as a moment of change: a moment in which an individual can quickly realise immediate change and success by reducing plastics in their everyday environment and routine; where one executes a choice to eliminate plastics in their near and distant future. Thereby, citizens' individual replacement strategies piggyback many ideas of instantaneity.

On the level of individual replacement practices, the instant availability of material alternatives thus enables many of our participants to argue that an instant and immediate reduction of plastics in their near-to-home environment is indeed possible. Because of this, having or not having plastics in one's Little Future is regularly understood as dependent on one's individual choice and effort to replace or not replace plastics. Obviously, such understandings often neglect differences in people's living realities. Whilst some citizens visualise a world in which everyone can easily and rapidly replace plastics, others critique that many people lack the resources to adopt these individual replacement strategies (see sub-chapter 7.4). Many simply do not have the resources to be able to replace plastic artefacts with material alternatives.

Globally, as one participant puts it: "*[T]he majority of people in the world struggle to survive on a daily basis"* (G3_TH:22); they prioritise putting a meal on the table for their family, keeping a roof above their heads, and making sure they stay warm during harsh winter days over replacing well-working plastic artefacts. Aside from this disregard for many people's living realities, citizens' enthusiasm for material replacement also overshadows the possible consequences that may result from replacing plastics. To make this point more explicit, I will elaborate on two aspects largely absent in participants' discussions about quick, small-scale material replacements of plastics.

First, citizens' anticipatory narratives reveal little engagement with the *afterlives of the replaced plastic artefacts*. When a plastic artefact is replaced, it inevitably starts a second life or an afterlife. This raises important questions. What happened to the kitchen supplies Olaf replaced? What about the plastic cups that were once used for events? Where did they go? For how long? Did they become part of new socio-material entanglements? If so, what are their socio-cultural, environmental, and economic benefits? And their consequences? Whilst Olaf was able to enact his own Little Future after replacing plastics with wood, in whose Little Futures will the afterlives of those replaced plastic artefacts be situated? Moreover, whose everyday futures will be impacted by the materialising impacts of those castaway artefacts? In each one of our discussion groups such questions remain broadly unaddressed. Instead, citizens tend to stick to the idea that there exists a relatively easy and quick way to replace plastic materials.

The second aspect is closely related to the first; it circulates around the *afterlives of the material alternatives* themselves. Our discussion groups found very little engagement with or assessment of questions related to the afterlives of plastics' material alternatives. What happens, for example, with all the glass that will break during events at the Viennese town hall? What will happen with the used wooden forks or with the wooden or bamboo toothbrushes? Indeed, the afterlives of plastics' alternatives are absent from citizens' discussion. This is particularly interesting given the fact that plastics' material alternatives also do not have an infinite usage time: they will be used, somewhen and somewhere, and they will enter an afterlife. Much like plastics then, we can assume that these material alternatives will continue to accumulate in many Little Futures as time passes: as burned remnants, in filters of waste

treatment plants, in landfills, or wherever the wind tends to blow. Thus, on an individual level, citizens' horizon of anticipation for the consequences of replacing plastics is not far-reaching.

7.2 THE LARGER SCALE: SLOWLY TRANSGRESSING TO MATERIAL ALTERNATIVES FOR PLASTICS

In contrast to participants' broad lack of anticipation for smaller-scale plastic replacement, citizens appear to be much more comprehensive in imagining strategies for material replacement at larger scales—anticipating future consequences, potential outcomes, and adverse impacts. In most of our discussion groups, citizens' discussions tended to move from narrating about individual replacement practices and towards larger scales of change: "*if everyone uses the [other material] now*" (G1_LU:8). What if everyone in our society replaces their plastic cooking equipment with wooden equivalents? What about replacing their plastic artefacts with material alternatives more generally? Engaging with questions about material replacements on a broader scale provokes citizens to anticipate the future not only more critically, but more nuanced, as our participants, frequently come to question the feasibility and consequences of replacing plastics at a larger societal scale.

Indeed, the prospect of replacing plastics with other materials not on an individual but on a societal scale is a subject addressed in every discussion group. Sometimes these conversations evolve from the discussion dynamics themselves. Other times, however, in the responsibility/action phase of IMAGINE PLASTICS, it is the moderator who navigates discussions towards large-scale replacements. In such cases, the moderator informs participants about the European Union's Single-Use Plastic Directive. Part of this directive restricts ten of the most common single-use plastic products found on Europe's beaches, shorelines, and seas. After explaining that to follow this directive, some single-use plastic items may no longer be available, the moderator asks participants what they think of such an initiative:

> Moderator: *[...] So, how do we imagine that we can reasonably regulate it and a ban regulation, like the one provided for in single-use plastic, is, so to speak, I am no longer allowed to offer the product.*
>
> Olaf: *Yes, if [plastic] no longer exists, then we won't have a disposal problem and then we'll just take wooden plates with us.*
>
> Lisa: *Well, you also have to find alternatives that won't cause any problems in the future, because there's the issue of wood, where an incredible number of trees are [...]*

> Olaf: *Well, it's more durable. I have a wooden board, a cutting board, that I've had for so many years and it fits.* (G3_77)

With the information that certain single-use plastic products will be banned in the future, Olaf calls for material alternatives—wood to be precise. Here, Olaf is aligned with other participants who offer alternatives to plastics as technological solutions that can govern the previously diagnosed problems of plastics. Amongst participants, it is noteworthy that the prospect of banning certain plastic products does not seem to prompt many to regard their future-making as a window of opportunity to rethink our current consumption rhythms, routines, and habits with materials and artefacts. These instead seem to be well-protected, as citizens tend to believe that all that needs to be done is to simply replace plastics with other materials.

In explaining that without plastics there is no waste disposal problem, Olaf has, to his interpretation, already paved the road for the large-scale material replacement of plastics. In his solution-oriented approach, material alternatives to plastics seem to already exist for our use; as such, he does not engage with the potential long-term consequences that could arise if plastics are replaced with wood. Lisa, a young student, however, tries to anticipate the prospective impact of this change, imagining the "*incredible number*" of trees that would need to be cut down to realise this change (G3_LI:77). Before she can finish her line of thought—as to why this would raise an issue of wood—Olaf interrupts her, arguing that wood is more durable, attested by the "*many years*" he has had his cutting board (G3_77). The durability argument (i.e. wood is often used for a longer time than plastics) thus helps Olaf justify replacing plastics with wood. In this regard, Olaf's argument fits with citizens' prior diagnosis that long-living artefacts made from durable materials are less problematic. In any case, the other part of this diagnosis leaves us to wonder whether a plastic cutting board, which might be just as durable as a wooden one, would be just as justified for this use case.

To come back to Lisa's line of thought, we can sense that her argument is intertwined with questions about the consequences of mass production: What happens when everyone wants to or must switch to wooden plates? Where would the wood come from? What would happen to the forests? Moreover, to think even further, how might the mass production and use of wood raise issues related to, for example, an increase in monocultures, the loss of biodiversity, the resilience of ecosystems, and the quality of soil and air? Ultimately, would the widespread use of wooden artefacts and components be any more sustainable than plastics? In another

discussion group, Anna, who introduced herself to other discussion participants by explaining how she replaced plastics in her kitchen, raises similar questions about the mass production of material alternatives like bamboo, corn starch, or wood:

> *I've now looked around a bit to see what the alternatives are, and they're now relying on bamboo, cornstarch, and wood, yes? And that's when my alarm bells went off a bit: If everyone switches to wooden toothbrushes and […] bamboo right away, where will we get the resources from? What impact will that have? That, I think, has it really been researched like that? Is it really more sustainable?* (G1_AN:6)

In discussions about replacing plastics on a larger scale, the broader questions raised by Lisa, Anna, and other participants point us towards the important interplay between individual actions and larger societal consequences. Whilst individuals like Olaf support practical and immediate solutions that fit neatly into existing consumption habits, others, including Lisa and Anna, call for a more sophisticated consideration of the broader environmental consequences that may arise if we are to replace plastics on a large scale. Still, many participants construct a future in which the general consumer is seen as unequipped to make such complex considerations due to uncertainty and limited knowledge about raw resources, transparency of the material compositions, production conditions, transportation routes, potential adverse impacts on human and environmental health, and other aspects related to the production of plastics' material alternatives.

Citizens' concerns thereby point towards the need for a thorough assessment—a need to research the long-term sustainability and potential consequences that could emerge if everyone replaces plastics with (an)other material(s). The importance of thorough assessment, reflection, and consideration of the impacts of materials lives and afterlives become very visible with Lothar's responsibility/action card, which he wrote himself on an empty card. He titles it "*[a] lifecycle concept*" and explains further:

> *So, a lifecycle—that means a well thought out process, what comes in at the front, what goes out at the back, what happens then, from the beginning to the end. And that means, that we only have one part, we now have the extraction of crude oil […] now we have the products. And the second part, until again where it's gone, we don't have that yet. And that would be the lifecycle, from creation to death book, to total disposal. And that is missing, and I think that would be what our researchers, developers, [...] industry, all together are called to think about.* (G2_LO:99)

Lothar's life cycle concept describes what economists often refer to as 'life cycle assessment' (European Environment Agency, n.d.). A life cycle assessment is a method that assesses the environmental impact of a product over its entire life cycle, from raw material extraction to production, use, and disposal. This method analyses energy consumption, resource consumption, emissions, and waste to assess environmental impacts and identify possible improvements. Whilst Lothar demands such a life cycle assessment for plastic products, other participants also ask for the same thorough assessment of the material alternatives imagined to replace plastics. This assessment of plastics' material alternatives is regularly constructed as a precondition by our participants before they would approve a large-scale replacement of plastics.

With individual consumers imagined to become too overwhelmed with such a task— to understand the complexity of such assessments—citizens instead construct a net of actors who would be responsible for doing so. Like Lothar, most citizens thus call for "*our researchers, developers, [...] industry*" (G2_LO:99) to assess the life cycle of different products made not just from plastics, but also from plastics' potential replacements. Citizens' discussions therefore reveal the extent to which such actors are imagined to be responsible for establishing better knowledge about products' lifecycles—from production, transportation, and use to the whereabouts and consequences of the materials' afterlives.

Citizens construct science, producers, and industries as actors who are responsible for caring about their products' disposability and recyclability *before* they are brought to the market. Thereby, these actors are also constructed to be capable of deciding—on a scientifically sound basis—which material replacements should or have a role in our Big (more sustainable) Futures and which should not. Thus, when citizens narrate about replacing plastics at scale, it is not the sum of individual consumers imagined to be responsible for realising futures with fewer plastics. Instead, to enact Big Futures with sustainable alternatives to plastics, responsibility is delegated away from the individual citizen (through life cycle assessment) to many different institutional actors. Still, however, even whilst citizens call for the establishment of scientific grounding before large-scale replacement activities commence, many of our participants weave in their own diagnoses of our contemporary society and indicate several potential hurdles that may emerge in attempting to realise their demands. On the one hand, citizens point towards the extensive time required to produce scientific knowledge or erect regulatory

policy; on the other hand, they implicate the generally slow transgression of our economies, which are imagined to decelerate change.

Amongst the participants who argue that establishing adequate scientific knowledge is a slow and time-consuming process, some even discuss whether scientific knowledge production itself works as a delaying mechanism: "*Politicians need room to manoeuvre, if you commission a study you have a year's peace of mind. That legitimises*" (G5_OS:60). Whilst sound scientific knowledge and estimates are considered fundamental to policymaking and regulatory incentives, many citizens point towards the slow and interdependent nature of scientific research and political decision-making, each of which can delay the large-scale replacement of plastics. Politicians, for example, may use the slow pace of scientific knowledge production as a strategy to postpone action, whilst scientists are usually dependent on political funding. This creates a type of feedback loop, which hinders progress and prevents changes to how the challenges of our contemporary use and consumption of materials will be governed. With the slow pace of scientific research and political decision-making in transitioning towards Big (more sustainable) Futures, citizens thus opt to wait for broader systemic changes.

Whilst some participants are convinced that society needs to wait for science to establish more sophisticated knowledge on plastics and material alternatives and wait for political instructions, frameworks, and regulations, others are not so patient. "*I can't always just wait for the others to start, or I can't wait for there to be research on it and alternatives, because who knows when that will happen, yes?*" explains Clara (G1_CL:6). Clara is part of a faction of participants who do not want postpone action to a point in time when knowledge is more available, but call for us to start acting in the nearer future. Whilst most participants in this faction acknowledge that science needs time to create adequate knowledge and have no problems with blaming political actors for being too reactive and not precautionary enough, many of them nonetheless call on the individual consumer and citizen to act, at best, now, and, at worse, soon. As this faction of participants is not small, individuals are frequently imagined in our discussion groups as needing to take proactive steps—reducing personal plastic use and engaging in more reuse and recycling. Thereby, we often also encounter narratives that describe a need to change the paces and rhythms in which we consume our products more generally (see sub-chapter 7.3).

The second aspect citizens construct as a hurdle for realising large-scale change—namely the imagined slow transgression speed of economies and industrial branches—is based on their belief that industry will be slow to adapt. Participants' anticipatory narratives show how they believe that the pace of enacting Big Futures with fewer plastics or no plastics will constrained by the speed at which industries can transition from processing plastics to processing other materials. In their discussions, we can sense that many consider it impossible for industries to be able to simply stop using plastics and change to processing different materials. Thus, in contrast to their general optimism when it comes to small-scale individual change—with quick and easy material change (see sub-chapter 7.1.)—citizens construct Big Futures with large-scale plastic replacement as a sluggish and slow process. Clara is one of several discussants who highlight how such a shift would require a considerable amount of time:

> *[W]hen I develop and produce new prod[ucts], new materials, etc., etc. […] Of course it takes time, and of course I can't retrain everyone who now works in the plastics-producing industry from one day to the next, I don't know, to work in another area.* (G2_CL:12)

Clara is not alone in recognising that plastic-producing industries cannot change overnight, as transitioning to alternative materials and product areas takes time. Realising a future with fewer plastics will require widespread, systemic changes in how materials are produced, used, and consumed—a process seen as gradual rather than immediate. At this broader societal scale, it becomes clear that citizens' discussions about replacement extend beyond materials alone. In other words, replacing plastics also means transforming processes, products, practices, knowledge, regulations, and even jobs. Achieving large-scale change requires shifts among both human and non-human actors. Thus, the vision of a Big more sustainable Future is largely perceived as a slow, complex transition rather than an instant transformation.

7.3 TOWARDS SLOW AND CIRCULAR: SHIFTING RHYTHMS OF CONSUMPTION

Citizens often describe a society of consumption, but not one that is built on the consumption of plastics alone. Instead, they describe how contemporary consumption relies on a multiplicity of materials. Because participants' discussions and narratives frequently drift from speaking about plastic alone, it is a deliberate decision that the analysis that follows stretches beyond plastics to discuss other materials too. The analysis instead links back to citizens' prior diagnoses, which criticise the general rhythms in which we consume. Citizens' narratives show

that many find it important to change today's predominant fast and linear rhythms of consumption to slower and more circular ones to realise more sustainable futures.

Our participant Valerie, for example, is amongst the many citizens who criticise the linear rhythms imagined to be supporting today's disposable consumption:

> *So, I think the only thing that will help in the long term is to move away from disposable consumption. Because there are certainly many alternatives, but if you only use them once, then it is also very wasteful of resources. If you really want to achieve something in the long run, then there must somehow be more sustainable solutions. […] So, that somehow it helps not just to say: Ban plastic and find alternatives, but also really use more often and not just once.* (G5_VA:82)

Valerie argues that simply replacing disposable plastic items with alternatives that are also disposable does not address the underlying issue. This echoes citizens' prior diagnosis that linear buy-use-and-throw-away rhythms of goods are wasteful regardless of the material they are made from and that they pose concerns for both the present and the futures that lay ahead (see Chapter 5. Diagnostic narratives). Valerie's criticism—that material alternatives to plastics would also be a waste of resources if consumed in similar rhythms—thus aligns her with other participants who, as we have discussed, argue that a material replacement for plastics would not alone be sufficient in enacting the Big (sustainable) Futures many want. Like others, Valerie instead highlights the need to focus on solutions that promote reuse rather than single-use; that promote circularity rather than linearity for meaningful and sustainable long-term impacts.

A recurring repertoire in citizens' attempts to challenge and rethink today's fast and iterative rhythms of (plastic) consumption can be found in anticipatory narratives that circulate around prolonging the usage time of artefacts. Whilst arguments to prolong the usage time of artefacts also often justify the use of plastics, as importantly work to challenge today's rhythms of consumption. In each of our discussion groups, we can see how citizens' anticipatory narratives advocating for prolonging use life work to criticise our current rhythms of consumption and welcome new ones. Ultimately, to prolong the usage time of artefacts through reuse, donation, repair, or other life-extending practices reduces purchase frequency and slows down consumption. This, in turn, decreases the demand for new raw materials and minimises waste, promoting resource efficiency and sustainability. As our participant, Ursula, notes: "*Yes, going into a cycle. And I think that's a really good idea because it also has something to do with sustainability and avoiding waste*" (G3_UR:54). Prolonging the usage time of our products is

imagined as an essential ingredient in realising more sustainable versions of the future with slower and more circular rhythms of consuming our everyday goods.

Refusing linearity whilst fostering circularity and promoting a circular economy more generally is tightly entangled with the idea of enacting more sustainable ways of consuming and preventing the creation of waste. Moreover, if we think about these reuse narratives in relation to the diagnostic narratives we learned about in the first empirical chapter, it becomes clear how the idea(l)s of reuse and other practices that extend usage time are frequently envisioned as mechanisms through which the general consumer can exercise power. In other words, citizens perceive their attempts to prolong usage time as a way to counteract predominant market rhythms and the major tactics believed to support such rhythms—namely planned obsolescence and marketing of perpetually new trends—on an individual and situated basis. Extending the life of artefacts through reuse is thus imagined by citizens as an act of resistance towards our current rhythms of consumption. What then becomes quite clear in citizens' anticipatory narratives is the tension they feel between their individual prolongation practices and the market forces (or tactics), which shorten the life span of goods.

On one side of this tension, we can sense robust economic structures and the temporalities they coproduce. Citizens describe how these economic structures influence the consumer to continue with our linear, fast, and as citizens also suggest, highly unsustainable rhythms of consuming; these structures stand at odds with citizens' demands for more environmentally friendly versions of the future. Many citizens therefore see using artefacts past their usual expiration date as an act of (subtle) rebellion. This becomes evident when, for instance, our participant Lukas discusses electronics and shares his own history and assessment of mobile phone (re-)use:

> *I also have to say that I used to change more often, but now I try to use them until they no longer work. I just let the battery get replaced, I don't care—the main thing is that I have it for as long as possible. It's the same with other electronic items, because I also think that as long as it's not broken, why should I throw it away and buy a new one, just because the advertising suggests me: wow, this is somehow much better now, or much nicer, or they've just changed it a bit, it's somehow better now;—in reality, probably not at all anyway.* (G1_LU:30)

Lukas describes how he tries to stretch the usage time of his mobile phone as long as possible and how he would replace the battery to extend its use life. Like other participants, Lukas thus

attempts to counteract economically induced planned obsolescence as well as marketing strategies and to expand the time span between mobile phone purchase and disposal. However, although there are individuals like Lukas who try to prolong the use life of artefacts through reuse, the predominant market logics accused of shortening it are highly challenging; they are at least challenging enough to continue to lead many consumers into aligning with the fast rhythms of our contemporary consumption.

On the other side of this tension, however, stands the individual consumer, who is not entirely powerless. Consumers themselves, our participants' stories show how they often explain their ideal vision of artefacts as being items that have second, third, and even fourth use lives due to, amongst other things, repair, refill, swapping or trading, gifting, or donation. In those stories, we encounter an assortment of citizen anecdotes about reuse, some of which highlight advantages and the need for multi-way packaging, repair cafés, giveaway platforms, clothing collection containers, fashion swap parties, and upcycling workshops, to name but a few examples. What each of these stories about reuse practices, infrastructures, and networks have in common is the underlying argument that artefacts should be used as long as possible and should—also as long as possible—remain in our systems of use and consumption. Thus, aside from shifting from a linear buy-throw-away mentality to a more circular culture of consumption, prolonging the use life of artefacts is regularly imagined as a means that can challenge the pace at which we consume today, which many participants previously diagnosed as highly problematic. This sentiment becomes particularly clear in Karl's argument:

> *Well, I think if you already have it, you should use it as long as possible, because then the production cycle is longer, or the use cycle is longer—so there's just less waste, waste; if I buy it, if I buy it new all the time, I throw them away [...] something gets into the environment, that becomes more easy, no? If I use it longer [...] less gets into the environment.* (G4_KA:49)

Karl reminds us that frequent purchases lead to frequent disposals, often imagined to accumulate in the environment. This idea, shared by Karl and others, helps construct an understanding that artefacts become less problematic in the future when their lifespan is extended. The underlying assumption is that using fewer new resources will result in less waste. However, what remains implicit in Karl's narrative (though made explicit by other participants) is the connection between reusing existing artefacts and a reduction in consumer demand for new products. This, in turn, leads to a reduced need for raw materials, fewer transportation

processes, and lower emissions. In this view, reusing existing artefacts is imagined to slow down the rapid pace of contemporary production, consumption, and disposal. By using fewer resources, generating less waste, and reducing the accumulation of waste in the environment, citizens commonly construct a vision of a slower, more circular rhythm of consumption as being more sustainable. However, it is also often noted that to achieve these more sustainable consumption patterns, individual consumers must actively engage in reuse and prolongation schemes.

During our discussion groups, several participants attempted to shape individuals' moral obligation to reuse consumption goods to circumvent feeding into predominant buy-throw-away rhythms and into the "*infinite economic growth, which we all pursue*" (G1_LU:19). This entailed some participants encouraging others to reuse and thus to contribute to the enactment of more circular, slower, and more sustainable consumption at a small scale. Often attached to these future-making calls are the hopes that the Little sustainable Futures enacted through such individual reuse practices will act as a stepping stone for Big sustainable Futures. However, some participants criticise individual reuse practices as insufficient to enact Big sustainable Futures, as not every person has the capacities, time, knowledge, or motivation to reuse. They argue that to realise more sustainable rhythms of consumption in the futures ahead, we must move beyond individual reuse practices and consider the broader reuse infrastructures and systems in which individual reuse is situated.

Thus, we also encounter anticipatory narratives that argue that reuse must occur on a larger level of society if it is to make a difference. In these narratives, participants' demand to establish broader infrastructures, systems, and networks that enable wide-reaching reuse of artefacts and support a certain circular use of resources. Elements cited as particularly necessary to enact more circular rhythms of consumption and thus, more sustainable versions of the future, include the fostering of broader schemes and networks for reusing, repairing, re-purposing, or donating artefacts to give them another life and a future. Although citizens share numerous situated examples of their reuse practices in different contexts—reusing plastic bags, repairing mobile phones, donating clothing, or refilling bottles—they continuously criticise our existing reuse infrastructures as insufficient. Taking the example of PET bottle deposit schemes, our participant, Lothar, highlights that there is a divergence between existing structures and required (future) structures for reuse:

> *That [...] is the reusable packaging. That doesn't just mean we throw it away, it's another big logistical problem, so returning it, reusing it, it has to be cleaned [...] yes, no, taking it back is definitely a problem. Many chains, Hofer or whatever, don't know this deposit system at all.* (G2_LO:106)

Lothar is one of many participants who criticise the lack of broader reuse infrastructures and networks, such as deposit systems for plastic bottles in supermarkets. Indeed, citizens routinely criticise them for not being as widespread as needed, which ultimately limits individuals' possibilities to reuse. Thus, even if an individual wants to give a bottle another use life, it is not always possible within the—at that time—current system. It is not only this limited existence, but also the insufficiency of large-scale reuse systems, that are particular points of blame for making it more difficult for individual citizens to reuse and to slow down their own consumption. At the same time, the individual consumer is regularly constructed as a victim—one who cannot reuse but is forced to follow linear buy-throw-away rhythms as the most convenient option. Citizens regularly blame businesses and political decision-makers for not establishing larger return and reuse infrastructures and thereby for not supporting circularly oriented ways of living and consuming. In doing so, many participants accuse these actors of playing into short-sighted and capitalist thinking—of the ever more, ever new, and ever faster. Citizens thereby find them at fault for allowing the mobilisation of problematic Big Futures that they believe will be coined by continuous consumption, wasteful handling of resources, and accumulation of (plastic) waste.

The perceived lack of larger return and reuse infrastructures is also quite prevalent in the case of dm's refillable detergent bottles discussed in the previous chapter (see Chapter 6. Justificatory narratives). As we discussed, for some participants, it was not convenient to drive across the city of Vienna to a specific drugstore just to get a washing detergent bottle refilled. Instead, buying a new plastic bottle of washing detergent was imagined to be the more convenient and time-saving option. This example is one of many that illustrates how missing or insufficient infrastructures for reuse are seen as a burden to citizens' ability to help realise slower and circular rhythms of consumption. This insufficiency is compounded by the convenience citizens find in their current practices. Whilst citizens describe reuse practices as an option that is usually both quite time-consuming—due to, for example, extra travel time for travelling, organising, or becoming better informed—and money-intensive, they know that their well-entrenched linear buy-throw-away routines are efficient and, most of the time,

particularly cost-effective. Ultimately, if reuse infrastructures and networks are not well established and not spatially present, following routinised rhythms of fast and linear consumption is seen as even more convenient—despite their understanding that such practices create more and more future waste.

Still, as we have seen, these stories—including dm's washing detergent refill service—also show that overcoming their shortcomings is not seen as impossible. Indeed, practices for reuse become more favourable the better they can be integrated into existing patterns of everyday life: in established routines and in well-entrenched habits of consuming. *"Yes, that's feasible again if it's somewhere on everyday routes"* (G1_LU:10), shares Lukas. Especially in cases where reuse would not require much more time or money than buying a disposable option, it is very welcome amongst our participants. Thus, on the one hand, this story is one of many that show how citizens are quite open to integrating and adapting more circular rhythms of (plastic) consumption. On the other hand, it also uncovers that their willingness to do so often only goes so far as the infrastructures that help sustain their reuse. In citizens' making of the future, we therefore learn that if reuse infrastructures are missing or are less widespread, then reuse practices will not be imagined to be convenient solutions for individual citizens.

7.4 TAKING TIME: TO CHALLENGE HOW WE CONSUME (PLASTICS)

Beyond the recognised need for robust infrastructures to foster individual reuse practices, participant narratives can show us that there is another specific resource they believe they need to be able to help create change: time. Participants narrated need for time has multiple purposes: time to become aware of their own consumption patterns, time to rethink their living, consuming, and working practices, time to become informed about the most sustainable options, time to dismiss old living standards, norms, and ideas, and time to plan, perform, and stabilise new practices and new habits. Temporal resources are thus imagined as crucial to challenge and change our future ways of consuming (plastics). This need to take time is particularly concrete, for example, when our participant, Jan, a student, shares:

> *And, and yes, that you just get to a life where there's no stress at all for: boah, now I need a quick coffee-to-go in a plastic cup, that this stress isn't even there in the first place, and I'm going in a social direction, saying that people need more time again so that they can do without this disposable plastic at all. (G2_JA:38)*

Jan suggests that to enact futures with less use of disposable single-use plastics such as to-go cups, people need more time in their daily lives. The underlying idea in Jan's call for a slower

societal pace is that current fast-paced lifestyles create stress and thus, a dependency on convenience, which often entails plastic-packaged products. "*[S]imply taking time for yourself*" (G2_JA:38) is what enabled Jan to become aware of his consumption habits and the necessities of life, and helped him reduce the amount of single-use plastics in his life. Advocating for more time and less stress, Jan's argument implies that a slower lifestyle would facilitate more sustainable behaviours and a reduction of single-use plastic consumption. Later in the discussion, Jan elaborates further on his position, explaining:

> *So, for me, the tip is clearly to make time to cook things myself again and to go to the market, which is perhaps only possible once a week, but you can also plan that way—on Monday there's a pumpkin soup or whatever—and then the end product is that you can just take a jar of soup with you for the next day, and then you don't need to go somewhere to get something in plastic during your lunch break. [...] and as far as everyone has the opportunity to simply take time for themselves and have time to cook things themselves again and then there will be significantly less plastic.* (G2_JA:114)

More broadly, Jan's argument implies that reduced consumption of plastics can be achieved if more people prioritise time to engage in sustainable practices, like, for example, cooking meals at home and shopping at local markets. Following this idea(l), we can sense how his emphasis rests on the importance of individual time management and personal responsibility. This raises an important question: how much time do we need to engage with and come to terms with our consumption patterns? Moreover, if people were to have enough time, would they indeed engage with or change how they consume, or would they set other priorities instead: spending time with their family or friends, pursuing further education or rekindling old hobbies? Whilst this will remain an open question, the idea that more time will lead to citizens consuming differently places a heavy burden on their shoulders, including on those who may not have the temporal, financial, or situational means to alter their consumption patterns.

Nonetheless, even whilst not quite as argumentative as Jan, participants share many stories that stress how people must take time to mobilise more sustainable and resource-reduced ways of living and consuming. Taking time is thus frequently constructed as an essential ingredient to realise more sustainable futures. However, much like Jan's anecdote, these stories often sound as if the lone act of taking time will lead to creating the awareness to rethink consumption patterns and re-do consumption rhythms. In other words, citizens making of our

futures—whether with, without, or with fewer plastics—is often explored along a deficit model in which individuals and society more generally are imagined to lack not only the necessary knowledge (see sub-chapter 7.5), but also the temporal resources needed to change our habits, as to possess such resources is imagined to lead to the behaviour changes we desire. Thinking about change along such a deficit model way of thinking simultaneously emphasises individual responsibility and oversimplifies time as a governable resource, which largely disregards the power of the various temporalities that shape everyday life.

Indeed, our participants routinely construct and treat time as a resource that can simply be taken and governed—something that can be applied from one task to the next without adaption. This understanding of time, however, fails to acknowledge that time is not equally accessible, as not all of us (feel that we) have ownership over our own temporal resources. When Jan, for example, begins to explain how he is able to take so much of his time to engage with his consumption patterns, he wonders if his model is applicable to other peoples' realities as well:

> Jan: *Well, I'm really taking a lot of time for it right now, that's not normal. So, that's why [...] it's good that we say what is really realistic about my model [...]*
>
> Johanna: *I mean, it certainly depends on your life situation, [...] if I have, I don't know, four children and work half-time somewhere in a supermarket, then that's clearly not going to be possible*. (G2:119)

As Johanna points out, not everyone can freely choose what they use their time for and is often limited by temporal resources to be able to engage with their own consumption habits. People's everyday lives are shaped by the temporalities of their private and professional lives, by the opening hours of sports centres, malls, or municipal buildings, by the availability of twenty-four-seven services, by public transportation schedules, and more. Being subjected to many different temporalities of life, having ownership over one's own temporal resources is not always a given: *"sometimes you really don't have time"* (G2_JO:115). Instead, people prioritise their available time for certain tasks whilst they postpone or neglect others. As Johanna argues, not everyone has the luxury of flexible time and not everyone can take the time they please. Like Johanna, many participants narrate about a lack of time, limited time, time pressure, or an obligation to follow certain temporal structures (see Chapter 6. Justificatory narratives). Not having time and therefore not being able to pause fast and

iterative rhythms of consuming, makes it difficult for the individual to change their own often automatised consumption patterns and adapt to other ways and rhythms of living and (not) consuming. That not everyone has full control over their temporal resources suggests once again that broader societal changes are needed to realise change. Until then, many will likely continue to feel as if they have no choice but to follow the rhythms and fast paces of our contemporary society.

Nonetheless, we do encounter participants like Jan or Theo, who acknowledge having "*the luxury of time, money, and energy to deal with plastic and actively try to reduce my plastic consumption, which is quite difficult*" (G3_TH:21). Yet, even with the resources he has, Theo points out that engaging with his plastic consumption remains challenging. On the one hand, plastic consumption is difficult to address because plastics are so deeply embedded in everyday life—they often go unnoticed, becoming an invisible part of modern society. From food packaging to household items, their ubiquity makes their use almost unquestioned. On the other hand, reducing plastic use would also likely mean giving up what citizens perceive as plastics' "*Convenience Factor […]*" (G1_LU:9). Convenience, to be sure, is a common association people make with practices that require minimal effort or time. Plastics fit this perfectly. They offer quick access to packaged food, disposable containers, and lightweight products. However, as we have discussed, whilst plastics offer use cases that are often quite immediate, their environmental and societal costs are often hidden. This makes it harder to recognise the trade-offs that are involved. The prospect of reducing plastic consumption is therefore not only a pathway to making futures with less plastics but also an invitation to rethink what we define a convenient life to be. Moving away from plastics would involve the adoption of more intentional practices, like planning meals or using reusable containers—practices that may feel inconvenient for many members of society built around quick, on-the-go consumption. These shifts, even if only for now hypothetical, challenge our assumptions about convenience and the speed at which we expect things to happen.

This challenge is entangled with the fact that, as Theo suggests, on an individual level, even when resources, knowledge, motivation, and awareness are present, reducing plastic consumption remains difficult. As mentioned, this offers a larger point of critique about deficit model thinking. This line of thinking assumes that providing the right information or motivation will lead to sustainable choices. In other words, people would act differently if only they knew

differently. This analysis seeks to overcome this. It instead suggests that to foster more sustainable consumption patterns, we must address not only individual knowledge and motivation but also (infra)structural factors, including economic pressures, reuse infrastructures, flexible work schedules, and product design adaptions. Only with broader changes can we support individual shifts in their Little Futures towards more sustainable consumption practices and, in turn, reduce society's reliance on plastics in Big Futures.

Until then, well-entrenched consumption patterns, time-saving conveniences of plastics, temporal inconveniences of refusing plastics, lacking broader reuse infrastructures, different forms of planned obsolescence, strong marketing efforts, and other aspects will continue to make it challenging for the individual to change the role of plastics in their lives. We must not underestimate the immense difficulty individuals face when standing and working against such well-encultured fast and iterative rhythms of (plastic) consumption, which are situated in a society that generally strives for ever more and ever improved efficiency, productivity, self-optimisation, and the desire to keep (improving) living standards.

7.5 FUTURE CITIZENS: EXPECTING OTHERS TO (MOBILISE) CHANGE

Thus far, we have learned that in exploring and making our futures with(out) plastics, individuals often want—but do not always feel equipped—to bring about more sustainable futures. We have already unravelled how challenging it is for the individual to refuse plastics, challenge the temporalities of consuming (plastics), and give up on the multiple conveniences and the co-produced lifestyles and living standards they help create. Still, as we have seen, there are also stories of the individual citizen who nonetheless tries to resist, who tries challenge our contemporary rhythms of consuming (plastics) by reusing, reducing, or removing plastics in their life to enact more sustainable versions of our futures. Amongst this group, several citizens wonder whether the changes they have made to their practices and the actions they have taken will make a difference in the bigger picture. Will the little changes and small contributions they have made to realise their Little sustainable Futures be enough to foster more sustainable and less toxic Big Futures? Whilst these questions must, at least for now, remain without answer, many citizens have no doubt that the relationship between plastics and society will change in futures that lay ahead; Theo, for example, predicts the following:

> *So, I think in 10 years' time, the general global awareness of plastic will simply become much, much broader, so it will simply grow [...] I think it will then generally*

> *grow strongly amongst young and old, but I would say that I have particularly high hopes for the younger generations, for those for whom climate change is a fact or a climate catastrophe in general, and plastic is just as much a part of that as many other things [...]. ...] I am positive and more optimistic that it will become more part of the public discourse, that more awareness will be created, but I myself believe that it will also become clearer how harmful it is and how widespread the damage already is. (G3_TH:83).*

Following Theo's vision, younger and older generations will be much more aware of plastics in 10 years from 2019. This highlights a common contrast our participants draw in their anticipatory narratives: between the current state of awareness and action on plastics and an optimistic future projection of increased awareness and action. Indeed, like Theo, many citizens express hopeful beliefs that citizens of the future, especially the younger generations, will come to play a significant role in this change. To ensure that people will indeed become more aware of plastics' consequences in the futures ahead, many participants consider it pivotal to spread more information, more awareness, more enlightenment, and more educational measures. Some participants keep their calls more subtle, such as Ella, who explains, "*[I] do think that a lot will change; and I also think it's important to educate people and that will take us a lot further"* (G1_EL:118). Other participants, on the other hand, have more concrete ideas. Describing how awareness-raising processes and their impacts could look like, Christopher, for example, paints the following picture:

> *One minute of information. So, with 10 news programmes a day, I reach a huge number of people who, perhaps after two or three months, are already starting to think about why are they bothering us with this now? What have we done wrong, can't we do something better? It will certainly take one generation to complete the awareness-raising process, but it would be a start. [...] But as I said, an information and permanent communication process is necessary, and governments are also called upon to do this, otherwise it won't get into people's heads. (G3_CH:32).*

Emphasising the need to constantly provide information about plastics, Christopher suggests that the problem of awareness or action on plastics is due to a lack of sufficient information being communicated to the public. Christopher assumes that repeated exposure to information will gradually lead people to reconsider their views and eventually their behaviours. His idea(l) thus aligns, once again, with the underlying assumptions of the deficit model: increased exposure to information will fill the knowledge gap and lead to change. Thereby, Christopher does not believe in a fast change; instead, he highlights how "*it will certainly take one*

generation to complete the awareness-raising process" (G3_CH:32). This reveals that a long-term information campaign is imagined as necessary to overcome what Christopher sees as a knowledge deficit. This argument resonates with the anticipatory narratives of many other participants. Like Christopher, other participants construct our current levels of information and awareness as insufficient in leading our society to realise that our present ways of consuming plastics might be problematic. Despite the fact that calling for more information and awareness to steer people's behaviours and make more sustainable futures rests on the underlying assumption that higher awareness and better education will produce change, many participants nonetheless are quite pointed—both in their critiques of the current information landscape and what an improved one may look like in the future.

Christopher, for example, pleads for mainstream media and governments to take responsibility for closing the awareness and knowledge gap on plastics by continuously providing more information. Other citizens imagine a broader variety of actors and institutions to be responsible for informing the public and sparking change. Amongst these actors and institutions are a diverse assortment of media types and channels, political subsidies, educational programmes, non-governmental organisations and their activities, schools, and various workshops of all sorts. Whilst the specificities of their awareness-raising strategies look different, citizens' strategies predominantly depart from the knowledge deficit model we have discussed in assuming that more awareness and more knowledge will translate into better, more sustainable, and more adequate handling of our resources, plastics included. Nonetheless, the moderator encouraged participants to engage deeper with this assumption and to reflect on it, asking one discussion group, for example: *"[Did] this experience at school and this preoccupation with it then led to people—your colleagues at school or even you—behaving differently"* (G4_UF:28)? This question, however, does not gather many answers. Instead, it is met with participants not knowing whether a change in respective environments took place and very little effort to engage critically with their assumptions.

Indeed, rather than questioning whether more information would lead to a more sustainable Little or even Big Future, participants continue to remind us that long-term systemic changes do not happen overnight because they are time-consuming processes. What we can take from participants' stories, however, is their belief that the education of younger generations has a pivotal role in realising more sustainable systemic change, as their anticipatory narratives

routinely imagine this education to lead to better choices that will assure us more sustainable and better futures. Materialised through their discussions, citizens' narrated expectations thus tap into two beliefs: children as future awareness raisers (for Little Futures) and children fuelling action for more sustainable trends (for Big Futures). In what follows below, we will learn how within these next-generation narratives, children are particularly imagined to be the ones who solve future problems with plastics and the lives we live with them.

In every discussion group, children and younger generations are routinely ascribed the role of awareness raisers. For instance, Anna, a teacher, shares:

> *And I think you have to start with the children. We also told the children [...] that the children should help educate their parents a bit, yes? When you go shopping, the children should say: Mama, why do we have to take this? Because that's where you have to start. We're a different generation, we grew up differently and I think it's very difficult to break out of patterns. But the children are already very advanced.* (G1_AN:38)

In describing how children can play a significant role as awareness raisers, Anna emphasises the influence they can exert on their parents' behaviour due to their openness to new ideas and therefore, their ability to challenge established habits and norms, such as one's shopping choices. Anticipatory narratives like Anna's are built on an anticipated generational shift in which older adults who acknowledge the difficulty of changing well-entrenched and stabilised consumption routines see children as better equipped to promote and adopt more sustainable ways of consumption. Another participant, Ursula, argues similarly:

> *That you simply let the children look, consciously let them look. What do we see every day when we go shopping, but we no longer see it? Because the mum buys automatically, and reaches out. And the children then watch like a hawk. They say: Mum, why are you taking that? There are others too* (G3_UR:22).

Like Anna, Ursula considers children to be potential agents for changing parental consumption habits. By questioning their shopping decisions and pointing towards alternatives, she imagines how children can encourage adults to reflect on their actions and potentially reconsider their consumption habits. Anna and Ursula are amongst the many citizens who anticipate this generational gap and construct children as important sources for broader awareness and considerable changes in behaviour to enact Little sustainable Futures for individual families. What we see here then is the making of futures in which current citizens see themselves and their peers as unready to change without the external intervention of their children.

What materialises from these next-generation anticipatory narratives is an interesting cycle of awareness-raising. On one hand, older generations want educational measures to raise awareness amongst the younger generations to solve our current problems of (plastic) consumption in the future. On the other hand, those same younger generations are simultaneously expected to make older generations aware of their often-encultured practices, which play into today's problematic consumption habits and rhythms. This cycle of awareness too reflects a deficit model, as the education of future citizens—the oft-mentioned, younger generation—is seen as a necessary means to address perceived shortcomings in consumption awareness and behaviour amongst present citizens, or the older generation. This creates a mode of intergenerational injustice, in which today's citizens shift care, concern, and solutions for the future into the future, thus outsourcing the responsibility to change society's ways into the hands of future citizens and future generations.

At the same time, we encounter another form of tightly intertwined next-generation narratives that go beyond the context of familial supermarket visits, small household levels, and the shaping of Little Futures. Discussants also imagine younger generations to be important agents in bringing about more collectively oriented Big sustainable Futures. Many of our participants admire how younger people today gather and organise themselves around specific issues and moreover, how they use different technical innovations: the internet, smartphones, and social media platforms. Through these technological devices and infrastructures, participants describe how the spread of news and information can have tremendous speed and reach. Olaf, for example, explains that

> *[M]edia globalisation has one advantage, everyone can see what is happening all over the world and it will create awareness amongst young people and future generations. An insane 100,000 initiatives will be founded and politics will be forced to change and the economy will be forced to change* (G3_OL: 90)

Being technologically armed, Olaf and other participants expect younger generations to exert more public pressure and force changes towards sustainability in political and economic realms alike. The tight anticipatory entanglement between awareness of children regarding sustainability (including the sustainable consumption of resources), political pressure, and systemic future changes is recognisable across all discussion groups. It becomes especially visible, however, when participants' discussions incorporate climate change as a global issue intersecting with plastics and sustainability. Indeed, when the topic of climate change emerges

in citizen discussions, our participants frequently emphasise the international grassroots movement, Fridays for Future. Within this movement, at least in its original incantation, students and pupils aim to mobilise political leaders to act to mitigate the effects of climate change and more importantly, to immediately accelerate our transition from fossil fuels to renewable energies. Indeed, the Fridays for Future movement and the actions of its poster child Greta Thunberg regularly serve participants as a point of reference in arguing how our society needs a similar movement with a focus on plastics. Whilst students and pupils are imagined to not yet be in the position to legally enforce more sustainable regulations and legal frameworks themselves, through movements like Fridays for Future, they are imagined to already be practising their care for the future: calling on political decision-makers to act and raising political pressure.

For many participants, Fridays for Future thus functions not only as an example of how societal movements can form around an issue, but how pressure from young citizens can move society onto more sustainable paths in the long run. Johanna imagines this impact as such:

> *Fridays For Futures is also an important, certainly important, so just like with the hippie movement, that at some point a fashion, or a lifestyle that you like, has become embedded in fashion, I think that [...] will also be important, that this movement—even if it has many opponents, but I think it will still characterise life, the lifestyle a bit* (G2_JO:164)

Like the hippie movement of the 1960s and 70s, Johanna expects the Fridays for Future movement to influence and shape future lifestyles and cultural norms. She imagines how social movements like Fridays for Future could foster sustainability and care for the health and well-being of our planet, its people, and environments, and how they might stimulate broader shifts to more sustainable lifestyles and trends in the futures to come. Like others, Johanna thus considers such movements to be an important part of our journey towards the sustainable use of resources and an enduring societal change.

However, although many participants admire and expect children and students to be part of such social movements that bring society towards more sustainable futures, they also criticise what they interpret to be a double standard amongst the younger generations. Admiring their protests pushing for immediate action to address climate change, our participants nonetheless criticise them—based on pictures they have seen on social media channels—for the waste they have left behind: discarded protest signs, banners, fast food, and beverage containers.

Although a separate issue, littering is generally not considered a sustainable practice amongst our participants. With pupils of the same age, our participating teacher Johanna, too shared such criticism:

> *it's just like the people at Fridays for Future, I love that on Facebook, when the rubbish bins are always photographed after the things, they should take their stuff away for once, or should they rather plant a tree instead of going there to demonstrate* (G2_JO:94).

Whether these accusations are valid or not, such messages lead our participants to regularly blame younger generations for performing this double standard: advocating for more sustainable futures whilst making non-sustainable decisions in the present. That many of our participants are themselves engaging in these double standards is, however, mostly beyond their reflective scope (see sub-chapter 7.1). Take for example how they aim to realise their Little Futures: without plastics, yes, but only through a material replacement without much reflection on the sustainable dimensions of those material alternatives or the practices at the very root of society's plastic problem.

7.6 CONDENSING ANTICIPATORY NARRATIVES

Whilst most citizens enjoy today's comforts, conveniences, and ways of life with plastics, they are also concerned about their uncertain long-term impacts and effects in futures yet unknown to us. In envisioning our trajectories towards futures with, futures with less, and futures without plastics, citizens' discussions swing between small-scale individual efforts and broader systemic changes. In making these futures, citizens connect their narratives about pasts, presents, and futures in specific ways, which brings to life both their Big and their Little Futures (Michael, 2017). Being attentive to how citizens imagine the futures of plastics and society thus allows us to better grasp the performativity of futures not only on different spatiotemporal levels but also in terms of their multiplicity and interrelationality. In narrating society's futures with plastics, citizens tap into five re-occurring strategies that are imagined to challenge and eventually bring change to well-entrenched, yet often unsustainable and wasteful practices, standards, materials, artefacts, rhythms, and paces of living and consuming.

Very prevalent in citizens' anticipatory narratives is their making of Little Futures with fewer plastics. In these Little Futures, certain plastics are excluded from everyday life. This supports the idea(l) of preventing the accumulation of future plastic waste and exposure to potentially toxic plastic-related chemicals. Yet, whilst citizens Little Futures reveal a desire to live with less

plastics, they also often show that many do not want to give up on the convenience of their well-entrenched consumption habits (see sub-chapter 8.4 for the paradox on replacing plastics). Therefore, a simple replacement of plastic artefacts with non-plastic equivalents is one very prominent path citizens advocate for to be able to enact their Little Futures with fewer plastics and simultaneously continue to live a convenient life. Knowing how past generations lived with fewer plastics and fewer plastic-related problems (see Chapter 5. Diagnostic narratives), non-plastic materials are often constructed as enabling the making of more sustainable futures. For many citizens, replacing plastics with other non-plastic materials, including glass, wood, leather, wool, bamboo, or cotton, to name but a few examples, is therefore one way of extending plastic-reduced trajectories of the past into the future.

Infused with trajectorial thinking (Appadurai, 2012), it is particularly tangible amongst citizens how replacing plastics today is often imagined to have the causal effect of not having plastic materials tomorrow and thus having no plastic-related (waste or own health) problems in the futures to come. Thereby, material replacements of plastics on the small scales of everyday life are frequently constructed to be good and quick material solutions. This shows that despite citizens' efforts to contribute to what they believe to be environmentally friendly futures and to help govern the future (visible) problems of plastics, they do not want to disrupt their current habits and routines. Such futures seem feasible because plastics can be replaced—essentially immediately—by other materials.

Indeed, in industrialised countries like Austria, citizens face few barriers in enacting their Little (plastic-reduced) Futures. With today's dominance of instantaneity (Adam & Groves, 2011), how citizens describe the prospect of replacing plastics reveals that planning for futures is no longer really necessary, as almost every artefact—no matter its material composition—is imagined to be immediately available to almost anyone. Plastic artefacts are seen to be quickly replaceable items in people's everyday lives; at the individual level, this replaceability is also frequently seen as a solution to prevent future plastic waste. It is therefore understandable why citizens' discussions—about the inevitable creation of new waste materials (not just from the afterlives of the replaced plastic artefacts but so too the afterlives of the material alternatives)—are limited. Still, all artefacts have an afterlife somewhen, somewhere, and in some form. It thus does not require too much anthropogenic sensitivity to assume that both plastic, as well as non-plastic materials, will continue to impact people's futures over time.

However, as this chapter has shown, there seems to be little citizen engagement with questions to do with whether material alternatives to plastics would be sustainable, long-term, or desired solutions. This is especially striking when one considers citizens' prior diagnosis of problematic fast and iterative rhythms of producing, consuming, and disposing. Participants' replacement narratives about non-plastic materials supporting practical and immediate solutions that nonetheless fit into our existing consumption habits to create their own plastic-reduced and locally situated Little Futures should therefore be taken with a grain of salt, and is taken up in sub-chapter 8.5, which elaborates further on this paradox.

Citizens narrate society's Big Futures much differently. Indeed, when their solutions for material replacement strategies move to larger societal scales, we can see much more critical engagement with the possible consequences of these large-scale replacement ideas. Many citizens are concerned that simply replacing one problematic material (such as plastics) with another may also turn out to be unsustainable and, likewise, could bring about new or similar problems when used at scale. Aware of the historical parallels between plastics and materials or substances that were eventually deemed harmful after being broadly used (see sub-chapter 5.3), many citizens call for a more sophisticated engagement with the possible consequences of blindly replacing plastics with other materials. With concerns about the making of Big, unsustainable, and potentially toxic Futures with material alternatives to plastics, many citizens express these feelings with precautionary calls for a life cycle assessment of materials and products before they are introduced to the market. Given citizens' current diagnosis, it may be as urgent to question whether our past and existing use of plastics—and the resulting consequences, such as the accumulation of plastic waste and the widespread release of microplastics and additives—has already played a significant role in shaping unsustainable and potentially Big toxic Futures, thus necessitating more immediate action.

Nonetheless, many citizens seem to remain quite precautious in taking action, wanting to prevent venturing further into the land of such potentially toxic futures by calling on science, producers, and industries to take responsibility, create better knowledge, and provide certainty about the sustainability of plastics' possible material alternatives. Demanding that these bigger stakeholders establish certainty about future advantages and disadvantages of large-scale replacements of plastics, many citizens thus believe that one of society's best paths towards a Big Future with sustainably produced materials is one placed into scientific and economic

hands. Given that these same stakeholders are simultaneously diagnosed by citizens to work along slow and time-consuming logic (see sub-chapters 5.1 and 7.2), it therefore seems that— unlike at the scale of people's Little Futures— replacing plastics at larger scales is imagined as requiring time and not being an immediate success or overnight achievement. Large-scale material changes are thereby imagined as being situated in more distant future horizons.

The prevalent solution amongst citizens to replace plastics with other materials (regardless of at which scale), shows a strong desire to not disrupt their well-entrenched routines and consumption habits, nor their living conditions or standards. Replacing plastics with ready-to-go alternatives is therefore popular amongst citizens, as they can rest assured that their future consumption can continue to function and contribute to the future along the temporal structure it has become accustomed to. They can continue with their fast paces and fast rhythms of consumption with new materials, despite the fact that these are the same fast and iterative buy-and-throw-away practices they diagnosed as problematic and alarming (see Chapter 5. Diagnostic narratives).

However, in (re)thinking the futures with(out) plastics, citizens do not only narrate about problem–solution packages that circulate around material replacements. Another popular set of solutions to enact futures with more sustainable consumption revolves around both individual and broader structural attempts to challenge our current ways of consuming plastics and other materials more generally. Citizens' anticipatory narratives reveal two main strategies to challenge our current rhythms and guide us towards slower and more circular consumption: prolonging the use life of artefacts and taking the time to engage with one's own consumption.

Practices to prolong the use life of plastic artefacts (and other artefacts more generally) include but are not limited to reuse, donation, and repair. Whilst each of these practices is imagined to reduce the frequency of new purchases and slow down our consumption, reuse practices are particularly emphasised, as citizens imagine reuse to help enable individuals to reject the fast and linear rhythms of consumption inscribed into many artefacts (see sub-chapter 5.2). Extending artefacts' usage time on an individual and situated basis is thus one way citizens imagine themselves able to counteract predominant market rhythms (such as planned obsolescence or marketing strategies for ever-new products). Through reuse practices, consumers can, as Madeleine Akrich (1992) would likely put it, actively de-script the linearity of single use and move towards more cyclically oriented rhythms of consumption. Individual

efforts to foster circularity and encourage a circular economy are thereby considered a meaningful way to counteract the market logics promoting the fast and linear consumption rhythms citizens identify to be at the root of many problems. Many citizens think of individual reuse practices as an important way to enact Little (sustainable) Futures whilst also contributing to the realisation of more sustainable Big Futures with less frequent consumption and increased waste prevention. However, these individual efforts are widely seen to be constrained by the limits and absences of broader reuse infrastructures. This leaves individuals with the challenging responsibility to govern the reuse of artefacts on their own and thus, to change our rhythms of consumption and enact Big Futures with more sustainable consumptions on their own too.

Citizens' other individual pathway to orient society's future consumption towards more sustainable paths—the need to take time—means to say that people should take time to become aware of their own consumption patterns, to dismiss the old and implement the new: new living standards, norms, and idea(l)s to perform and stabilise new consumption habits. In exploring this pathway of making our futures with, without, or with less plastics, citizens thus often speak (even if unknowingly) along a deficit model, as individuals are imagined as lacking the awareness and knowledge needed to realise these changes. In other words, citizens imagine that if one would possess such resources, their behaviour would change their habits. It should also go without saying that it completely overlooks the chance that education and awareness may not result in behavioural change whatsoever.

Whilst citizens often view taking one's time and building awareness as essential steps toward mobilising more sustainable and resource-reduced ways of living for both Little and Big Futures, this analysis has shown that not all citizens feel they have full ownership over their time. Indeed, many do not have agency over their own temporal resources. Nonetheless, framing the change in consumption practices purely through this deficit perspective oversimplifies time as a governable resource (Adam, 2004) and overlooks the influence of the various temporalities that shape everyday life. Instead, citizens' narratives render visible how they are subjected to, bound to, and orchestrated by the everyday temporalities of work, family, economy, transportation, and other factors. Thus, even if people are (more) aware of the consequences of their plastic consumption, it may not only be that they do not want to take time to consume differently; they may simply be unable to altogether. Thus, with linear buy and throw-away

rhythms so well-established and so default to many of our routines—neatly and symbiotically pacing along society's temporalities—for many, using plastics is entrenched as the most time-saving and convenient option.

Of course, as we have seen, this is an intergenerational issue. As one might assume, it will not be fixed tomorrow. Citizens' anticipatory narratives also revolve around recurring moves to raise awareness, educate and mobilise others—especially the younger generations. To ensure that future generations are more aware of plastics and, more generally, the consequences of their consumption, many participants believe it is crucial to spread more information, awareness, and educational measures. Entities including media, political decision-makers, educational programmes, non-governmental organisations, and schools are all called upon to close our knowledge gaps on plastics. Here again, deficit thinking is employed to enact more sustainable futures. In this next-generation narrative, we encounter the widespread belief amongst citizens that older generations should educate younger generations about plastics whilst the younger generations are nonetheless expected to make older generations (especially their own family members) more aware of their entrenched, yet unsustainable consumption choices and habits. In reflecting obvious deficit model thinking, this pathway thus shifts responsibility to bring families' Little Futures towards more sustainable paths onto the shoulders of the family's youngest members, creating a form of intergenerational injustice (see sub-chapter 8.6).

When it comes to Big Futures, citizens of the present also put their hopes into the younger generations and the generations yet to come. Younger generations are expected to bring about more sustainable lifestyles and cultural norms in Big Futures by, for example, continuing to enact movements similar to Fridays For Future or the 1960s and early 70s hippie movement. Whilst citizens today hope that future generations will bring about more sustainable changes, they often overlook the fact that if nothing changes now, those future generations will still live in a society driven by the same need for continuous growth and an efficiency-focused mindset. This will prioritise profit, fuel ever-increasing demand and production, support fast consumption cycles, rely on quick waste management systems, promote short-term thinking in economic and political systems, produce scientific knowledge at a slow pace, and lack comprehensive reuse infrastructures.

Reminding us that we should raise future citizens' awareness, citizens of the present thus nevertheless delegate the responsibility to deal with society's ways of consuming, the remnants of these behaviours, and the mobilisation of more sustainable systems and structures of consumption onto future generations. Notably, this contradicts their prior diagnosis that urgent action should be taken now to realise more sustainable and less toxic Big Futures. By shifting agency and responsibility onto future generations, citizens thus shift caring for the future into the very same future they say should not be brought about. In other words, many citizens are complicit in colonising the futures of others (Giddens, 1991) without anticipating or even attempting to mitigate potential impacts.

8. CONCLUSION: PARADOXES OF OUR LIVES WITH PLASTICS

I began this research with Victor E. Yarsley's and Edward G. Couzens's 1941 book, *Plastics*. Writing for a future not yet experienced, the authors described plastics as a most promising material with almost infinite areas of application. They anticipated that the material was going to shape the lives of generations to come. Indeed, today, plastics have many benefits and comforts that people enjoy. What the authors did not foresee to that extent, however, are how notions like plastic pollution, the plastic problem, and the plastic crisis would also become part of peoples' lives with and understanding of plastics. Taking a temporal perspective on our relationship with plastics makes tangible how the story of our lives with plastics is not only a continuing one but one that is rife with deep ambivalence and paradoxes.

Investigating how today's citizens narrate about and make sense of plastics through a temporal lens reveals how they diagnose our lives with plastics (diagnostic narratives), how they (do not) justify plastics' situated use (justificatory narratives) and negotiate plastics' future existences and ways of use (anticipatory narratives). Together, these narratives show how deeply paradoxical our lives with plastics truly are. I will therefore conclude this research by carving out six different yet interrelated paradoxes of our lives with plastics. It is my hope that making these paradoxes explicit will allow us to better understand why people may have difficulties engaging with, re-thinking, and eventually changing their well-entrenched consumption habits and routines with and through plastics. Whilst respectful of the strength of individuals' ability to unsettle contemporary consumption practices, these paradoxes raise questions regarding their responsibility and their reflexivity in a global system that is largely characterised by short-term profit, growth, and efficiency.

8.1 SLOW ENCULTURATION MEETS URGENT ACTION

The first paradox starts with the fact that the relationship between plastics and society has unfolded over time. Over the course of several human generations, plastics have become an integral part of almost every aspect of our everyday lives. Plastics and society have slowly but steadily co-produced one another. This has brought us many comforts and conveniences. However, as the calls for urgent action on plastics and plastic pollution intensify, we face a contradictory situation: How can society function without—or even with significantly less—plastics, and what would such a transformative change look like?

Through slow enculturation processes, plastics have become omnipresent and often imperceptible in everyday life, making it difficult for today's citizens to notice their omnipresence. Whilst most plastics are generally well-camouflaged and unquestioned, there are moments when people start to critically engage with plastics, encouraged by social media content, news articles, documentaries, holiday experiences, or research discussion settings like in this research.

With these moments of critical engagement, people's concerns about the chemical and material legacies of plastics become apparent. Consequently, citizens find themselves manoeuvring between the urgent need to change contemporary ways of life with plastics and the desire to maintain well-entrenched living standards. This raises a critical paradox. Although there is a widely recognised need for urgent action, there is also great uncertainty about how to address a material so deeply woven into the functioning lifestyles and routines of our society.

In these moments when plastics become visible again, it quickly becomes evident how deeply and often irreversibly they permeate our lives. This highlights the complexity of rethinking our relationship with such a well-encultured technology like plastics—one that cannot simply be extracted from our society. The challenge, then, is not only to recognise the urgent need for change but also to navigate the uncertainties and develop effective strategies for a sustainable future for our lives with plastics. Embarking into more sustainable futures requires a collective effort from individuals, businesses, and governments to create more environmentally conscious ways of living and consuming.

Thus, the paradox of our relationship pits plastics' slow enculturation against the urgency to act on these well-encultured materials. Despite the deep entanglement of plastics in our daily lives, it is crucial to critically engage with their ubiquitous presence and the challenges they pose. The path forward requires us to balance the urgency of reducing the impacts of plastics and plastic waste with the complexities of changing yet still well-encultured consumption patterns. By taking collective responsibility and encouraging innovative solutions we can work towards more sustainable practices and futures.

8.2 INVISIBILITY: THE BOON AND BANE OF FAST WASTE MANAGEMENT

The second paradox of our lives with plastics gravitates around the different paces and places where our waste is (imagined to be) managed. In the Global North, the slow enculturation of plastics into people's daily lives has been accompanied by advances in waste management

systems. These systems enable consumers to dispose of their waste quickly and, in turn, to detach almost immediately from the remnants of their consumption. In Vienna, the efficiency and speed of waste management systems rapidly convert considerable amounts of plastic waste into less visible forms. This invisibility allows Vienna's citizens to keep their consumption habits without challenge. Conversely, in the Global South, where waste management systems are often less efficient, plastic waste becomes a visible issue, which encourages citizens to demand action. Whilst this view draws on existing stereotypes of the North/South divide, it risks oversimplifying the complexities of waste management in both contexts. Many regions in the Global South are innovating with new waste management strategies (including TakaTaka Solutions[9] and Plastic Bank[10]) and there is also a growing recognition that waste management in the Global North is not as efficient or sustainable as is often imagined. Nonetheless, the pace of waste management plays a crucial role in determining how efficiently waste is (imagined to be) managed, where problems with plastics are perceived to occur, and where action is and will be demanded.

In many cities of the Global North such as Vienna discarded goods are quickly dealt with by efficient waste management systems. This ensures that plastic waste and other types of waste disappear rapidly from public view through processes like waste collection, incineration, and export. Whilst these practices sustain a picture of living in a rather clean city, the invisibility of waste allows Viennese citizens to tolerate buy-use-and-throw-away lifestyles and their consumption rhythms without questioning them. However, ultimately, this rapid disposal does not eliminate plastic waste or its associated problems: it merely shifts them to different forms, spaces, and times. Remnants and waste of our consumption are often exported to future citizens and distant communities. Rather than truly addressing the issue, it is simply made it someone else's problem.

In many communities in the Global South, waste management systems are imagined as lower or even non-existent. As a result, used and disposed of plastics, including artefacts imported

[9] In Kenya, the company TakaTaka Solutions has developed a business model focusing on waste collection, sorting, and recycling. The company uses technology to help communities improve waste disposal processes, turning waste into a resource (TakaTaka Solutions, 2024).

[10] Plastic Bank is an innovative social enterprise that incentivizes plastic waste collection in countries including Haiti, Indonesia, and the Philippines. It allows individuals to exchange plastic waste for credits, which can be used to access goods or services or even exchanged for cash. The initiative not only helps manage plastic waste but also provides economic opportunities for impoverished communities (Plastic Bank, 2024).

under the guise of recycling from the Global North, accumulate and become highly visible there. This visibility of plastic waste—through pictures, media articles, documentaries, and so on—alerts citizens in places such as Vienna and urges them to demand action in these distant communities. Yet, their concerns about plastic pollution in these regions often seem to be entirely disconnected from their own daily plastic-riddled practices and consumption habits. This disconnection contributes to what discard studies describe as 'waste colonialism', where waste and pollution are exported from one place to another—a process that both creates and reimposes substantial inequalities.

The paradoxical nature of this situation thus lies in the fact that efficient waste management systems in the Global North make plastic waste invisible, perpetuating unsustainable consumption habits, whilst less efficient systems in the Global South lead to visible environmental and social consequences. Thereby, it is both the pace and efficiency of waste management that largely inform whose plastic waste becomes visible, who must live side-to-side with plastic waste and its consequences, who is constructed to have problems with plastics, and who is imagined to need solutions. Despite recognising the need for urgent action against plastic waste and pollution, the very systems designed to manage waste in the Global North thus preserve a disconnect from the actual problem. This highlights a contradictory dynamic between visibility, responsibility, and action.

8.3 PARADOX OF PLASTICS' DURABILITY

The third paradox is the paradox of plastics' durability. Due to the strong chemical structures in their polymers, plastic materials have long been appreciated for their robustness and durability. The materials' ability to withstand degradation ensures a long use life of plastic artefacts. However, it is this very durability that forms a paradox, which presents itself in two ways. First, is when these long-living materials are, for some reason or another, used for short-living or single-use products. The second is when such durable plastic artefacts become unusable and they become (categorised as) plastic waste. It is in these stages that plastics' durability—once a desirable and celebrated characteristic—turns into problems.

This issue has gained traction with the realisation that most plastics will degrade over an incredibly long period—one that will last not just decades, but often centuries. This prolonged degradation contradicts the most common expectation for plastic products: quick disposability. This contradiction is part of what leads many citizens to perceive the enduring presence of

plastic as an accumulating burden.Citizens' criticism of this paradox intensifies with their narratives about deliberate efforts to shorten the lifespan of plastic-permeated products. The poster child of these efforts, of course, is the phenomenon known as planned obsolescence. Different forms of planned obsolescence—designed material breaking points, hardware-taxing software updates, and ever-new trends—lead citizens to criticise these tactics as fuelling capitalist growth logic and sustaining a rhythm of fast consumption whilst they, as consumers, are left feeling powerless and burdened by an accumulating pile of short-lived plastics.

Interestingly, however, not all citizens view this durability paradox as something that is always negative or problematic. For example, when citizens categorise and justify the short use duration of durable plastics, or even single-use, as essential features of a product—to preserve hygiene or sterile conditions, ensure food safety, or provide time convenience—the severeness of this paradox loses traction. In these cases, the short use life of durable plastics serves to maintain high standards of living and functional efficiency and overshadows concerns about waste accumulation and environmental impacts—including the chemical legacies of (micro)plastics, leaching plastic additives and absorbed POPs.

Plastics' durability paradox thus regularly provokes critical reflection on our material choices and consumption patterns. Through these reflections, we can grasp how this paradox covers three interlinked dimensions: material durability (the longevity of the plastic material itself), chemical durability (the persistence of plastic polymers and additives), and object-functional durability (how long the plastic object is functional). These tensions show the difficult choices we must make between enjoying immediate benefits and ensuring long-term sustainability. They challenge our society to balance convenience with responsibility for the health of humans and the environment. Thus, balancing the benefits of plastics' durability with the challenges of waste management and environmental impact is key to shaping sustainable futures.

8.4 REPLACING PLASTICS: BALANCING QUICK FIXES AND LASTING SOLUTIONS

Since their creation, plastic materials have gradually come to replace numerous natural materials, including tortoise shells, paper, cotton, and wood, due to their versatility, durability, and cost-effectiveness. Today, plastics are viewed as highly ambivalent materials—essential in many applications yet problematic due to their (potential) impacts on environmental and human health. Consequently, in recent years, citizens have begun to strive to replace plastics with more natural alternatives again. Considering the various scales of potential replacements,

individuals and society more generally have been left to navigate between fast personal replacements and slower systemic changes, both of which are charged with social, environmental, and economic implications.

Still, citizens do not have to reach too far into the past to imagine a world without plastics. Indeed, most visions to replace plastics are fuelled by citizens' collective memories of past times—times with more natural materials and, of course, fewer problems with plastics and plastic waste. Collective memories of the past strongly impact many of the citizens who advocate for replacing plastics with materials such as wood, glass, or cotton. Ideas to use more natural materials are often linked to a vision of a plastic-reduced and more environmentally friendly and sustainable future. For individual citizens, the desire to replace plastics with natural alternatives often comes from the way such products are presented as being a quick and easily achievable solution. Products made from materials such as bamboo, metal, cotton, or wood are already prevalent in the market today. Their presence and relatively small additional cost to the consumer make shifting one's possessions to non-plastic products seem like an effective personal contribution to environmental sustainability.

However, this enthusiasm to replace plastics often overshadows several other critical considerations. Begin with the fact that as soon as plastic artefacts are replaced they will most likely enter an unknown afterlife with unknown consequences. Next, consider that natural materials, which are generally perceived as more sustainable, have environmental footprints of their own that must be accounted for—both in terms of their production and their disposal. In sum, alternatives to plastics have afterlives of their own that—whilst often more favourable than plastics—are not always as sustainable as one might think. Consumers may thus (unknowingly) contribute to other environmental problems if the collateral consequences of such quick individual replacement practices are not considered. In buying into this mentality: problem–solution–package, citizens view plastics as the problematic material to be resolved, which is alleged to be achievable by substituting goods constructed with plastics for goods constructed with other materials, without questioning their rhythms, paces, or ways of living and consuming (with) plastics.

On a larger, more societal scale, citizens' solutions to replace plastics with natural materials involve many complex challenges. To start, such immediate and large-scale replacements may not be feasible at all due to a lack of currently available resources. These projections run

simultaneously to our global economic systems, which are not expected to be able to change fast enough not only in terms of which materials we would need to change but also in terms of getting people and their practices to change as well, as it is ultimately these practices which require the processes that have become entangled with our dependency on plastics. The question of whether a large-scale replacement is quickly feasible is thus overridden by a question of whether it is also a sustainable way to go.

To achieve meaningful sustainability in the long term, citizens require economic and scientific actors to step up and create efficient and low-impact production methods. Additionally, the processes to develop and implement more transparent and large-scale waste management systems is an important aspect for citizens to participate in—to help choose and shape which practices we will follow in reducing our use of plastics. To not involve citizens in such processes would likely only lead to changes along the lines of what we have discussed above with the pitfalls of trendy alternative-material goods: quick replacements for plastics with materials that will just turn into yet more waste to be managed and eventually made invisible under the umbrella of recycling.

The arguments presented above exemplify why understanding society and plastics as a co-produced phenomenon helps explain why technical or materially-oriented solutions alone (i.e. to substitute plastics with other materials or to improve recycling practices) might not be sufficient enough to challenge the robust rhythms of our fast and linear mass consumption habits; we have already seen the length to which our societies will go to avoid seeing the remnants of these habits with our production and consumption exported in both spatial and, as I have attempted to show, temporal terms. The paradox that comes with the prospect of replacing our plastics highlights the need for a multifaceted approach. We must evaluate the lifecycle impacts of materials on both an individual and societal scale in consideration of their production, use, and disposal to identify sustainable options and avoid unintended (future) consequences. Based on citizens' narratives regulative decision-makers and legal frameworks are imagined to play a crucial role in guiding the transition through policies and regulations that incentivise more sustainable practices and infrastructures, support research, and ensure economic shifts.

The paradox of plastics' potential replacements speaks to the complexities of transitioning to a more sustainable society. Whilst individuals can make quick choices by choosing natural

alternatives, it is crucial that we still consider the broader environmental consequences of such choices and, moreover, that we nevertheless continue to strive for more systemic changes in terms of consumption patterns. It is only by addressing both issues that we can begin to redirect our path towards a more sustainable and resource-efficient future.

8.5 FAST AND LINEAR MEET SLOW AND CIRCULAR CONSUMPTION RHYTHMS

Fast and linear buy-use-throw-away rhythms, sustained by disposable plastic products, are diagnosed by citizens as robust and dominant. Yet, at the same time, citizens also believe that slower and more circular rhythms of consuming are essential ingredients to bringing more sustainable and less wasteful futures into being. Amongst citizens, there is thus a paradox between the fast and linear consumption rhythms they live in and with versus the slow and circular ones they, at some level, believe we must realise. This paradox underscores the complexities of transitioning to a more sustainable society.

Plastic use enables fast and linear consumption. It is largely perceived as a timesaving option, which allows people to maintain efficient and convenient yet (materially) wasteful ways of life. This perception is deeply embedded in today's society and in its people—a society in which speed and efficiency are greatly valued. In turn, reflecting on and engaging with one's consumption rhythms, patterns, and routines is not always a priority. Still, many citizens are, however, eager to challenge this status quo. They recognise the environmental and social costs associated with fast and linear consumption. Whilst defending and justifying the fast and linear use of goods in certain sub-systems of our society (such as health care or medicine), citizens are generally eager to adopt more sustainable practices.

However, in their calls to shift towards slower and more circular rhythms, one essential ingredient for change becomes apparent: the need to take time. Adopting and integrating alternative consumption rhythms is seen by citizens as a time-consuming endeavour. It takes time to become aware of one's personal consumption patterns, discard old norms, implement new living standards and ideas, and perform and stabilise new consumption habits. Citizens need time to rethink living standards and ways of life; time that not everyone has or wants to dedicate to such causes. With countless other time-intensive obligations such as work, study, or family responsibilities, many people do not (feel they) have ownership of their temporal resources and cannot simply take the time they would ideally need. Instead, citizens feel little room for reflection and change whilst trying to keep up with the contemporary paces of

everyday life. This raises the question, aside from one's mental and financial capacities, of who has the temporal capacities to challenge today's consumption rhythms. This is significant; such an imbalance in ownership over one's own temporal resources may only further deepen many existing social inequalities—or create new ones altogether—as individuals with busier lives and schedules may face greater challenges in adopting sustainable practices.

To address this issue, it is crucial to explore ways that empower individual change by creating moments and spaces where people with varying degrees of temporal ownership can reflect on and engage with their current consumption habits. This could involve community initiatives, educational programs, and supportive policies that facilitate the transition to slower and more circular consumption rhythms. Creating opportunities for individuals to reflect and engage could help them develop a deeper understanding of their consumption patterns and the impact of their choices. In addition, it may also foster a greater sense of collective responsibility and encourage more community action. By providing the necessary spaces to take time, society might thus be able to support (future) citizens in making more sustainable choices that help contribute to the broader goal of conserving resources and reducing waste.

Ultimately, to enact more sustainable rhythms, citizens' willingness and efforts to consume slower and more circularly must be met with more available and accessible supportive infrastructure. Without, for example, adequate reuse infrastructures, individuals are unlikely to see reuse as a convenient viable solution. If we are to encourage slow and circular consumption patterns in good faith, we must first ensure that supportive infrastructures exist. Moreover, if we are to hope that these infrastructures will help ween society away from our current habits, then they must be as temporally convenient as the fast and linear use of disposable plastics we have become accustomed to.

8.6 THE INTERGENERATIONAL BURDENS OF PLASTICS

It has taken several generations for people to establish their current habits and routines of using and consuming plastics. Because of citizens today must not only deal with their own concerns about the material and chemical remnants left behind by using plastic materials, but they must also face the jarring prospect of replacing these well-encultured and quite robust systems of consumption in their daily lives. This tension led many citizens to experience an urge to rethink these well-established consumption systems for the sake of the present and future

society. Still, however, many report feeling inadequately equipped to challenge the prevailing culture of fast, linear, and wasteful consumption.

Citizens' next-generation narratives reveal how deeply paradoxical the intergenerational burden of consumption is. Even though they concede to carrying some of the burdens of prior generations who contributed to shaping today's consumption rhythms, citizens nonetheless tend to export responsibility for change to future citizens and the younger generation. Because the younger generations are imagined to be receiving a more contemporary education (thus raising their awareness about today's more pressing issues), they are not only expected to cultivate better consumption habits regarding plastics and enlighten older generations about their deeply entrenched consumption patterns; they are also expected to participate in fostering political activism for systemic long-term change.

This reliance on future generations to correct current consumption patterns highlights a significant intergenerational injustice. It effectively shifts the burden of managing and mitigating the impacts of past and present consumption onto those who had no hand in creating these issues. By expecting society's youth to both clean up after previous generations and establish sustainable consumption habits, citizens thus shift caring for the future into the future. To postpone responsibility for sustainability rather than address it in the present is an injustice to both the younger generations and the generations not yet born. It reveals a refusal to understand how today's production, consumption, and disposal practices contribute to environmental degradation or the burden we are placing on future humans and ecosystems. Effectively, it shows how we are colonising the futures of both human and non-human entities.

With our ways of consuming, we are colonising the future of others because we are often (not) making decisions without thoroughly anticipating, mitigating potential impacts, or often without even connecting our own production, consumption, and disposal practices as part of the problem. Ultimately, it is clear that the part of what often legitimises our use of plastics is our current conveniences and living standards. It is thus the comfort many of our societies have become accustomed to that is perhaps the most significant part of what continues to hinder a thorough re-thinking of our lives with plastics.

REFERENCES

Adam, B. (1992). Modern times: The technology connection and its implications for social theory. *Time & Society, 1*(2), 175-191.

Adam, B. (1995). *Timewatch: The social analysis of time*. Cambridge: Polity Press.

Adam, B. (1998). *Timescapes of modernity: The environment and invisible hazards.* London, UK: Psychology Press.

Adam, B. (2002). The multiplicity of times: Contributions from the Tutzing Time Ecology Project: Introduction. *Time & Society, 11*(1), 87-88.

Adam, B. (2004). *Time*. Cambridge: Polity Press.

Adam, B. (2006, June 21–23). *Futurescapes: Challenge for social and management sciences, retroscapes and futurescapes–Temporal tensions in organizations.* Paper presented at the International Conference, Palazzo d'Aumale, Terrasini, Italy.

Adam, B. (2009). Futures in the making: Sociological practice and challenge. In V. Jeffries (Ed.), *Handbook of public sociology* (pp. 429–445). Lanham, MD: Rowman & Littlefield.

Adam, B. (2013). *Time and social theory.* Malden, MA: John Wiley & Sons.

Adam, B., & Groves, C. (2007). *Future matters: Action, knowledge, ethics.* Leiden, Netherlands: Brill.

Adam, B., & Groves, C. (2011). Futures tended: Care and future-oriented responsibility. *Bulletin of Science, Technology & Society, 31*(1), 17-27.

Adams, V., Murphy, M., & Clarke, A. E. (2009). Anticipation: Technoscience, life, affect, temporality. *Subjectivity, 28*(1), 246–265.

Adkins, S. (2021). Slow violence: The erosion of marine plastic debris and. In Farrelly, T., Taffel, S., & Shaw, I. (Eds.)., *Plastic legacies: Pollution, persistence, and politics* (pp. 41–57). Athabasca University Press.

Akrich, M. (1992). The de-scription of technical objects. In W. Bijker & J. Law (Eds.), *Shaping technology/building society: Studies in sociotechnical change* (pp. 205-224). Cambridge, MA: MIT Press.

Allon, F., Barcan, R., & Eddison-Cogan, K. (2020). *The temporalities of waste: Out of sight, out of time.* Abingdon, UK: Routledge.

Amazon. (n.d.-a). Retrieved from https://www.amazon.com/Baby-Einstein-Neptunes-Discovery-Jumper/dp/B01EUNA0WK?th=1

Amazon. (n.d.-b). Retrieved from https://www.amazon.de/Kunststoffbesteck-f%C3%BCr-Personen-Orangefarben-18-teilig/dp/B07MXT7B8L

Appadurai, A. (2012). Thinking beyond trajectorism. In M. Heinlein, C. Kropp, J. Neumer, A. Poferl, & R. Römhild (Eds.), *Futures of modernity: Challenges for cosmopolitical thought and practice* (pp. 25–32). Bielefeld, Germany: Transcript Verlag.

Appadurai, A. (2013). The future as cultural fact: Essays on the global condition. *Rassegna Italiana di Sociologia, 14*(4), 649–650.

Architectureartdesign. (n.d.). Retrieved from https://www.architectureartdesigns.com/wp-content/uploads/2013/03/ArchitectureArtDesigns-1105.jpg

Ashraf, M. A. (2017). Persistent organic pollutants (POPs): A global issue, a global challenge. *Environmental Science and Pollution Research, 24*(5), 4223–4227.

Bai, X., Van Der Leeuw, S., O'Brien, K., Berkhout, F., Biermann, F., Brondizio, E. S., … Glaser, M. (2016). Plausible and desirable futures in the Anthropocene: A new research agenda. *Global Environmental Change, 39*, 351–362.

Barkhuizen, G. (2015). Narrative knowledging in second language teaching and learning contexts. In A. De Fina & A. Georgakopoulou (Eds.), *The handbook of narrative analysis* (pp. 97–115). Malden, MA: Wiley-Blackwell.

Belndorfer, H. (2019). *Wegwerfen ist eine Sünde: Österreichische Konsumgeschichten aus beinahe hundert Jahren.* Wien, Austria: Böhlau Verlag.

Bennett, I. (2008). Developing plausible nano-enabled products. In E. Fisher, C. Selin, & J. M. Wetmore (Eds.), *The yearbook of nanotechnology in society: Volume I: Presenting futures* (pp. 149–155). Dordrecht, Netherlands: Springer.

Bensaude-Vincent, B. (2013). Plastics, materials and dreams of dematerialization. In J. Gabrys, G. Hawkins, & M. Michael (Eds.), *Accumulation* (pp. 31-43). Routledge.

Bensaude-Vincent, B. (2018). Of times and things: Technology and durability. In *French philosophy of technology* (pp. 279–298). Springer.

Berghaus. (n.d.). *Berghaus*. Retrieved from https://www.berghaus.com/?geoip=geoip

Bergmann, S. (2021). Dawn of the Plastisphere: An experiment with unpredictable effects. In Farrelly, T., Taffel, S., & Shaw, I. (Eds.)., *Plastic legacies: Pollution, persistence, and politics* (pp. 79-99). Athabasca University Press.

Bomm, L. (Producer). (2019). *Personal photograph*.

Boudia, S., Creager, A. N., Frickel, S., Henry, E., Jas, N., Reinhardt, C., & Roberts, J. A. (2018). Residues: Rethinking chemical environments. *Engaging Science, Technology, and Society, 4*, 165–178.

Bouwmeester, H., Hollman, P. C., & Peters, R. J. (2015). Potential health impact of environmentally released micro- and nanoplastics in the human food production chain: Experiences from nanotoxicology. *Environmental Science & Technology, 49*(15), 8932–8947.

Braun, Y. A., & Traore, A. S. (2015). Plastic bags, pollution, and identity: Women and the gendering of globalization and environmental responsibility in Mali. *Gender & Society, 29*(6), 863–887.

Brown, J., & Macfadyen, G. (2007). Ghost fishing in European waters: Impacts and management responses. *Marine Policy, 31*(4), 488–504

Brown, N., Rappert, B., & Webster, A. (2000). *Contested futures: A sociology of prospective techno-science*. London: Routledge.

Bruner, J. (1987). Life as narrative. *Social Research, 54*(1), 11–32.

Bruner, J. (1991). The narrative construction of reality. *Critical Inquiry, 18*(1), 1–21.

Caritas Österreich. (n.d.). *Ein zweites Leben für alte Handys!*. Retrieved from https://www.caritas.at/spenden-helfen/spenden/aktuelle-spendenaufrufe/wundertuete#:~:text=So%20funktioniert%20die%20%C3%963%2DWundert%C3%BCte,Zentrum%20der%20Caritas%20in%20Wien.

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. Sage.

Chilvers, J., & Kearnes, M. (2015). *Remaking participation: Science, environment and emergent publics*. Routledge.

Clarke, A. (2005). *Situational analysis: Grounded theory after the postmodern turn*. Thousand Oaks, CA: Sage.

Clker. (n.d.). Retrieved from https://www.clker.com/clipart-671116.html

Comfortfurniture. (n.d.). Retrieved from https://www.comfortfurniture.com.sg/page/baton-sleep/#video

Czarniawska, B. (2004). *Narratives in social science research*: Sage.

Das stinkt der Umwelt! Plastik und Co im Biomüll. (2014, July 18). *Krone*, p. 28. Retrieved from https://www.wiso-net.de/document/KRON__9940BDB2478CC07D0BA7CD4676377F6

Davies, T. (2018). Toxic space and time: Slow violence, necropolitics, and petrochemical pollution. *Annals of the American Association of Geographers, 108*(6), 1537–1553

Davis, H. (2022). *Plastic matter*. Duke University Press.

De Fina, A., & Georgakopoulou, A. (2015). *The handbook of narrative analysis*. John Wiley & Sons.

Deleuze, G., & Guattari, F. (1987). *A thousand plateaus* (B. Massumi, Trans.). University of Minnesota Press.

Delgado, A., Lein Kjølberg, K., & Wickson, F. (2011). Public engagement coming of age: From theory to practice in STS encounters with nanotechnology. *Public Understanding of Science, 20*(6), 826–845.

Deville, J. (2013). Paying with plastic: The enduring presence of the credit card. In J. Gabrys, G. Hawkins, & M. Michael (Eds.), *Accumulation* (pp. 101–118). Routledge.

Dey, T., & Michael, M. (2021). Caring for the multiple cares of plastics. In Farrelly, T., Taffel, S., & Shaw, I. (Eds.)., *Plastic legacies: Pollution, persistence, and politics* (pp. 139-158). Athabasca University Press.

Diepens, N. J., & Koelmans, A. A. (2018). Accumulation of plastic debris and associated contaminants in aquatic food webs. *Environmental Science & Technology, 52*(15), 8510–8520.

Douglas, M. (2002). *Purity and danger: An analysis of concepts of pollution and taboo*. Routledge.

Durkheim, E. (1915). *The elementary forms of religious life* (J. W. Swain, Trans.). Macmillan.

Elias, N. (2007). *An essay on time*. University College Dublin Press.

European Commission. (2018). *Changing the way we use plastics*. Retrieved from https://ec.europa.eu/environment/circular-economy/pdf/pan-european-factsheet.pdf

European Environment Agency. (n.d.). *Life cycle assessment*. Retrieved from https://www.eea.europa.eu/help/glossary/eea-glossary/life-cycle-assessment

Farrelly, T., Taffel, S., & Shaw, I. (2021). *Plastic legacies: Pollution, persistence, and politics*. Athabasca University Press.

Felt, U. (2016a). Of timescapes and knowledgescapes. New languages and landscapes of higher education, *129*, 148.

Felt, U. (2016b). Of timescapes and knowledgescapes: Re-timing research and higher education. *New languages and landscapes of higher education, 129*, 148.

Felt, U. (Producer). (2019). *Personal photograph*.

Felt, U., Felder, K., Öhler, T., & Penkler, M. (2014). Timescapes of obesity: Coming to terms with a complex socio-medical phenomenon. *Health, 18*(6), 646–664.

Felt, U., & Fochler, M. (2010). Machineries for making publics: Inscribing and de-scribing publics in public engagement. *Minerva, 48*(3), 219–238

Felt, U., Fochler, M., Müller, A., & Strassnig, M. (2009). Unruly ethics: On the difficulties of a bottom-up approach to ethics in the field of genomics. *Public Understanding of Science, 18*(3), 354–371.

Felt, U., Fochler, M., & Sigl, L. (2018). IMAGINE RRI: A card-based method for reflecting on responsibility in life science research. *Journal of Responsible Innovation, 5*(2), 201–224.

Felt, U., Schumann, S., & Schwarz-Plaschg, C. (2017). IMAGINE: A card-based discussion method. In P. Liamputtong (Ed.), *Handbook of research methods in health social sciences* (pp. 1–16). Springer Singapore.

Felt, U., Schumann, S., Schwarz, C., & Strassnig, M. (2014). Technology of imagination: A card-based public engagement method for debating emerging technologies. *Qualitative Research, 14*(2), 233–251.

Felt, U., Wynne, B., Callon, M., Gonçalves, M. E., Jasanoff, S., Jepsen, M., . . . Rip, A. (2007). *Taking European knowledge society seriously*. Report of the expert group on science and governance to the Science, Economy and Society Directorate, Directorate-General for Research, European Commission. Office des Publications Officielles des Communautés Européennes.

Fenichell, S. (1996). *Plastic: The making of a synthetic century*. HarperBusiness.

Ferretti, M. P. (2007). Why public participation in risk regulation? The case of authorizing GMO products in the European Union. *Science as Culture, 16*(4), 377–395.

Fisher, T. (2013). The death and life of plastic surfaces: Mobile phones. In J. Gabrys, G. Hawkins, & M. Michael (Eds.), *Accumulation* (pp. 121–134). Routledge.

Flaherty, M. G. (2011). *The textures of time: Agency and temporal experience*. Temple University Press.

Folkers, A. (2021). Fossil modernity: The materiality of acceleration, slow violence, and ecological futures. *Time & Society, 30*(2), 223–246.

Freeman, M. (2015). Narrative as a mode of understanding. In A. De Fina & A. Georgakopoulou (Eds.), *The handbook of narrative analysis* (pp. 21-37). Malden, MA: Wiley-Blackwell.

Freinkel, S. (2011). *Plastic: A toxic love story*. Houghton Mifflin Harcourt.

Fuchs, A. (2019). 1. Theoretical perspectives: Temporal anxieties in the digital age. In *Precarious times* (pp. 23–69). Cornell University Press.

Fuger, S., Köhl, A. N., Stroehle, T., Lang, M. N., Füller, J., & Hutter, K. (2021). Fighting the wicked problem of plastic pollution and its consequences for developing regions with expert and crowd solutions. Paper presented at the *Proceedings of the 54th Hawaii International Conference on System Sciences*.

Fuller, S., Ngata, T., Borrelle, S., & Farrelly, T. (2022). Plastics pollution as waste colonialism in Te Moananui. *Journal of Political Ecology, 29*(1), 534–560.

Gabrys, J., Hawkins, G., & Michael, M. (2013a). *Accumulation: The material politics of plastic*. Routledge.

Gabrys, J., Hawkins, G., & Michael, M. (2013b). Introduction: From materiality to plasticity. In *Accumulation: The material politics of plastic* (pp. 15–28). Routledge.

Giddens, A. (1981). Time and space in social theory. In J. Matthes (Ed.), *Lebenswelt und soziale Probleme: Verhandlungen des 20. Deutschen Soziologentages zu Bremen 1980* (pp. 88–97). Campus Verlag.

Giddens, A. (1991). *Modernity and self-identity: Self and society in the late modern age*. Stanford University Press.

Glăveanu, V. P. (2017). Collective memory between stability and change. *Culture & Psychology, 23*(2), 255–262.

Goodin, R. E., & Dryzek, J. S. (2006). Deliberative impacts: The macro-political uptake of mini-publics. *Politics & Society, 34*(2), 219–244.

Granjou, C., Walker, J., & Salazar, J. F. (2017). The politics of anticipation: On knowing and governing environmental futures. *Futures, 92*, 5–11.

Gray-Cosgrove, C., Liboiron, M., & Lepawsky, J. (2015). The challenges of temporality to depollution & remediation. *Surveys and Perspectives Integrating Environment and Society, 8*(1).

Guardian, T. (n.d.). *Retrieved from https://www.architectureartdesigns.com/wp-content/uploads/2013/03/ArchitectureArtDesigns-1105.jpg*

Hahladakis, J. N., Velis, C. A., Weber, R., Iacovidou, E., & Purnell, P. (2018). An overview of chemical additives present in plastics: Migration, release, fate and environmental impact during their use, disposal, and recycling. *Journal of Hazardous Materials, 344*, 179–199.

Halbwachs, M. (1992). *On collective memory*. University of Chicago Press.

Hawkins, G. (2001). Plastic bags: Living with rubbish. *International Journal of Cultural Studies, 4*(1), 5–23.

Hawkins, G. (2009). More-than-human politics: The case of plastic bags. *Australian Humanities Review, 46*, 43–55.

Hawkins, G. (2011). Packaging water: Plastic bottles as market and public devices. *Economy and Society, 40*(4), 534–552.

Hawkins, G. (2018a). Plastic and presentism: The time of disposability. *Journal of Contemporary Archaeology, 5*(1), 91–102.

Hawkins, G. (2018b). The time of materials. *Journal of Contemporary Archaeology, 5*(1), 1–3.

Hawkins, G., Potter, E., & Race, K. (2015). *Plastic water: The social and material life of bottled water*. MIT Press.

Head, L., Saltzman, K., Setten, G., & Stenseke, M. (2016). Holding on and letting go. In L. Head, K. Saltzman, G. Setten, & M. Stenseke (Eds.), *Nature, temporality and environmental management: Scandinavian and Australian perspectives on peoples and landscapes* (pp. 3–12). Routledge.

Henderson, L., & Green, C. (2020). Making sense of microplastics? Public understandings of plastic pollution. *Marine Pollution Bulletin, 152*, 110908.

Huerta Lwanga, E., Mendoza Vega, J., Ku Quej, V., Chi, J. d. l. A., Sanchez del Cid, L., Chi, C., . . . van der Ploeg, M. (2017). Field evidence for transfer of plastic debris along a terrestrial food chain. *Scientific Reports, 7*(1).

Idies, Y. (2020). The landfill paradox: Reflections on the temporalities of waste. In F. Allon, R. Barcan, & K. Eddison-Cogan (Eds.), *The temporalities of waste: Out of sight, out of time* (pp. 136–147). Routledge.

Indiamart. (n.d.-a). Retrieved from https://www.indiamart.com/proddetail/histopathology-treatments-services-19863909433.html

Indiamart. (n.d.-b). Retrieved from https://www.indiamart.com/indore-proteins-private-limited/sanitary-napkins.html

Ingold, T. (2012). Toward an ecology of materials. *Annual Review of Anthropology, 41*, 427–442.

Irwin, A., & Michael, M. (2003). *Science, social theory & public knowledge*. McGraw-Hill Education (UK).

Irwin, A., & Wynne, B. (2003). *Misunderstanding science? The public reconstruction of science and technology*. Cambridge University Press.

James, E. (2015). *The storyworld accord: Econarratology and postcolonial narratives*. University of Nebraska Press.

Jasanoff, S. (2004). *States of knowledge: The co-production of science and the social order*. Routledge.

Jasanoff, S., & Kim, S.-H. (2015). *Dreamscapes of modernity: Sociotechnical imaginaries and the fabrication of power*. University of Chicago Press.

Jovchelovitch, S. (2012). Narrative, memory, and social representations: A conversation between history and social psychology. *Integrative Psychological and Behavioral Science, 46*(4), 440–456.

Katovich, M. A. (1987). Durkheim's macrofoundations of time: An assessment and critique. *The Sociological Quarterly, 28*(3), 367–385.

Kramer, K. L. (2012). Chapter 1 - Sustainability, user experience, and design. In *User experience in the age of sustainability: A practitioner's blueprint* (pp. 1-20). Elsevier.

Law, J. (2004). *After method: Mess in social science research*. Routledge.

Lebel, S. (2016). Fast machines, slow violence: ICTs, planned obsolescence, and e-waste. *Globalizations, 13*(3), 300-309.

Lefebvre, H. (2004). *Rhythmanalysis: Space, time and everyday life*. Bloomsbury Publishing.

Liboiron, M. (2013). Plasticizers: A twenty-first-century miasma. In J. Gabrys, G. Hawkins, & M. Michael (Eds.), *Accumulation: The material politics of plastic* (pp. 148-163). Routledge.

Liboiron, M. (2016). Redefining pollution and action: The matter of plastics. *Journal of Material Culture, 21*(1), 87-110.

Liboiron, M. (2021). *Pollution is colonialism*. Duke University Press.

Lidskog, R., & Waterton, C. (2018). The Anthropocene: A narrative in the making. In M. Boström & D. J. Davidson (Eds.), *Environment and society: Concepts and challenges* (pp. 25-46). Springer.

LIFE Magazine. (1955, August 1). Throwaway Living. *LIFE*, 39(No. 5).

Liu, L.-Y., Mai, L., & Zeng, E. Y. (2020). Plastic and microplastic pollution: From ocean smog to planetary boundary threats. In G. Jiang & X. Li (Eds.), *A new paradigm for environmental chemistry and toxicology: From concepts to insights* (pp. 229-240). Springer Singapore.

Macnaghten, P., Davies, S. R., & Kearnes, M. (2015). Understanding public responses to emerging technologies: A narrative approach. *Journal of Environmental Policy & Planning*, 21(5), 504-518.

Macnaghten, P., Kearnes, M. B., & Wynne, B. (2005). Nanotechnology, governance, and public deliberation: What role for the social sciences? *Science Communication*, 27(2), 268-291.

Marquardt, J., & Delina, L. L. (2021). Making time, making politics: Problematizing temporality in energy and climate studies. *Energy Research & Social Science*, 76, 102073.

Matzka-Sanoi, L. (2021). Kärnten überprüft Flüsse und Bäche auf Mikroplastik. *heute.at*. Retrieved from https://www.heute.at/s/kaernten-ueberprueft-fluesse-und-baeche-auf-mikroplastik-100181282

McKay, D., Perez, P., & Xiaoyu, L. (2021). Plastics Talk/Talking Plastics: The Communicative Power of Plasticity. In T. Farrelly, S. Taffel, & I. Shaw (Eds.), *Plastic Legacies: Pollution, Persistence, and Politics* (pp. 225-244). Athabasca University Press.

Meikle, J. L. (1997). Material doubts: The consequences of plastic. *Environmental History, 2*(3), 278-300.

Merrill, J. B. (2007). Stories of Narrative: On Social Scientific Uses of Narrative in Multiple Disciplines. *Colorado Research in Linguistics*, *20*.

Merrypak. (n.d.). Retrieved from https://www.merrypak.co.za/product/foam-meal-box-no31/

Michael, M. (2009). Publics performing publics: of PiGs, PiPs and politics. *Public Understanding of Science, 18*(5), 617-631.

Michael, M. (2015). Engaging the mundane: Complexity and speculation in everyday technoscience. In J. Chilvers & M. Kearnes (Eds.), *Remaking Participation: Science, Environment and Emergent Publics* (pp. 81-98). Routledge.

Michael, M. (2017). Enacting big futures, little futures: Toward an ecology of futures. *The Sociological Review, 65*(3), 509-524.

Mitchell, B. (2021). Consumer perceptions of packaging sustainability: The size of the problem for businesses. In M. Topić & G. Lodorfos (Eds.), *The Sustainability Debate: Policies, Gender and the Media* (pp. 101-119). Emerald Group Publishing.

Moezzi, M., Janda, K. B., & Rotmann, S. (2017). Using stories, narratives, and storytelling in energy and climate change research. *Energy Research & Social Science, 31*, 1-10.

Murphy, M. (2006). *Sick building syndrome and the problem of uncertainty: Environmental politics, technoscience, and women workers*. Duke University Press.

Myers, G. (1998). Displaying opinions: Topics and disagreement in focus groups. *Language in Society*, 27(1), 85-111.

Natlawreview. (n.d.). Retrieved from https://natlawreview.com/article/nlrb-throws-cold-water-mandatory-arbitration-provisions-prohibiting-class-actions

Nicholson, C. (2017). The role of collective memory in protracted conflict. *Culture & Psychology*, 23(2), 217-233.

Nixon, R. (2011). *Slow Violence and the Environmentalism of the Poor*. Harvard University Press.

Nowotny, H. (1992). Time and social theory: Towards a social theory of time. *Time & Society*, 1(3), 421-454.

Nowotny, H. (1995). Wer bestimmt die Zeit? Zeitkonflikte in der technologischen Gesellschaft zwischen industrialisierter und individualisierter Zeit. In K. Weis (Ed.), *Was ist Zeit? Zeit und Verantwortung in Wissenschaft, Technik und Religion* (pp. 81-100). München: Deutscher Taschenbuch Verlag.

O'Lear, S. (2016). Climate science and slow violence: A view from political geography and STS on mobilizing technoscientific ontologies of climate change. *Political Geography, 52*, 4-13.

O'Lear, S. (2021). Geographies of slow violence: an introduction. In *O'Lear, S. (Ed.)*, *A Research Agenda for Geographies of Slow Violence: Making Social and Environmental Injustice Visible* (pp. 1-14). Edward Elgar Publishing.

Ochs, E., & Capps, L. (1996). Narrating the self. *Annual Review of Anthropology, 25*(1), 19-43.

Oomen, J., Hoffman, J., & Hajer, M. A. (2022). Techniques of futuring: On how imagined futures become socially performative. *European Journal of Social Theory*, *25*(2), 252-270.

Papadaki-Anastasopoulou, A. (Producer). (2019). Personal photograph.

Papadaki-Anastasopoulou, A., & Felt, U. (2021). Assembling plastic policy objects in the making of the EU Single-Use Plastics Directive. *Preprint* (Department of Science and Technology Studies, University of Vienna).

Parashar, N., & Hait, S. (2020). Plastics in the time of COVID-19 pandemic: Protector or polluter? *Science of The Total Environment*, *144274*.

Parker, L. (2020, 09th April 2022). Plastic pollution is a huge problem—and it's not too late to fix it. *National Geographic*. Retrieved from https://www.nationalgeographic.com/science/article/plastic-pollution-huge-problem-not-too-late-to-fix-it

Pelhamlibrary. (n.d.). Retrieved from https://www.pelhamlibrary.org/programs/offline-family-time-board-games-hot-chocolate/

Perrée, R. (1996). *Bakelite: The Material of a Thousand Uses: Based on the Becht Collection*. Cadre.

Peterson, J., & Zahara, A. (2016). Anthropocene adjustments: Discarding the technosphere. In *Discard Studies: Social Studies of Waste, Pollution, & Externalities*.

Pidgeon, N., & Rogers-Hayden, T. (2007). Opening up nanotechnology dialogue with the publics: risk communication or 'upstream engagement'? *Health, Risk & Society*, 9(2), 191-210.

Plastics Europe. (2023). *Plastics – The fast facts 2023*. Retrieved from https://plasticseurope.org/knowledge-hub/plastics-the-fast-facts-2023/

Plastic Bank. (2024). Retrieved from https://plasticbank.com/

Ragusa, A., Svelato, A., Santacroce, C., Catalano, P., Notarstefano, V., Carnevali, O., . . . Draghi, S. (2021). Plasticenta: First evidence of microplastics in human placenta. *Environment International*, *146*, 106274.

Regulation (EU) 2017/745 on medical devices. (2017). *Official Journal of the European Union*. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R0745

Regulation (EU) 2017/746 on in-vitro diagnostic medical devices. (2017). *Official Journal of the European Union*. Retrieved from https://eur-lex.europa.eu/eli/reg/2017/746/oj/eng

Ricoeur, P. (1980a). Narrative time. *Critical Inquiry*, *7*(1), 169-190.

Ricoeur, P. (1980b). *Time and narrative, Volume 1*. University of Chicago Press.

Roberts, J. A. (2010). Reflections of an unrepentant plastiphobe: Plasticity and the STS life. *Science as Culture*, *19*(1), 101-120.

Rosa, H. (2013). *Social acceleration*. Columbia University Press.

Rosa, H., & Scheuerman, W. E. (2009). *High-speed society: Social acceleration, power, and modernity*. University Park: Penn State University Press.

Rose, N. (1999). *Powers of freedom: Reframing political thought*. Cambridge University Press.

Roßmann, M. (2021). Vision as make-believe: How narratives and models represent sociotechnical futures. *Journal of Responsible Innovation*, *8*(1), 70-93.

Royal Academy of Engineering. (n.d.). *Sustainable futures*. Retrieved from https://raeng.org.uk/media/se4aydou/sustainable-futures-student-booklet.pdf

Ryghaug, M., Holtan Sørensen, K., & Næss, R. (2011). Making sense of global warming: Norwegians appropriating knowledge of anthropogenic climate change. *Public Understanding of Science*, *20*(6), 778-795.

SAPEA. (2019). *A Scientific Perspective on Microplastics in Nature and Society*. Retrieved from https://www.ria.ie/assets/uploads/2024/06/sapea_report-micro-plastics.pdf

Schwarz-Plaschg, C. (2018). The power of analogies for imagining and governing emerging technologies. *Nanoethics*, *12*(2), 139-153.

Scott, C. K. (2019). The roads to the fork: How the human and natural environments have shaped eating utensils. *Food and Society in Asia Pacific*, 223.

Shenhav, S. R. (2015). *Analyzing social narratives*. Routledge.

Sorokin, P. A., & Merton, R. K. (1937). Social time: A methodological and functional analysis. *American Journal of Sociology*, *42*(5), 615-629.

Squire, C., Andrews, M., Davis, M., Esin, C., Harrison, B., Hydén, L.-C., & Hydén, M. (2014). *What is narrative research?* Bloomsbury Publishing.

Stadt Wien. (n.d.). Nicht gefährlicher Abfall - Abfallmengen in Wien. Retrieved from https://www.wien.gv.at/umweltschutz/abfall/nicht-gefaehrliche-abfallmenge.html#siedlungsabfaelle

Stanes, E. (2021). Dressed in plastic: The persistence of polyester clothes. In T. Farrelly, S. Taffel, & I. Shaw (Eds.), *Plastic Legacies: Pollution, Persistence, and Politics* (pp. 117-137). Athabasca University Press.

Stilgoe, J., Lock, S. J., & Wilsdon, J. (2014). Why should we promote public engagement with science? *Public Understanding of Science*, *23*(1), 4-15.

TakaTaka Solutions. (2024). Retrieved from https://takatakasolutions.com/

Tarpgaard, J. (2021). Toward large-scale social change and plastic politics. In T. Farrelly, S. Taffel, & I. Shaw (Eds.), *Plastic Legacies: Pollution, Persistence, and Politics* (pp. 203-223). Athabasca University Press.

Tod durch Müll. (2013, 21.04.2013). *Krone*. Retrieved from https://www.wiso-net.de/document/KRON__39080A640617BC12CC1DA5AB69692CC2

Tolinski, M. (2011). *Plastics and sustainability: Towards a peaceful coexistence between bio-based and fossil fuel-based plastics*. John Wiley & Sons.

Tutton, R. (2017). Wicked futures: Meaning, matter, and the sociology of the future. *The Sociological Review, 65*(3), 478-492.

Urry, J. (2016). *What is the Future?* John Wiley & Sons.

Villarrubia-Gómez, P., Cornell, S. E., & Fabres, J. (2018). Marine plastic pollution as a planetary boundary threat – The drifting piece in the sustainability puzzle. *Marine Policy, 96*, 213-220.

Vostal, F. (2016). *Accelerating academia: The changing structure of academic time*. Basingstoke: Palgrave Macmillan.

Wajcman, J. (2015). *Pressed for Time: The Acceleration of Life in Digital Capitalism.* The University of Chicago Press.

Wertsch, J. V. (2008). The narrative organization of collective memory. *Ethos, 36*(1), 120-135.

Westermann, A. (2013). The material politics of vinyl. In J. Gabrys, G. Hawkins, & M. Michael (Eds.), *Accumulation* (pp. 68-86). Routledge.

Wien Energie. (n.d.). Müllverbrennungsanlage Spittelau. Retrieved from https://positionen.wienenergie.at/projekte/waerme-kalte/mva-spittelau/

Wilsdon, J., & Willis, R. (2004). *See-through science: Why public engagement needs to move upstream.* London: Demos.

Wong, A. (2019). The rise and fall of the plastic straw: Sucking in crip defiance. *Catalyst: Feminism, Theory, Technoscience, 5*(1), 1-12.

Wood, D. (2002). *On Paul Ricoeur: Narrative and interpretation.* Routledge.

WordPress. (n.d.). Retrieved from https://pswordpress-production.s3.amazonaws.com/2018/09/cheese-2725235_1280.jpg

WWF. (2021). The lifecycle of plastics. Retrieved from https://wwf.org.au/blogs/the-lifecycle-of-plastics/

Wynne, B. (2013). *Rationality and ritual: Participation and exclusion in nuclear decision-making.* Routledge.

Yarsley, V., & Couzens, E. (1945). *Plastics.* New York: Penguin Books.

Zhao, Q., Zhu, L., Weng, J., Jin, Z., Cao, Y., Jiang, H., & Zhang, Z. (2023). Detection and characterization of microplastics in the human testis and semen. *Science of The Total Environment, 877*, 162713.

APPENDICES

APPENDIX A: STORY CARDS (ENGLISH AND GERMAN)

Story 1	Story 2	Story 3
Citizen A	**European policymaker**	**Scientist A**
Everybody calls for caution in using plastics and some plastics are even banned already; and I probably agree. Yet, before we start banning certain plastics we need to think of alternative options. In fact, plastics were invented to save natural resources. What happens when we use wood, glass, or metal instead of plastics? Which environmental consequences does this have? Maybe we need to completely re-think.	Plastics are vital for our European economy. Employing over 1.4 million people (of which nearly 30.000 in Austria), the European plastics industry is worth more than 350 billion EUR a year. At the same time, plastic waste is undeniably a big issue. As Europeans, we need to act together to tackle this problem. If we do not change the way in which we use plastics, there will be a moment by 2050 when there is more plastic than fish in our oceans.	In public we often focus on specific plastic objects such as plastic bags, bottles, or straws. However, the invisible pollution of micro-plastics is not considered sufficiently. These very small particles are present in our waters, but also in the air and some of the foods we consume. The possible impacts of microplastics on humans and animals need better scientific investigation. Then we can decide on acceptable political actions and measures.
Story 4	**Story 5**	**Story 6**
NGO advocate	**Small business owner**	**Citizen B**
It is not only about the plastics themselves, but also about the additives in them. We have enough evidence that some of them interfere with human hormones. Certain additives from items such as baby bottles are already banned. However, manufactures use always new additives. Here we need to act. We need clearer regulations on additives and to stop fearing economic players.	Our firm employs around 200 families, without counting the connected businesses. These employments assure the livelihood of many. There is so much talk about the environmental issues with plastics that people forget the socio-economic aspects. Regulation should not be just focusing on environmental risks. They should also recognise that people's livelihood depends on these job – losing work is also a risk!	Plastic is a wonderful material. I am actually a great fan. Plastic enabled many aspects, which were unimaginable before. Plastic has changed our lives. I think that politicians and environmentalists make the plastic problem bigger than it is. Why should we give up on the conveniences of plastic? Seriously, people like me are not responsible for the problems with plastic. We just need to recycle, then plastic is not a problem.

Story 7	Story 8
Scientist B	**Environmental expert**
Evidently, there is much more to be known about the way plastic and its chemical ingredients interact with our bodies and the environment. Yet, we have more than enough and quite detailed information on the negative effects of plastics and microplastics on health and the environment. I think it is now time to act accordingly. We are in Europe and therefore we should apply the precautionary principle. We cannot simply wait another 20 years. Then it will be too late.	Just think for a minute: some plastics are used for about 10 minutes and need up to 450 years to degrade … and even after, they remain with us as little plastic particles. Marine animals can entangle in or ingest plastics ... and die. Should we therefore not better care for future generations? It is true, plastic is a global issue. Still, we also need to act locally.

Geschichte 1	Geschichte 2	Geschichte 3
Bürger/in A	**EU EntscheidungsträgerIn**	**Wissenschaftler/in A**
Alle fordern, dass weniger Plastik verwendet wird, und einige Kunststoffe sind sogar schon verboten. Ich stimme dem im Großen und Ganzen zu. Aber bevor wir ein Plastikverbot erlassen, müssen wir über Alternativen nachdenken. Eigentlich wurde Plastik ja erfunden, um natürliche Ressourcen zu schonen. Was passiert, wenn wir jetzt Holz, Glas oder Metalle verwenden statt Plastik? Welche Aus-wirkungen hat das auf die Umwelt? Vielleicht müssen wir ja ganz umdenken.	Plastik ist für unsere europäische Wirtschaft von entscheidender Bedeutung: über 1,4 Millionen Beschäftigte (davon fast 30.000 in Österreich), 350 Milliarden Euro pro Jahr. Gleichzeitig sind Kunststoffabfälle unbestreitbar ein großes Thema. Als Europäer müssen wir gemeinsam handeln, um dieses Problem anzugehen. Wenn wir die Art und Weise, wie wir Kunststoffe verwenden, nicht ändern, wird es bis 2050 soweit sein, dass es in unseren Ozeanen mehr Plastik als Fische gibt.	In der Öffentlichkeit konzentrieren wir uns zu sehr auf bestimmte Plastikgegenstände wie Plastiksackerl, Flaschen oder Strohhalme. Die unsichtbare Verschmutzung durch Mikro-plastik, also durch die ganz kleinen Plastikteilchen, wird aber nicht genügend berücksichtigt. Die sind in unserem Wasser, in der Luft und in einigen Lebensmitteln. Die möglichen Auswirkungen von Mikroplastik auf Mensch und Tier müssen wesentlich besser erforscht werden. Dann könnte man politisch entsprechende Maßnahmen ergreifen.

Geschichte 4	Geschichte 5	Geschichte 6
Umweltschützer/in	**Kleinunternehmer/in**	**Bürger/in B**
Es geht nicht nur um die Kunststoffe selbst, sondern auch um die darin enthaltenen chemischen Zusatzstoffe. Wir haben genügend Beweise dafür, dass einige davon etwa den menschlichen Hormonhaushalt stören. Es wurden bereits bestimmte Zusatzstoffe aus Artikeln wie Babyflaschen verboten. Allerdings verwenden die Hersteller immer neue Zusatzstoffe. Hier sollten wir handeln. Wir brauchen klarere Regelungen für Zusatzstoffe und müssen uns dem Einfluss der Industrie entziehen.	Unser Betrieb beschäftigt rund 200 Familien, ohne die angeschlossenen Unternehmen dazu zu zählen. Dies sichert das tägliche Leben von Vielen. Wir reden derzeit fast nur mehr über die Umweltprobleme bei Plastik und vergessen dabei die positiven sozialen und wirtschaftlichen Aspekte. Politiker sollte sich nicht nur auf Umweltrisiken konzentrieren. Sie sollten auch bedenken, dass viele Menschen von diesen Jobs abhängen - auch der Verlust von Arbeit ist ein Risiko!	Kunststoff ist ein wunderbares Material. Ich bin eigentlich ein großer Fan. Plastik hat viele Möglichkeiten eröffnet, die vorher undenkbar waren und unser Leben verändert. Ich denke, Politiker und Umweltschützer machen das so genannte Plastikproblem größer als es ist. Warum sollten wir auf den Komfort von Plastik im Alltag verzichten? Ehrlich gesagt, sind Menschen wie ich nicht für die Probleme mit Plastik verantwortlich. Wir müssen ja nur recyceln, dann ist Plastik auch kein Problem.

Geschichte 7	Geschichte 8
Wissenschaftler/in B	**Umweltexperte/in**
Sicher brauchen wir noch mehr Wissen, wie sich Plastik und chemische Zusatzstoffe auf unseren Körper und die Umwelt auswirken. Gleichzeitig gibt es schon klare Hinweise auf negative Auswirkungen von Plastik und Mikroplastik auf Gesundheit und Umwelt. Ich denke, es ist jetzt an der Zeit, entsprechend zu handeln. Wir sind in Europa und sollten daher das Vorsorgeprinzip anwenden, d.h. wir sollten Maßnahmen zur Minimierung von Risiken setzen. Wir können nicht einfach weitere 20 Jahre warten. Dann wird es zu spät sein.	Denken Sie nur kurz nach: Plastik wird manchmal ca. 10 Minuten verwendet und braucht bis zu 450 Jahre, um sich abzubauen ... und auch dann bleiben kleine Plastikteilchen in der Umwelt zurück. Mehr als 50 Milliarden Plastikteile befinden sich bereits in unseren Meeren. Meerestiere können sich in Kunststoffen verfangen oder diese aufnehmen ... und sterben. Sollten wir uns vor diesem Hintergrund nicht besser um die nächsten Generationen kümmern? Es stimmt: Plastik ist ein globales Problem. Trotzdem müssen wir auch lokal handeln.

APPENDIX B: CONTEXT CARDS (ENGLISH AND GERMAN)

Context 1	Context 2
Cosmetics and care products[11]	**Health care**[12]
Numerous cosmetic products contain microplastics. They get in contact with our skin. When they are washed down the drain, sewage treatment plants cannot filter the microplastics out of the water. What do you think about this?	To fulfil the hygiene standards, much of the equipment used in hospitals and doctor's practices is made from plastics. They are used once and then thrown away. How should we deal with plastics in this area?
Context 3	**Context 4**
Electronics[13]	**Food packaging**[14]
Smartphones, headphones, TVs and laptops are almost unimaginable without plastic parts. They have become part of our lives. Should the use of plastics in this context be reconsidered?	Food packing increases the shelf life of products and ensures food safety. However, we need to consider the composition of the plastics used as they might leak chemical substances into our food. How to balance advantages and potential problems?

[11] Cosmetic and care products image (Papadaki-Anastasopoulou, 2019)
[12] Health care image (Indiamart, n.d.-a)
[13] Electronics image (Felt, 2019)
[14] Food packaging image (WordPress, n.d.)

Context 5	Context 6
Re-use of plastics[15]	**Plastics in bodies**[16]
Every plastic item could be having many lives … if we only think creatively! This avoids waste and makes your surroundings beautiful. Should we think more about re-using plastics?	Aquatic animals often incorporate smaller pieces of plastics in their bodies. Even when this is the case, animals might live as long as others of their kind. Should we nevertheless be concerned about this?

Context 7	Context 8
Toys[17]	**Single-use plastics**[18]
Every plastic item could be having many lives … if we only think creatively! This avoids waste and makes your surroundings beautiful. Should we think more about reusing plastics?	Single-use plastics have entered our lives in many different forms. They render our everyday life more convenient and flexible. Beyond that also aspects of hygiene and take away culture matter. What would justify the widespread single use of plastics?

[15] Re-use of plastics image (Architectureartdesign, n.d.)
[16] Plastics in bodies image (Guardian, n.d.)
[17] Toys images (Amazon, n.d.-a; Pelhamlibrary, n.d.)
[18] Single-use plastics images (Amazon, n.d.-b; Clker, n.d.; Indiamart, n.d.-b; Merrypak, n.d.; Natlawreview, n.d.; Royal Academy of Engineering, n.d.)

Context 9	Context 10
Transportation[19]	**Breathing plastics**[20]
In transportation, plastics are frequently used. Airplanes, cars, busses and trams … all these seem unthinkable without plastics. They are light and robust. Isn't it great that we have such long-lasting materials?	We inhale tiny microplastic particles even in places we perceive as unproblematic. They originate from different sources such as care and bike tyres, shoe soles, synthetic clothing and many more. What does that mean for us?

Context 11	Context 12
Synthetic clothing[21]	**Mattresses**[22]
Synthetic fibres can make our textiles and clothing waterproof, breathable or even fire-resistant. Yet, when washed they release small plastic fibres into our environment. Should we reconsider using them?	We spend an average of 7-8 hours sleeping. Mattresses have a long lifespan, but they are often made of foamed plastics and can release different chemicals. Is that something to be considered when purchasing them?

[19] Transportation image (Bomm, 2019)
[20] Breathing plastics image (Felt, 2019)
[21] Synthetic clothing image (Berghaus, n.d.)
[22] Mattresses image (Comfortfurniture, n.d.)

Kontext 1	Kontext 2
Kosmetik- und Pflegeprodukte[23]	**Gesundheitswesen**[24]
Zahlreiche Kosmetikprodukte enthalten Mikroplastik. Sie kommen mit unserer Haut in Berührung. Wenn sie abgewaschen werden, können Kläranlagen das Mikroplastik oft nicht ganz aus dem Wasser herausfiltern. Wie stehen Sie dazu?	Die meisten Spielzeuge und Spiele für Erwachsene, Kinder und sogar Haustiere bestehen aus oder enthalten Plastik. Der Einsatz von Plastik bietet uns eine große Vielfalt an Formen, Farben und Oberflächen. Was würde es bedeuten, auf die Verwendung von Kunststoffen für Spielzeug zu verzichten?
Kontext 3	**Kontext 4**
Elektrik[25]	**Lebensmittelverpackungen**[26]
Smartphones, Kopfhörer, Fernseher und Laptops sind ohne Kunststoffteile kaum vorstellbar. Sie sind Teil unseres Lebens geworden. Sollte die Verwendung von Plastik in diesem Zusammenhang überdacht werden?	Lebensmittelverpackungen erhöhen Haltbarkeit von Produkten und gewährleisten Lebensmittelsicherheit. Allerdings erzeugen sie viel Plastikmüll und chemische Substanzen kommen mit unserem Essen in Berührung. Wie bringt man Vorteile und potenziellen Probleme in Einklang?

[23] Bild Kosmetik- und Pflegeprodukte (Papadaki-Anastasopoulou, 2019)
[24] Bild Gesundheitswesen (Indiamart, n.d.-a)
[25] Bild Elektrik (Felt, 2019)
[26] Bild Lebensmittelverpackungen (WordPress, n.d.)

Kontext 5	Kontext 6
Wiederverwendung von Plastik[27]	**Plastik im Körper**[28]
Jedes Plastikteil könnte viele Leben haben... wenn wir nur kreativ sind! Das vermeidet Verschwendung und macht unsere Umgebung schön. Sollten wir mehr über die Wiederverwendung von Plastik nachdenken?	Wassertiere nehmen oft kleinere Kunststoffstücke in den Körper auf. Auch wenn das der Fall ist, können diese Tiere oft so lange leben wie andere ihrer Art. Sollten wir uns dennoch darüber Gedanken machen?

Kontext 7	Kontext 8
Spielzeuge[29]	**Einweg-Plastik**[30]
Die meisten Spielzeuge und Spiele für Erwachsene, Kinder und sogar Haustiere bestehen aus oder enthalten Plastik. Der Einsatz von Plastik bietet uns eine große Vielfalt an Formen, Farben und Oberflächen. Was würde es bedeuten, auf die Verwendung von Kunststoffen für Spielzeug zu verzichten?	Einweg-Kunststoffe haben in vielfältiger Weise in unser Leben Einzug gehalten. Sie machen unseren Alltag komfortabler und flexibler, auch bezüglich Hygiene und Mitnahme-Kultur. Was rechtfertigt die weit verbreitete Einmalverwendung von Plastik?

[27] Bild Wiederverwendung von Plastik (Architectureartdesign, n.d.)
[28] Bild Plastik im Körper : (Guardian, n.d.)
[29] Bild Spielzeuge (Amazon, n.d.-a; Pelhamlibrary, n.d.)
[30] Bild Einweg-Plastik (Amazon, n.d.-b; Clker, n.d.; Indiamart, n.d.-b; Merrypak, n.d.; Natlawreview, n.d.; Royal Academy of Engineering, n.d.)

Kontext 9	Kontext 10
Transport[31]	**Plastik einatmen**[32]
Im Transport wird häufig Plastik verwendet. Flugzeuge, Autos, Busse und Straßenbahnen... alle sind ohne Kunststoffe nicht denkbar. Sie sind leicht und robust. Ist es nicht toll, dass wir so langlebige Materialien haben?	Wir inhalieren winzige Mikroplastik Partikel, auch an Orten, die wir als unproblematisch empfinden. Sie stammen aus verschiedenen Quellen wie Auto- und Fahrradreifen, Schuhsohlen, synthetischer Kleidung und vielem mehr. Was bedeutet dies für uns?

Kontext 11	Kontext 12
Synthetische Kleidung[33]	**Matratzen**[34]
Synthetische Fasern können unsere Textilien und Bekleidung wasserdicht, atmungsaktiv oder sogar feuerresistent machen. Doch beim Waschen setzen sie kleine Kunststofffasern in unsere Umwelt frei. Sollten wir die Verwendung überdenken?	Die Matratzen auf denen wir schlafen sind oft aus Schaumstoff und haben eine lange Lebensdauer. Sie enthalten aber auch fragwürdige chemische Zusatzstoffe, die freigesetzt werden können. Ist das etwas, das man beim Kauf berücksichtigen sollte?

[31] Bild Transport (Bomm, 2019)
[32] Bild Plastik einatmen (Felt, 2019)
[33] Bild Synthetische Kleidung (Berghaus, n.d.)
[34] Bild Matratzen (Comfortfurniture, n.d.)

APPENDIX C: RESPONSIBILITY/ACTION CARDS (ENGLISH AND GERMAN)

Responsibility/Action 1	Responsibility/Action 2	Responsibility/Action 3
Politicians should act	**Engaging NGOs**	**Develop alternatives**
It is true that we all contribute to the plastic litter. However, in a consumer society, I personally feel that I cannot do much. Plastic seems unavoidable. If anybody, then the politicians need to step up.	The state is very often protecting the industry. Therefore, we need NGOs to come in and alert us to the problem. They have the expertise, and they are engaged. They can push industries and regulators to act.	The production and distribution of plastics have become an influential industry. But we need alternatives. But before, their environmental impact and risks need to be adequately assessed.
Responsibility/Action 4	**Responsibility/Action 5**	**Responsibility/Action 6**
The polluter pays	**Stop littering**	**Redesigning plastics products**
We should apply the polluter-pays principle. Meaning that mainly those, who produce or use a lot of plastics, need to care for their end life. In a globalised economy, this might be complex, but it is an important way to make polluters realize what they do.	We sit at the beach/in the park with our plastic bottle, our plastic cup, straws, cigarettes, and many other plastic objects – much of this remains at the beach or the park. And then we want the policymakers to care for the next generations instead of acting yourself.	Producers should think more carefully about the disposability and the recycling of any product, before it is brought to the market and we consume it. They could invest more into clever product design.

Responsibility/Action 7	Responsibility/Action 8	Responsibility/Action 9
Consumers' choices	**Regulating and declaring**	**Monitoring**
The market is the best regulator. Companies offer products. If consumers do not buy them, they will not survive on the market. So, we have to simply share the responsibility.	Policymakers should regulate or even forbid certain kinds of plastics. Producers should be obliged to declare what is in the products. Then it would be easier for us consumers to choose accordingly.	If we want to act, we first need to know who is creating and releasing how much (micro)plastics. We need to monitor the paths of plastics more closely, from production, via usage, to disposal. Then we can find points for intervention.
Responsibility/Action 10	**Responsibility/Action 11**	**Responsibility/Action 12**
Balancing economy and environment	**Waste management structures**	**Scientific assessment**
If politicians regulate plastics too much, they might end up harming the EU economy. Therefore, solutions that balance economic stability and environmental friendliness are needed.	Plastic waste is unavoidable. We need local, regional, and national actors to put in place infrastructures for recycling and plastic waste collection. Only then we can expect the people to do their share in protecting the environment and our resources.	We need to invest in a better scientific understanding of potential risks and harms of (micro)plastics for humans, animals, and the environment. Only then can we develop a long-term strategy.

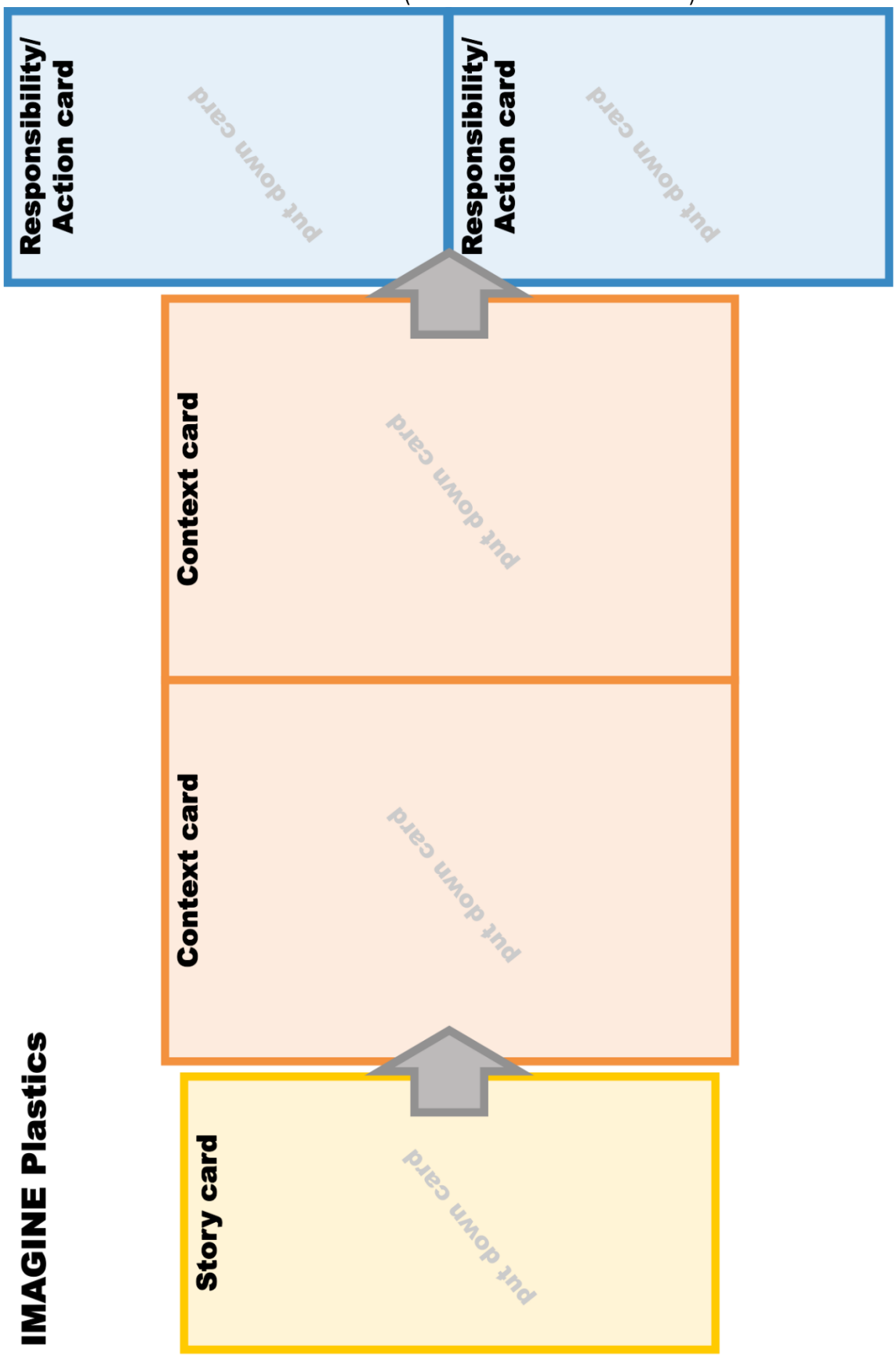
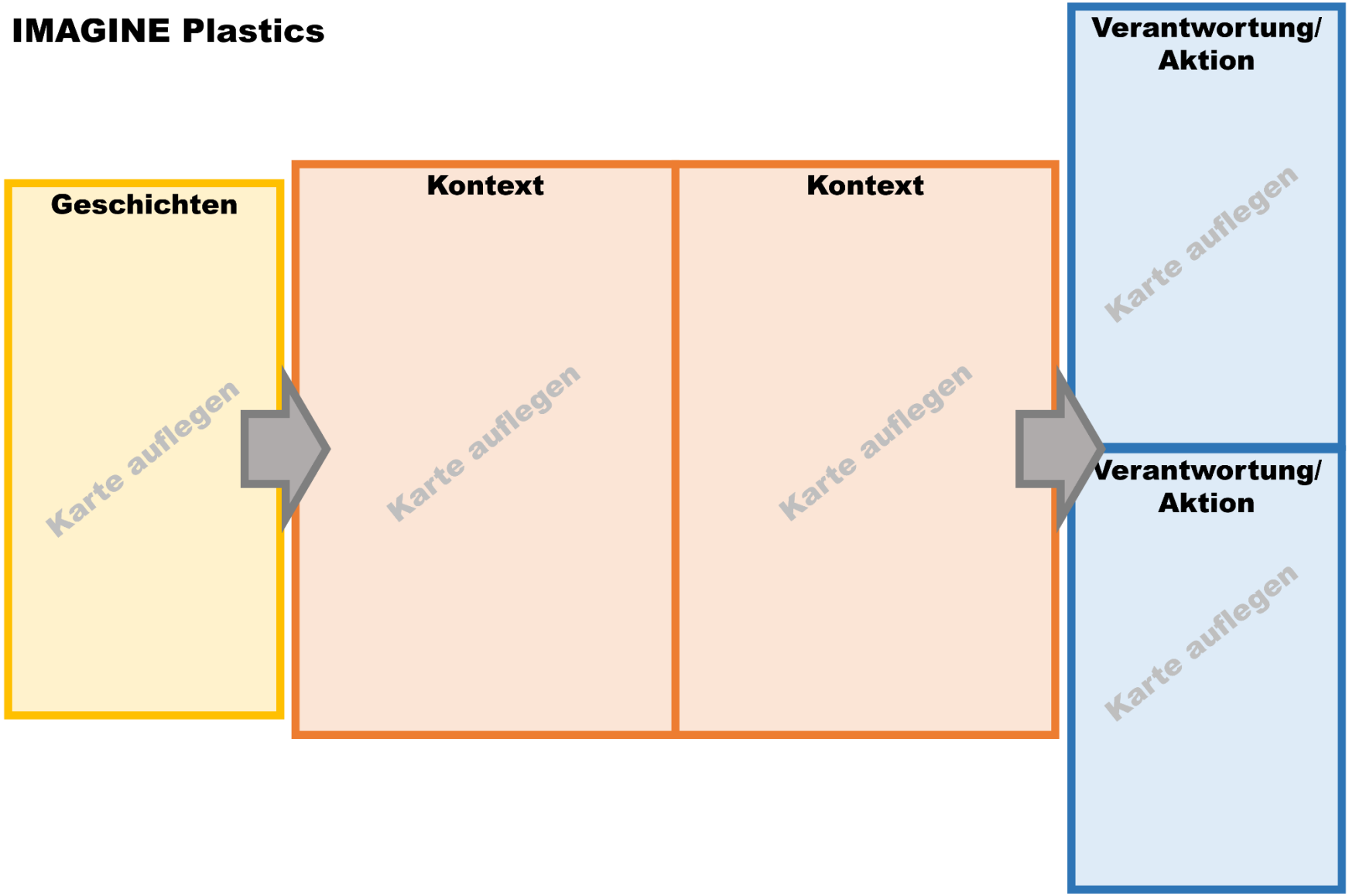
Responsibility/Action	Responsibility/Action

Verantwortung/ Handlung 1	Verantwortung/ Handlung 2	Verantwortung/ Handlung 3
Politiker sollten handeln	**Engagierte NGOs**	**Alternativen entwickeln**
Es ist wahr, dass wir alle zum Plastikmüll beitragen. In einer Konsumgesellschaft habe ich persönlich jedoch das Gefühl, dass ich nicht viel tun kann. Plastik scheint unvermeidlich. Wenn überhaupt, dann müssen Politiker vortreten.	Der Staat schützt die Industrie sehr oft. Deshalb brauchen wir Nicht-Regierungs-organisationen, die uns auf das Problem aufmerksam machen. Sie haben das Fachwissen und sind engagiert. Sie können Industrie und Regulierungsbehörden zum Handeln anregen.	Die Produktion und der Vertrieb von Plastik haben sich zu einer einflussreichen Branche entwickelt. Wir brauchen aber Alternativen. Aber vorher müssen auch deren Umweltauswirkungen und Risiken vertrauenswürdig beurteilt werden.
Verantwortung/ Handlung 4	**Verantwortung/ Handlung 5**	**Verantwortung/ Handlung 6**
Der Verschmutzer zahlt	**Stopp das Vermüllen**	**Umgestaltung von Plastikprodukten**
Wir sollten das Verursacherprinzip anwenden. Das bedeutet, dass vor allem diejenigen, die viele Plastik herstellen oder verwenden, sich am Ende um das Plastik kümmern müssen. In einer globalisierten Wirtschaft mag dies komplex sein, aber es ist ein wichtiger Weg, um den Verschmutzern klarzumachen, was sie tun.	Wir sitzen am Strand/im Park mit unseren Plastikflaschen, Plastikbechern, Strohhalmen, Zigaretten und anderen Dingen aus Plastik – vieles davon bleibt am Strand/im Park. Und dann wollen wir, dass sich die politischen Entscheidungsträger um die nächsten Generationen kümmern, anstatt selbst zu handeln.	Die Hersteller sollten sorgfältiger über die Entsorgbarkeit und das Recycling von jedem Produkt nachdenken, bevor es auf den Markt gebracht und von uns konsumiert wird. Sie könnten mehr in intelligentes Produktdesign investieren.

Verantwortung/ Handlung 7	Verantwortung/ Handlung 8	Verantwortung/ Handlung 9
Entscheidungen der Verbraucher	**Regulierung und Deklaration**	**Beobachtung**
Der Markt ist der beste Regulator. Unternehmen bieten Produkte an. Wenn Verbraucher sie nicht kaufen, werden sie nicht auf dem Markt überleben. Wir müssen also einfach die Verantwortung teilen.	Die politischen Entscheidungsträger sollten bestimmte Arten von Plastik regulieren oder sogar verbieten. Die Hersteller sollten verpflichtet sein, zu erklären, was Produkte beinhalten. Dann wäre es für uns Verbraucher einfacher, entsprechend zu wählen.	Wenn wir handeln wollen, müssen wir zunächst wissen, von wem und wieviel (Mikro)Plastik erzeugt und verwendet wird. Wir müssen den Plastikkreislauf von der Herstellung über die Verwendung bis zur Entsorgung genauer verstehen. Dann können wir Punkte finden an denen man eingreifen kann.
Verantwortung/ Handlung 10	**Verantwortung/ Handlung 11**	**Verantwortung/ Handlung 12**
Wirtschaft und Umwelt balancieren	**Abfallwirtschafts-strukturen**	**Wissenschaftliche Bewertung**
Wenn Politiker Plastik zu sehr regulieren, könnten sie der EU-Wirtschaft schaden. Daher sind Lösungen gefragt, die wirtschaftliche Stabilität und Umweltfreundlichkeit in Einklang bringen.	Plastik ist unvermeidlich. Wir brauchen lokale, regionale und nationale Akteure, die Strukturen für die Sammlung und das Recycling von Plastikabfällen schaffen. Nur dann können wir von den Menschen erwarten, dass sie ihren Beitrag zum Schutz der Umwelt und unserer Ressourcen leisten.	Wir müssen in ein besseres wissenschaftliches Verständnis der potenziellen Risiken und Schäden von (Mikro)Plastik für Mensch, Tier und Umwelt investieren. Nur dann können wir eine langfristige Strategie entwickeln.

Verantwortung/ Handlung	Verantwortung/ Handlung

APPENDIX D: DISCUSSION BOARD (ENGLISH AND GERMAN)



IMAGINE Plastics