CITIES BEYOND TOMORROW

The art of connecting futures and action for urban sustainability transformations

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LIST OF ACRONYMS

COVID-19	Coronavirus Disease 19
EU	European Union
FAO	Food and Agriculture Organization
FPC	Food Policy Council
H2020	Horizon 2020
IPCC	Intergovernmental Panel on Climate Change
KPI	Key Performance Indicator
SDG	Sustainable Development Goals
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
VA/AR	Augmented Reality
WWOOF	Worldwide Opportunities on Organic Farms

I. INTRODUCTION

"Play captures a lot of what goes on in the world. [...] We need to develop practices for thinking about those forms of activity that are not caught by functionality, those which propose the possible-but-not-yet, or that which is not-yet but still open."
- **Donna Haraway**[1]

Kyoto (Japan): A group of citizens has gathered at a meeting set up by a local food research project. Today's attendees are here for a variety of reasons: they are interested in consuming local food and fostering the traditional food culture, they have fears over food safety, or they want to give their children healthy and organic school lunches. Some of them have already set up their own food initiatives, like farmers' markets, or traditional vegetable shops. The group is eager to explore the possibilities of forming a new group to promote their wishes for the Kyoto food system. They are looking to draw inspiration especially from North American examples, where groups called "Food Policy Councils" (FPCs) have been successful in changing local practices around food. They wonder how they should go about this in Kyoto, where there are many engaged citizens, each with their own vision of a better food future. Kyoto has a strong and historic food culture and even produces its own unique heirloom vegetables. Yet the local government does not seem eager to embrace or support this group and their innovative ideas. One of the people at the meeting declares: *"It's very difficult to think about the **ideal**, ideal future."*

Gothenburg (Sweden): A group of people has gathered in a room on a university campus. They are managers at public transport companies, public housing associations, or energy corporations and have been joined by a group of academics. All of them have signed on to collaborate in IRIS, a European project to realize "smart cities". Through their interventions, Gothenburg, Nice and Utrecht will be equipped with communal electric cars, energy-saving smart meters, and streetlights that only switch on when people walk past. However, preliminary studies have shown that there may be some obstacles ahead. In some houses in which gas cookers have been replaced by electric cookers, tenants are putting camping gas burners on their new stoves. In other cases, the tenants have trouble reading and understanding their new meters and their tenements are permanently too hot or too cold. Being aware of these hiccups, the project members still really want to involve these citizens and to co-design the changes with them. In Gothenburg, the project members even see this as their democratic duty, something that the citizens also expect from them. One of the attendees declares his strong belief that *"all stakeholders need to have a dialogue. We have a humble duty to this"*. However, the clock is ticking, and some technical solutions are already being implemented as he speaks.

Utrecht (the Netherlands): Hundreds of first-year students holding smartphones are roaming the streets of Utrecht in small groups. They are scouting the streets for inspirational examples of sustainable practices to photograph and upload to a digital map. They spot green roofs, speculate on the spots where humans can co-exist with other species, and they even swap their experiences with second-hand or "vintage" clothing. *"I didn't realize that you could get such a cool outfit at a second-hand store!"* exclaims one of the students to his teammate. A few kilometers away, a group of researchers is anxiously tracking what

the students are choosing to upload. They have high hopes for the game that the students are playing. Most of their students know a lot about sustainability issues. They are of the generation that took part in 2019's climate marches and are very socially aware. However, the students also express apathy and dread over their futures. By opening their eyes to sustainable practices and reflecting on their own role in this urban system, the researchers hope to give them a perspective for taking action.

These examples show how in cities all over the world initiatives are emerging, sometimes on a very limited scale, to find solutions to sustainability issues. These initiatives stem from a deep concern for the problems facing our world. We are in the midst of a global environmental crisis, evidence of which has been mounting over the past decades. The most recent environmental reports by bodies such as UN Environment (2019) and the Intergovernmental Panel on Climate Change (IPCC) (2021) illustrate the threats associated with this crisis for entire communities, species, and all systems on the planet. The alarming signals from the scientific community and from real life in the form of wildfires, floods, and droughts have not been ignored. There is a growing sense of urgency that has led to ambitious goals such as the Paris agreement to stay well below 2 degrees of global warming (UNFCCC, 2015) and the EU's Green Deal (European Commission, 2019) that states that the EU will be carbon neutral by 2050. However, the most recent UN Environment GEO-6 outlook (2019) states that *"the world is not on track"* to reach any of these targets: neither the sustainable development environmental goals for 2030, nor the climate and emissions targets for 2030 or 2050. The IPCC (2021) has warned that their latest report might be the last to outline a pathway for staying below 1.5 degrees of global warming. This indicates that there is a problem in translating aspirations into action: how can societies be put on track to achieve these radically different sustainable states? In the current situation, it appears that most politicians are not radical enough, and important incumbent actors have a stake in delaying change. This does not alter the magnitude and seriousness of the existing threat, and therefore a growing number of communities and groups is trying to bring about change outside of existing governance structures. They are especially present in cities, since these are environments that not only experience the majority of sustainability issues but are also catalysts for innovation and change (Acuto et al., 2018; Elmqvist et al., 2019; UN Environment, 2019; UN Habitat, 2020; IPCC, 2021). The aforementioned stories from Kyoto, Gothenburg, and Utrecht are only a few examples of such communities. It is evident that they represent an important missing link in shaping more sustainable societies, but little is understood about how they can exert influence and achieve actual change.

In the current "decade of action", cities, countries and governance networks have committed themselves to ambitious sustainability goals (Leichenko & O'Brien, 2019). A wide base of support and action is needed to realize the transformative change that allows these targets to be met. In both governance and futures literature, there are calls for a "second generation" of research. On the one hand, a *"second generation"* of approaches to ***futures*** is needed, in which images of the future are an emergent property of the engagement between various stakeholders, including researchers (Robinson, 2003: 854). On the other hand, there is a call for a second generation of *governance research* that puts

legitimacy, dramaturgy, and the future of democracy center stage (Netelenbos, 2020). To realize these shifts, traditional methods of thinking about and acting on the future do not suffice. Moreover, the prevailing cognitivism also demands a new mode of interaction with images of sustainable futures (Hajer, 2003; Netelenbos, 2020). Studying the concrete organization of futures practices and the transformational images of the future they produce can address both calls in a more systematic manner. This can generate answers to questions that the three examples at the start of this chapter raise. Examples of such questions are:

How can the motivated, active group of change-makers in Kyoto develop its vision for the future? And how could they organize to make this dream reality?

How can the Gothenburg group design a process in which citizens can also bring their ideas for the smart cities of the future to the table, and make the project really inclusive and successful?

Can the Utrecht2040 game really make a new generation feel like they have a key role in a large sustainability transformation?

The three example questions contain larger themes that are important for understanding and especially for realizing the "decade of action". This thesis aims to improve understanding of one of these themes: images of the future, how they contribute to urban sustainability transformation, and how they can be generated or moved. This work can support emergent communities of actors in their development of new forms of governance by outlining how to imagine these forms, how to achieve them, and how they work.

1.1. Urban sustainability transformations in context

In the face of the current environmental crisis, societal actors are encountering unprecedented challenges and the conventional rules and norms of governance are being challenged (Hajer, 2003). To move from the unsustainable practices of the present to a sustainable future requires changes to take place across multiple levels, from the daily lives of city dwellers to the institutional context. "Transformations toward sustainability" refer to those fundamental changes in structural, functional, relational, and cognitive aspects of systems that lead to new patterns of interactions and outcomes (Patterson et al., 2017). In this context, new communities of actors need to coalesce around new images of their cities if the necessary transformations are to be brought about. The sustainability challenge of our time will touch all members of urban communities, although not all in a similar way or in equal measure. The examples from communities that emerged in Kyoto, Gothenburg, and Utrecht to address environmental issues illustrate that these changes are complex and have economic, social, and environmental dimensions. For example, urban climate change action contains issues such as mobility and the transition to sustainable energy systems. As long as transforming these practices to more sustainable states remains an urgent issue, imagining futures in which the urban environment, economic reality, and social practices are fundamentally different remains a challenge for every modern city.

In recent years, cities have become key governance arenas in terms of sustainability challenges. They have taken the lead in addressing challenges like climate change, mobility, and social justice (Wigginton et al., 2016). This development is also expressed in the emergence of city networks (Herrschel & Newman, 2017), reports by international organizations such as the UN (UN Habitat, 2020) and in research (e.g., Wigginton et al., 2016; Bibri & Krogstie, 2017). The concentration of population, activities, and resource use in cities shapes their future by increasing efficiency as well as through generating multipurpose solutions combining different sustainability goals (McCormick et al., 2013). For many kinds of practitioners, the urban scale can be seen as an important scale unit in which to realize transformations toward sustainability (Wigginton et al., 2016; Rink et al., 2017; Elmqvist et al., 2018; Elmqvist et al., 2019).

1.1.1. Challenges for the governance of transformations

Exploring the processes of transformative change toward sustainable futures is a key contemporary research question (Future Earth, 2014; Bai et al., 2016). The diverse conceptual approaches developed to understand and analyze societal transformation processes include socio-technical transitions, social-ecological systems, sustainability pathways, and transformative adaptation (Patterson et al., 2017). After exploring what enables cities and urban stakeholders to purposefully initiate and perform such transformations, Wolfram (2016) describes how transformative capacity can entail different things depending on the subject that is addressed, the outcome that is targeted, and the different components that constitute the concept of capacity. In addition to the literature on sustainability transformations, there is also a significant body of literature on sustainability transitions. Traditionally, the transitions literature has argued for and studied the uptake of niche innovations in institutional contexts or regimes (Loorbach & Rotmans, 2006; Van Doren et al., 2020), but in recent years, the scope of literature based on transitions research has broadened and strengthened its connections to other disciplines (Köhler et al., 2019; Markard et al., 2020). Hölscher et al. (2018) trace the development of and similarities and differences between transformations and transitions, finding that the two concepts are "not mutually exclusive", and that the different research communities behind them have moved closer to each other over the past years. This thesis mainly builds on the concept of sustainability transformations, but, when appropriate, will also incorporate the recent literature on transitions.

Overall, the increased awareness of climate change and sustainable development has led to relatively few initiatives that are decisively shifting urban development in a sustainable, resilient, and low-carbon direction (McCormick et al., 2013; Patterson et al., 2021). Although the aforementioned literature already conceptualizes transformations, there is still a gap with regard to the deliberate role that futures practices can play and how they can spur transformative action. Recently, the concept of the experimental city has gained traction. Authors such as Bulkeley & Betsill (2013), Hajer (2016) and Evans et al., (2017) have perceived a shift away from a linear, engineering perspective of futures, and urban sustainability transformations, toward a more open, creative, and non-linear approach. However, as the Gothenburg story illustrates, space must be made for such

dynamics of ongoing processes of transformation. Experimental cities allow for local contextualization and appreciation of the local situation, combined with a determination to find solutions to sustainability issues. At the same time, the intended system changes are large and ambitious. They aim to transform entire food and energy systems, and to work toward a holistic sustainable image of cities. One point of entry into governance for transformative change can be found in the concept of imaginaries: *"collectively held, institutionally stabilized, and publicly performed visions of desirable futures"* (Jasanoff, 2015: 4). Legislatures, courts, the media, and other institutions of power are most often the ones to elevate certain imagined futures above others, giving them a dominant position in policy development (ibid.). As such, decisions in the present are impacted by strong images of the future, whether positive or negative.

By targeting images of the future and imaginaries, researchers and practitioners gain new tools and techniques which may be better suited for the current challenges of intervening in unsustainable systems. Arguably, the effects on an urban system go beyond the cognitive, and into deeper emotional and philosophical levels of intervention (Meadows, 1999; Dorninger et al., 2021). Finally, and importantly, new roles for practitioners can be imagined and realized — not only for individuals, but also for new governance modes that work toward sustainability transformations. One example of such a new mode is the FPCs, presented in the Kyoto example, in which a varied group of food system actors gathers to push for a change in food policy (Harper et al., 2009; Smith et al., 2020). These new roles are an important aspect of the integration of traditional and new forms of governance and can bring about the necessary new collaborations. More empirical work is needed to understand how transformative change works. It is important not only to explore transformative dynamics in a general sense, but specifically to analyze various ways in which alternative images of sustainable cities can be brought into transformation processes and shift their course. This also requires new modes of interaction and new forms of governance.

1.1.2. The need for new modes of environmental governance

Governance is a key leverage point for sustainable urban transformations, especially since the social, organizational, economic, cultural, and political aspects often outweigh the technological challenge (McCormick et al., 2013). Governance is the interplay between government, business, and civil society, shaping institutions that in turn impact them (Kooiman, 1992; Rhodes, 1997, Stoker, 1998; Pierre, 2000; Lemos & Agrawal, 2006). Actors from each of these groups engage individually and collectively in purposive action in an effort to prevent or generate change (Brown et al., 2013). Driessen et al. (2012) distinguish three core elements of governance: actors, institutions, and content (politics, polity, and policy), noting that there are different modes of governance, and shifts can occur from one mode to another, in which the elements change. Shifts do not always mean more sustainable outcomes, and state that further research into this link is needed (ibid.). It is important to note that shifts in governance and changes in policy are by nature deeply political and contested. Whether transformations are to be approached in a normative or analytical fashion, or a combination of both, different actors will be affected in different ways: they may either gain or lose as a result of change. In addition to this, framings and narratives of transformation

processes, and what counts as a loss or a win, are social constructs. They may be viewed differently, as a result of *"judgments about problem boundaries, perceptions of change processes, contested uncertainties and ambiguities, and sometimes incommensurable value sets"* (Patterson et al., 2017: 2; see also Hajer, 2003;).

In recent years, cities have emerged as key governance arenas. Urban governance as a field of study is built on the notion that the local scale is the place both where action on sustainability issues is decided, and where action is played out. It arguably developed in relation to national governance, and since its infancy, publications in the field have been inherently conscious of the place of the urban level in a larger system (Bulkeley & Kern, 2006). Lukas (2019) distinguishes three "sets of meanings" that capture urban governance as a concept: *"(a) urban governance as a descriptor of new forms of cooperation, interaction, and decisionmaking on urban affairs, (b) urban governance as a normative concept about how interaction, cooperation, and decisionmaking should be organized, a notion that informs local, regional, and international policy circles, and (c) urban governance as an analytical concept that provides theoretical tools and categories to differentiate and understand the actual forms and modes by which urban affairs in different geographical and sociopolitical contexts are regulated and how decisions are made".* McCann (2017) notes that urban governance has been shifting its focus from urbanization to urbanism, i.e., to the ways in which the built environment and the lives of city dwellers interact and shape one another.

There is already an emergent and growing body of literature on experimenting with new modes of interaction and new forms of governance to achieve urban sustainability by involving novel groups of stakeholders, often in an urban context. Sengers et al. (2017: 15) note that *"Experiments represent important seeds of change that may eventually lead to profound shifts in the way societal functions such as the provision of energy or mobility are met".* They recognize the space that exists in the modern governance context for *"new sources of authority, legitimacy and action by new societal actors"* (ibid.: 16). This perspective has been shared and applied in practice by many others (Bulkeley & Castán Broto, 2013; Weiland et al., 2017; Ryan et al., 2017; Gugerell & Zuidema, 2017; Potjer, 2019). This experimentation may take place in the city — in Urban Transition labs, for example — but researchers and practitioners have also turned to new methodologies such as games (Nevens et al., 2012; Gugerell & Zuidema, 2017). Jordan and Huitema (2014: 715) observe a *"rush to explore what is filling the governance gaps created by gridlock in the international regime".* They distinguish between the invention (which reveals sources of novelty), diffusion (which reveals what is required for innovations to be taken up), and evaluation of new, innovative policy that highlights whether anything "really changes" (ibid.: 730).

Currently, the cutting edge is the emerging research on the ways in which futures and governance connect. As mentioned above, there is much experimentation with new forms of governance, but so far, an explicitly future-oriented focus has been largely absent. The emergent literature on anticipatory governance (e.g., Hebinck et al., 2018; Vervoort & Gupta, 2018; Muiderman et al., 2020) aims to bring more forward-thinking practices

into governance settings. In this literature, the focus is still largely on policy, and existing governance settings. A logical next step would be to address institutional voids (Hajer, 2003), gridlock (Jordan & Huitema, 2014), and instances of a knowledge–action gap (Blake, 1999) or value-action gap (ibid.; O'Brien, 2013) in the governance space. The knowledge from the current governance literature is very rich in data and analysis of outcomes, which is a valuable aspect to include in any experimental research on the governance of urban sustainability transformations. However, new insights may be gained by developing experimental, transformative, empirical work with an explicit futures focus.

1.1.3. Experimental and critical futures

Understanding how images of the future affect how we actually approach the future is an issue discussed in futures studies. This is not a uniform field, and there is a range of different futures methods: practices that can aid researchers and practitioners in imagining possible futures and taking action to achieve them. Some are cognitive and based on quantitative indicators, while others rely on creative imagination and storytelling. A somewhat rigid use of methods that look to the future in ways that are strongly determined by past conditions is still common in environmental governance (e.g., Popper, 2008). Futures methods such as scenarios, assessments, and back-casts are the backbone of many influential reports issued by organizations such as the IPCC (Ford et al., 2016). Because these reports are influential in shaping the policy measures that address urgent sustainability issues, it is problematic that the methodology is skewed in this way. It creates a false sense of risk elimination in the face of potentially unprecedented change, while systematically underestimating the power of new communities and coalitions at all levels to realize transformative futures (Vervoort et al., 2014). Furthermore, many classic foresight processes depart from rather narrow assumptions about reality and instead aim to predict the future either within certain boundaries of likelihood, or from perspectives that see the future as more uncertain in nature, but still navigable. What is lacking in both cases is an explicit engagement with contextual social imaginaries in order to imagine and initiate futures that can be considered truly novel (Vervoort & Gupta, 2018).

Without this deliberate engagement and reflexivity, it is easy to mistake futures methods as generators of trustworthy predictions, rather than a means of support in complex transformation processes. There is a challenge for futures practices to engage with new methods for developing transformative visions and pathways toward those visions and engaging with novel and unexpected future concerns. Novel futures emerging through such practices of what we nowadays call "futuring", i.e., the active creation of processes of making images of the future, can in turn help develop the knowledge-sharing networks and collaborative communities needed for sustainability transformations (ibid.; Kok et al., 2011; Van der Hel, 2016). Recently, the possibilities for futures methodologies have been expanded with the rise of digital technology and arrival of new methods such as games that offer entirely new ways to engage with futures beyond the typical foresight planning frame, for instance by focusing more on experience and experimentation (Vervoort, in review). In addition, a number of studies indicate that combining complementary futures methods creates a better fit with complex systems and can connect novel outcomes with real-world

practices, yielding a richer variety of futures (Kok et al., 2011; Van Vliet et al., 2012; Avin, 2012; Vervoort et al., 2014).

There is also a set of examples of explicitly futures-oriented experimentation, e.g., by Davies & Doyle (2015) in their experimental participatory back-casting session and described by Swilling, Pieterse & Hajer (2019). In addition to the concepts emerging from empirical studies, there is a set of approaches that explicitly focus on the experience and embodiment of new images of the future. These experiential approaches are especially prevalent in the futures literature, for example by using 3D interactive simulations (Dulic et al., 2016), experiential scenarios (Candy & Dunagan, 2017), or interactive installations (Hajer & Pelzer, 2018). Arguably, these examples are at the forefront of creating new modes of interaction with sustainable futures. However, as Angela Wilkinson (2009: 108) puts it: *"futures work seems to be characterised by highly personalised practices"*. Conferences such as those of the Earth System Governance or Anticipation 2022 yield a rich set of examples of cutting-edge new interactions, but peer-reviewed literature is lagging behind. Currently, there is a focus on describing approaches and their potential, but these approaches have not yet been supported by empirical work (e.g., Kuzmanovic & Gaffney, 2017; Garduño García & Gaziulusoy, 2021).

It is important to note that with the development of more participatory and immersive futures methods, the importance of researcher positionality has increased too. In participatory futures practices, researchers and participants generally co-produce futures knowledge. Academics and non-academics both participate in this co-production process (Norström et al., 2020). Paying attention to the multiple positionalities of the participants engaged in a futures practice and practicing reflexivity are crucial for a process to be both ethical and effective (Sultana, 2007). As Stirling (2014: 83) points out, social scientists can make recommendations based on their findings from this knowledge co-production process. However, he adds that to foster *"active political spaces for critical contention over alternative pathways"*, such scientists should supplement their recommendations with an transparent exploration of the underlying norms, paradigms, and power dynamics.

The cutting edge of current work in futures and foresight is in futures approaches that respond to "institutional voids" that hamper urban sustainability transformations. New methodologies that use creativity, imagination, and embodied experiences are hypothesized to be able to break though deadlocks or apathy and allow people to "practice with the future" and extend their futures capacity in a meaningful way (Guston, 2014). There is a growing body of literature from recent years that points out the perceived urgency and potential of using futures in this way. Examples are Candy & Dunagan's (2017) work on experiential scenarios, and work on the active creation of experiential futuring in the context of complex decision-making (Hajer & Pelzer, 2018), local and indigenous knowledge in decision-making (Escobar, 2020), and constructing visions of sustainable futures through assembling existing niche practices (Bennett et al., 2016). However, there is still no clear evidence on how futures and transformations are connected, or on how such a connection could lead to action on urgent sustainability issues.

1.1.4. Research gap and contribution of this thesis

The established governance and futures literature spans decades and contains valuable insights. Anticipatory governance is a young field that combines insights from both these fields, and advances governance with an explicit foresight component. The literature on the governance of transformations emerged from work on governance and urban transformations, answering a growing call for effective governance of transformations and an increasing focus on the urban context. Finally, experimental futures practices have combined governance and futures experimentations and innovation to develop new forward-looking practices that are a meaningful addition to the sustainability debate. Nonetheless, there is still a gap in the literature with regard to understanding the ways in which images of the future can be organized to contribute to transform cities to more sustainable states. This thesis connects insights from anticipatory governance, experimental futures, and governance of transformations literature, and builds new empirical work that contributes to all three bodies of literature. Thus, it addresses the current research gap and contributes lessons on futures interventions for urban sustainability transformations (Figure 1).

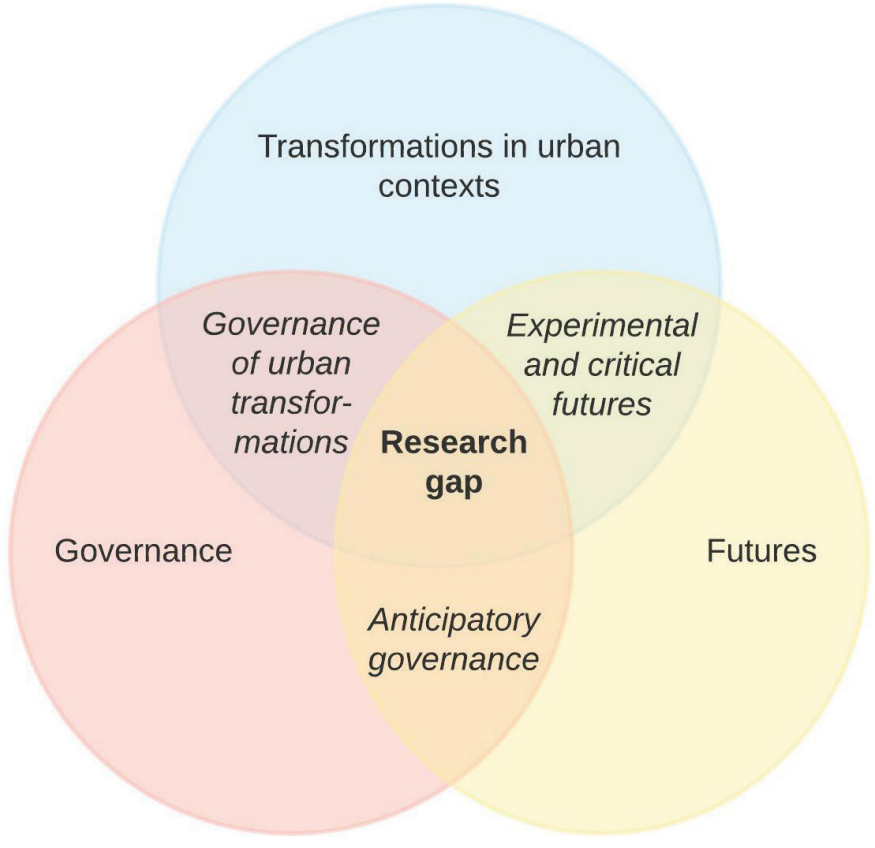

Figure 1. Theoretical framework

1.2. Four challenges

Deliberate engagement with futures practices can increase the futures literacy of citizens: their capacity to act on the future (Miller, 2007) and make them more reflexive on this future. Current futures practices mostly focus on prediction and the limiting of uncertainty, while experimental and critical futures seek to address shortcomings in the research and discourse on urban sustainability challenges (Muiderman et al., 2020). Despite the large potential for expanding existing perspectives on and assumptions about new futures methods referred to above, there is a gap in the literature with regard to understanding the ways in which images of the future can be organized to contribute to transform cities to more sustainable states. So far, however, this research has largely focused on mixing different existing planning-oriented futures methods. To bridge existing gaps and gain a holistic perspective of futures practices, this thesis identifies four challenges to the organization of futures practices for sustainability transformations that emerge from the combined literatures on transformations, governance, and futures: 1) Including different perspectives and assumptions in futures, 2) The need for novel approaches and methodologies, 3) Making space for participation, and 4) Broadening the scope of evaluations.

Including different perspectives and assumptions in futures

Every kind of engagement with the future is characterized by underlying perspectives and assumptions: whether the future can and should be predicted, whether it is open or predetermined by existing interests, and whether engagement with it can be speculative and creative or geared toward a specific goal. Muiderman et al. (2020) describe four perspectives on the future that they have identified in anticipatory governance: 1. probable and improbable futures 2. plausible futures 3. experimental futures, and 4. critical futures. Each perspective has its own corresponding tools such as scenarios and back-casts. Arguably, not all perspectives are created equal: prediction and the removal of uncertainty tend to dominate in environmental governance, whereas potentially experimental and critical perspectives are highly relevant too in formulating more effective responses to global environmental change. It is therefore important to be reflective on perspectives and assumptions at the start of a futures exercise. Secondly, it is important to experiment and speculate more in critical and experimental ways, to address potential blind spots and find necessary answers to governance questions surrounding global environmental change.

There is a longer history of thinking about and problematizing of futures perspectives or epistemologies in futures studies. One notable example is Inayatullah (1990), who distinguishes three futures epistemologies: empirical, interpretative, and post-structural, linking them to predictive, cultural, and critical positions on the future, respectively. Predictive approaches describe the world that already exists, while in the cultural-interpretative approach there are also objective truths, though they differ among cultures. The critical approach, finally, concerns itself with "investigating how the present and the future have come to be authoritatively created". This distinction is in a way similar to that of Muiderman et al. (2020), but Inayatullah already notes that empirical approaches are dominant, while the critical, post- structural approach is seen as *"impractical"* (1990: 136). This is problematic since, as Fuller (2019: 93) has written more recently: *"anticipation is a key framing activity in social emergence"*: perspectives of the future shape how people act on the future and thus continuously shape society. If the objective is transformation and alternative futures, predictive perspectives of the future will not suffice because they reproduce a future from the past. Cultural-interpretative approaches run the risk of relativizing differences. However, a critical perspective *"will show the monuments of power before us and thus allow the continuous destruction and reconstruction of alternative futures"* (Inayatullah, 1990: 137). Inviting and making space for multiple perspectives of the future is thus an important challenge when aiming for sustainability transformations.

The need for novel approaches and methodologies

From the governance, transformations, and futures literature emerges a unanimous call for novel futures approaches to help new coalitions of societal actors create pathways to sustainability transformations (Bai et al., 2016; Swilling et al., 2017; Vervoort & Gupta, 2018). Possible ways to do this are by combining and re-imagining existing innovative practices as "seeds" for transformational futures, and developing innovative combinations of methodologies (visioning, back-casting, and digital and live role-playing games) (Bennett et al., 2016; Candy & Dunagan, 2017; Vervoort, 2019). Any futures methodology should be selected in order to create multiple ways for participants to experiment and engage with sustainable futures, enabling them to co-create diverse yet grounded future pathways. There is a fast-growing set of examples of creative, location-based, experiential, and experimental futures practices (O'Brien et al., 2019; Von Wirth et al., 2020). Methods such as applied games are designed to offer a playful, environmental and experiential environment that provides "serious" content: topics, narratives, rules, and goals to foster a specific purposeful learning outcome (Mitgutsch & Alvarado, 2011).

A careful process design, taking into account its contextual factors, can be considered the "dramaturgy" of a futures practice (Hajer, 2009). Ball et al. (2021) describe how in emergency situations, such as the COVID-19 pandemic, political actors could gain credibility, legitimacy, and authority by taking on certain prototype roles that the public expects from their experts or leaders. Arguably, this could be taken to heart when designing futures practices that target the environmental crisis. However, in more creative or experimental futures, such expectations may also be subverted. Hajer & Pelzer (2018) describe how a careful mis-en-scene is an important element of an immersive setting that can succeed in getting those present to suspend their disbelief and can undermine their expectations. The challenge is to find a novel methodology and create a process around it that optimizes its effects in terms of generating sustainable urban futures.

Making space for participation

Institutional arrangements fund and facilitate projects that aim for urban sustainability transformations, and they can influence the way they are set up and how they are evaluated (Salmon et al., 2017). As such, the space available for a variety of perspectives on futures in the institutional context can be expected to significantly determine the open-endedness of transformation projects. If a project plan has already been predetermined in terms of actions and timing, there will be very little perceived scope and time to shape participatory

futures practices (Hebinck et al., 2018). Prescribed goals and participatory practices can be balanced, or there can be a tension between the two: the participation–prescription tension (Waylen et al., 2015). This starts at the institutional level when a project is incubated and can subsequently persist in the project plans.

Participatory futures processes may more easily generate novel outcomes that are taken up for implementation if many of the stakeholders involved in a futures practice have experience with participatory processes. This means that they are used to working in an environment that encourages participation and has certain protocols for this in place (Truex & Søreide, 2012). Such a strong participatory culture can enable a more critical distinction to be made between types of citizen engagement (Arnstein, 1968), and enables project members as well as citizens to make participatory futures practices meaningful and effective (Groot et al., 2018). The expected benefits are also culturally determined. Generally, these fall into one of the following three categories: (1) "substantive" benefits, i.e., an improvement of decision-making through citizens' place-based knowledge and values; (2) "instrumental" benefits, i.e., improving the acceptability and transparency of a plan, and thus its implementation; (3) "normative" benefits, where inviting stakeholders into decision-making increases the legitimacy of decisions and supports democracy (Glucker et al., 2013; Waylen et al., 2015). For futures practices aimed at urban sustainability transformations, this challenge is about adapting to the institutional and participatory contexts, to find connection and support where possible, and to work under imperfect circumstances if necessary.

Broadening the scope of evaluations

When developing and studying the use of futures methods to address urgent sustainability challenges, it is important to evaluate the outcomes. This is a crucial exercise in order to see whether the objectives have been met and a contribution to more sustainable cities has actually been made. "Success" in this way is not limited to quantifiable contributions to sustainability targets, but extends to outcomes on futures literacy, participatory culture, and the uptake of new modes of interaction. While this sounds obvious, evaluation of futures methodology is not standard practice, and empirical data on the deliberate use of futures methods is still scarce (Vervoort, 2019), so the research methodology is new and tailored to the context. It should be noted that the challenge of evaluating complex societal transformations is well recognized but has not been adequately researched in either governance or futures literature in both governance and futures literature (Hill & Varone, 2021). One important component of the research in this thesis is therefore to evaluate the outcomes of certain futures practices by formulating a set of criteria for success in each case and gathering data to evaluate the extent to which the criteria are met.

The transformations and governance literatures have a rich history of evaluating multidisciplinary, multistakeholder processes. Authors such as Wiek et al. (2014) dissect societal effects into variables such as knowledge, decision-making power, and transformational change. This could be a first step in the direction of evaluating the complex societal transformation processes that are needed to move cities to more sustainable

states through the use of new images of the future. However, some expansion is needed to accommodate creative and experimental approaches. Hajer & Pelzer (2018) have developed one example of such an evaluation by tracking the effects of their multimedia intervention "2050 - An Energetic Odyssey" through the subsequent discourse. Nevertheless, Light et al. (2019: 9) note that "most existing evaluation mechanisms are not tuned to detect the changes that creative practice brings about in individuals or communities". They argue for elements such as depth of feeling and meaning to be incorporated into new evaluation methods for this purpose. The expansion of frameworks for evaluation is an important challenge for futures practices aimed at sustainability transformations, to determine if they ultimately have the desired effects and if they make a meaningful contribution toward the sustainable states that are so urgently needed.

1.3. Research aim, questions, and framework

It is important to organize futures practices distinctly, since little is known about the role of contextual factors, the new images of the future that are created and how they can steer transformation processes, and the evaluation of these outcomes. By carefully designing a futures practice we can gain new insights into these elements and learn lessons from them. I argue that the innovative approaches of the futures field can enrich the space of the governance of sustainability transformations by carefully developing futures practices and studying their outcomes. This approach combines multiple strengths and opportunities: experimentation with and immersion in new futures, empirical studies into the futures practices, and evaluation of the transformative potential of their outcomes. Experimenting with futures and the governance of transformations also opens up the concept of governance itself and attracts new publics. This answers the call for *"more imaginative, community-based governance alternatives commensurate with the challenges of our time"* (Smith, 2020: 7). The aim of this research project, then, is to improve the understanding of distinctly organized futures practices in communities with an interest in sustainability transformations in an urban context, by evaluating three such practices in depth: in Kyoto (Japan); in a large European project involving Gothenburg and two other cities elsewhere in Europe; and in Utrecht.

The cases in this thesis are all examples of futures practices set up and conducted in the context of larger transformation processes. The context of the transformation process around the futures practice determines the extent to which the community can easily adopt the resulting plans and what kind of support is available to them. This context may be very separate from any larger project (**Chapter 3**), or it may be embedded in a larger project (**Chapter 5**). Experimenting with futures practices in these three relatively small case studies can provide insights into the first developmental steps toward larger transformational change. I argue that the imaginative, the creative, and the experiential can open up transformative futures perspectives in governance processes and allow researchers and practitioners to play with *"the possible-but-not-yet, or that which is not-yet but still open"* (Haraway, 2019).

The following main research question guides the research:
How can futures practices lead to action in urban sustainability transformations?
For each chapter of this thesis, the unit of analysis is one or more futures practices in an urban context. In each case, through such practices a community, which can be defined as a distinctly organized group of actors with an interest in sustainability transformations in an urban context, engages in a particular way. The urban communities were selected for their different compositions and to reflect different levels of governance. This means that each case is a different composition of contextual factors, methodology, and evaluation approaches, which can lead to new insights into the distinct organization of futures practices.

In each case, the urban communities engage with one or more futures practices. Each futures methodology falls in the categories of experimental and critical approaches of futures practices that open up futures to creativity, radical change, and critical reflection, making possible a more varied and reflexive view of what the future is and how to engage with it (Muiderman et al., 2020).

Chapter 2 sets the scene for the subsequent empirical chapters of the thesis. It argues that these approaches to the future are currently underrepresented in favor of methods that aim to predict the future or eliminate uncertainty. In **chapters 3** and **4**, niche local food system actors engage in agenda-setting for an FPC in Kyoto, through a complementary process of visioning, back- casting, and serious gaming. We study how this motivated, active group of change-makers can sketch out their vision for the future and organize themselves to realize their goals. **Chapter 3** seeks to answer my first research question:
Under what conditions do futures practices contribute to the participatory conceptualization of urban sustainability transformations?

Chapter 4 evaluates the transformative outcomes and impacts of **chapter 3**, and is centered around my second research question:
*Under what conditions do futures practices support multistakeholder initiatives in the **initiation** of urban sustainability transformations?*

In **chapter 5**, an international multi-community, IRIS Smart Cities, aims to make a smart cities process more participatory by using a futures-oriented design tool. This high-level group that is bound by predetermined interests and priorities stands in contrast to the grassroots community in Kyoto that was involved in a more open-ended futures process. The design tool helps the IRIS project members to design a process in which citizens can outline their smart cities of the future and make the project a success. My third research question is therefore:
*Under what conditions do futures practices **reclaim the space** for citizen engagement and alternative futures in pre-structured transformation contexts?*

In **chapter 6**, an experiential and experimental futures game, Utrect2040, engages the urban community of Utrecht in sustainability thinking. This community engages in the most creative, large-scale futures exercise of the three case studies. **Chapter 6** studies whether

this game can make a new generation feel like they are playing an active part in a large sustainability transformation. My fourth research question is therefore:
*Which elements of a large-scale, location-based futures game enable players to **reflect on and imagine** solutions for complex sustainability problems?*

Figure 2 illustrates the research outline and the way in which each chapter responds to the agenda-setting challenges presented in section 1.4 and elaborated on in **chapter 2**.

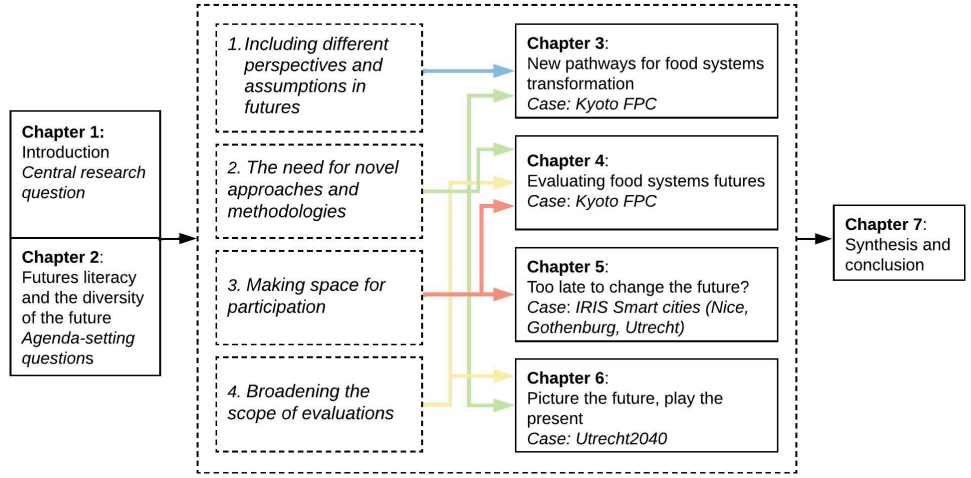

Figure 2. Research outline

1.4. Methodology
The data in this thesis was collected from three different case studies, each of which represents a different futures perspective, context, and methodology. This variety allows for a distillation of "best practices" and for the development of a set of lessons learned about on futures practices in different settings (Burns, 2017). Moreover, the cases involve researchers, practitioners, and citizens, and take place in real-world settings. Each case is an example of futures knowledge co-production (Norström et al., 2020). By collaborating with the urban communities in the three cases, the case studies in this thesis — especially the Kyoto study presented in **chapters 3** and **4** — also have some characteristics that are close to those outlined by participatory action research, which aims to explicitly link action and research activities (Stringer, 2014; Eelderink et al., 2020).

In general, case studies allow researchers to *"reveal the multiplicity of factors [which] have interacted to produce the unique character of the entity that is the subject of study"* (Blaze Corcoran et al., 2007: 9, quoting Yin, 1989). In these settings, for the purposes of this thesis, we experiment with new methodologies and particular *"stagings"* of the futures practices (Hajer & Pelzer, 2018). We develop and test new modes of interaction, through e.g., games and design approaches, with communities that have emerged around one

or more sustainability issues in their city. To measure the outcomes of the engagement of these communities with their futures practices, a mixed-method design is employed in each chapter. The methodologies in this thesis were chosen in order to measure the outcomes of a futures practice during or immediately after each interactive session (e.g., through surveys, or interviews), as well as much later (e.g., through document analysis). This enabled the various kinds of outcomes of a futures practice to be measured, from the personal (capacity building, learning, behavior change) to the governance level (local organizing, new policies).

Chapter 2 presents a literature review of anticipatory governance, transformations, futures literacy with an emphasis on experimental and experiential futures. This sets a theoretical stage for the subsequent four empirical chapters. The empirical **chapters 3–6** present concrete cases of distinct futures practices, showing particular communities that aim for transformations. This demands a mixed-method approach in most cases, tailored to the specific empirical context at hand. In **chapter 3**, a community of Kyoto food system actors engage in a complementary set of futures methodologies: visioning, back-casting, and serious gaming. To collect and analyze the pluriform results of these practices, a mixed-method approach of surveys, workshop observations, semi-structured interviews, and focus groups was deemed the most appropriate. **Chapter 4** builds on the futures work in **chapter 3**, by returning to the Kyoto FPC case to do a follow-up study into the longer-term outcomes. Evaluating experimental and critical futures approaches is not yet commonly done, so in this chapter I develop a set of evaluation criteria and assess them using data from semi-structured interviews as well as document analysis. In **chapter 5**, a community of smart city practitioners engages with a design tool that lets them re-imagine the future that their project helps shape. To collect data on this futures tool, surveys, and interviews were conducted after workshops in which it had been used. The workshops also yielded observation data. In **chapter 6**, a community of students experiments with their city in an urban futures game. The digital game infrastructure provides a unique opportunity to collect data on the players' decisions and preferences. Furthermore, the participants were surveyed before and after playing the game and more in-depth data was gathered in several focus groups.

The novel methodologies designed to experiment with futures are an important contribution of this thesis. Their data and the outcomes that these methodologies generate can be scaled in various ways (Lam et al., 2020), but perhaps the most significant contribution and potential for scaling is in applying the generalized futures methodologies in various situations. In these situations, the four main challenges underlying this thesis — perspectives, methodologies, contexts, and evaluation — can vary, yielding new insights every time.

[1] *The Guardian 20-6-2019*

2. FUTURES LITERACY AND THE DIVERSITY OF THE FUTURE

In this chapter, we argue that a key component of futures literacy is reflexivity regarding different attitudes toward the future. Various intellectual traditions and futures practices make epistemologically distinct claims about the future and its manifestations in the present. Through their different outlooks on analyzing, understanding, and influencing the future, these diverse approaches represent fundamentally different attitudes to what it means to meaningfully engage with the future. Because of this diversity of attitudes toward the future, and the different possible modes of engagement with the future, futures literacy is more complex than it appears at first glance. Looking at recent developments in futures literature, we build on four epistemologically and ontologically distinct approaches to the problem of the future. We argue that being futures literate depends on reflexivity about these different engagements with the future, and what these different approaches can offer future-oriented action respectively. Such reflexivity entails being reflexive about how different approaches to the problem of the future arise, as well as about the underlying power structures. We also investigate possibilities to cultivate this futures reflexivity and conclude with a set of questions to guide future research in deepening reflexivity as a key element of futures literacy.

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2.1. Introduction

The most lasting heirlooms of the past decades of studying the future are arguably the forward- looking practices that have created specific tools, methodologies, and artefacts with which to engage with the future, such as scenario development and simulation modelling (Andersson, 2018). These tools and practices have become "staples of global governance" (Andersson, 2018: 10). As such, they have come to inform and shape not only what it means to know the future, but also how to anticipate and interact with it. Importantly, these forms of future orientation rely on particular notions of projectivity, or the inherent future-oriented nature of agency and action, and of futures literacy, or the ability to use an appreciation of projectivity to act upon the future.

As Emirbayer and Mische (1998) recognized, all agency necessarily has to be future-oriented to some extent, because it is through projectivity that action attains its imagined value and meaning. Yet despite this, most people remain unaware of the projectivity of their own actions. To a significant extent, futures literacy as a field of research and intervention is predicated on the observation of people's inability to act on the future. For Riel Miller (2007; 2018), a pioneer in futures literacy, this inherent future-orientedness of behavior means it is important to educate people in futures literacy, enhancing their capacity to act on the future. At the same time, however, there exists a great variety in attitudes toward the future — as well as a variety of interpretations of what it might mean to be futures literate. Because of the diversity of attitudes toward the future, and the possibilities for modes of engagement with different futures, futures literacy is more complex than it first appears. As Lemke and Van Helden (2015) point out, literacy itself is a complex word. Originally denoting specific individual competencies, literacy has increasingly come to describe a process of collective meaning-making. This means that in a rapidly changing society facing uncertain futures, it is also uncertain which literacies are called for (Cope & Kalantzis, 2015; Lemke & Van Helden, 2015). In addition to more widely recognized literacies around knowledge, internalized design, and research, multiple ways of anticipating and acting on an ever-changing environment are also crucial. It is clear, however, that there are multiple established traditions of anticipation and future-oriented action, all with recognizable conceptions of futures literacy. There are, in short, multiple futures literacies, or at least multiple forms of futures literacy.

In this chapter, we zoom in on the multiplicity of the term futures literacy. We argue that a key component of being futures literate is reflexivity: a critical awareness of different attitudes toward the future, including what can be known about it, how it affects the present, how to study and measure it, and how to create pathways for action. An important element of such a reflexive futures literacy is an awareness of the multiple, often implicit interpretations of futures literacy, and how these are in constant conversation about different ways to "use the future". By showing how different traditions have different implicit and explicit perceptions of futures literacy, we aim to add to the debate on futures literacy by calling for a reflexive understanding of how particular conceptions of the future take shape and take hold, including the role that power plays in this process, to increase the futures literacy of different strands of futures studies themselves.

We suggest, then, that to be futures literate starts with being literate about what attitudes toward the future exist and what the power dynamics are, with being reflexive about one's own attitude toward the future, and with being aware of what other attitudes toward the future might have to offer. For purposes of clarity, in this chapter we suggest that futures are always plural but that there are analytically coherent attitudes toward "the" future. As such, we speak about futures (plural) whenever it concerns the plurality of possible future worlds (and the plurality within any given future) and about the future (singular) whenever we refer to the intellectual relationship to "the future".

The chapter is structured as follows: The next section elaborates on different epistemological and even ontological points of departure for futures approaches, and connects this to futures literacy. The third section of the chapter highlights approaches to the future that we argue are currently underrepresented but crucial for futures literacy. The fourth section proposes the concept of reflexivity as a way to consider various approaches to the future more critically and select ways of engagement that are fit-for-purpose. We end the chapter with a conclusion and some proposed avenues for future research into reflexive futures literacy.

2.2. Approaches to futures literacy

In the governance literature, various intellectual traditions make their own epistemologically and even ontologically distinct claims about the future and its manifestations in the present (Andersson, 2018; Muiderman, Vervoort, Gupta, & Biermann, 2020). These claims range from studies of the performativity of imagined futures (Beckert, 2016), sociotechnical imaginaries (Jasanoff & Kim, 2015), futures-in-the-making (Groves, 2017), futuring (Oomen, Hoffman, & Hajer, 2021), and expectations (Borup, Brown, Konrad, & van Lente, 2006; Van Lente, 2012) to investigations of "futures-in-the-making" and their discursive-material enactment (Adam & Groves, 2007, 2011; Groves, 2017; Tutton, 2017), and proactive attempts to adequately prepare for the future in terms of governance (Guston, 2014; Muiderman et al., 2020), design (Bendor, 2018; Candy & Dunagan, 2017), transitions (Geels & Schot, 2007; Grin, Rotmans, & Schot, 2010), and transformations (Hebinck, Vervoort, Hebinck, Rutting, & Galli, 2018; Wolfram, 2016). As a result of their different outlooks on analyzing, understanding, and influencing the future, these diverse approaches have fundamentally different attitudes to how the future should be treated — and what it means to meaningfully engage with the future. As such, they also hold different conceptions of what it would mean to be literate about the future. Most recognize, however, that it is deeply important to engage with the future as such, because people's actions are always in some way anticipatory — and in that sense always future-oriented (e.g., Bell, 2004; Bergman, Karlsson, & Axelsson, 2010; Miller, 2018; Vervoort & Gupta, 2018). Indeed, as Arjun Appadurai has shown, such an orientation toward the future is also evident among the world's poorest, such as in the capacity of Indian slum-dwellers to aspire to imagined futures (Appadurai, 2004, 2013).

As Jenny Andersson (2018: 4) observes, futures research is always "an intervention into the present and an attempt to shape coming times through the creating of manifold technologies, devices, and forms of future experience". This means that interpretation of futures literacy

always depends on the kinds of interventions made in the present, and how future times are imagined to be shaped. In literacy pedagogy, for example, literacy is considered a tool for the understanding and joining of discourses. Cope & Kalantzis (2009) describe the development of literacy as the creation of "active designers of meaning". In their work on multiliteracies, they describe literacy as a deeply constructivist practice: "each meaning maker designs the world afresh in a way which is always uniquely transformative of found meanings; and then leaves a representational trace to be found by others and transformed once again" (Cope & Kalantzis, 2009: 20). Futures literacy is, likewise, the capacity to "use the future" in various ways (Miller, 2018). Two questions feature centrally in such a view on futures literacy: Firstly, what is the future? And secondly, what methods do we use to "know the future"?

Despite the fact that people always base their actions, both individually and collectively, on some conception of the "later-than-now" (Miller, 2018), these questions are often overlooked. What anthropologist Arjun Appadurai (2004) has called "the capacity to aspire", the ability to imagine and strive toward a life or society different from one's present situation, is typically an implicit phenomenon rather than a process in which people are "active designers of meaning" (Cope & Kalantzis, 2009). As Riel Miller notes, *"people's fictions about the later- than-now and the frames they use to invent these imaginary futures are so important for everyday life, so ingrained and so often unremarked, that it is hard to gain the distance needed to observe and analyse what is going on"* (Miller, 2018,: 2).

Futures literacy addresses the capacity to reflect on such questions and the capacity to empower a more deliberate engagement with futures. In doing so, futures literacy as a concept tries to open up questions of the future both to a wider set of actors and to a wider set of questions. It offers a framework and corresponding social technologies that can acquaint people with thinking about the future and the choices made. We argue that in order to be successful, futures literacy needs further recognition of the many different possible answers to Miller's (2018) questions: "what is the future?" and "what methods do we use to know the future?" Futures literacy and, by extension, futures education can never be disentangled from normative and political commitments toward the future. As such, it is important to understand how different attitudes toward the future will influence what it means to be futures literate. We argue that futures literacy should be contextualized not just geographically or economically, but also epistemologically and ontologically, especially if the aim is to expand the range of possible futures. Comprehending how particular answers to Miller's (2018) questions shape the space for engaging with futures, and how certain methodologies and epistemologies open up or narrow down a particular range of what is possible and imaginable, is a crucial step on the path toward futures literacy. It will also help to understand and improve anticipatory systems and processes and contribute to the design of anticipatory approaches that are suited to their respective purposes.

A useful point of departure for this epistemological and ontological contextualization is the framework suggested by Muiderman et al. (2020), which investigates how different intellectual traditions approach the two questions posed by Miller (2018). Through a literature review with the notion of "anticipatory governance" at the center, the authors

categorize a diverse set of relationships to the future in different futures practices. These different approaches to the future are categorized according to three core aspects: "(i) assumptions about the future, in particular assumptions about the knowability and manageability embedded in the approach; (ii) the implications for actions to be taken in the present; and (iii) the ultimate aim of engaging in/with anticipatory governance" (Muiderman et al., 2020). This leads to a framework comprising four approaches, each with their own epistemology and tools. The paper points out that the same methods and tools are often used across different approaches to attitudes toward futures, resulting in very different framings of their processes and results. The first approach assumes that the future is at least partly knowable. The accompanying tools and methods consist of planning mechanisms and models to determine the probabilities of certain futures unfolding, including low-probability but high-impact futures, with the aim of mitigating risks. The second approach sees fundamental uncertainty in predicting any future, and thus prefers to conceptualize multiple plausible future pathways in order to test adaptive capacities in a future- oriented fashion. These approaches include a portfolio of quantitative models, participatory scenario development, strategic planning, and horizon scanning. A third way of engaging with the future aims to open up alternative future pathways through collectively imagining multiple futures, using design, gaming, and other experimental and experiential interventions geared toward co-creation. Lastly, a tradition of critical deconstruction and analysis interrogates engagements with "the future" by questioning how visions of and imaginaries for the future take hold and assessing their political implications.

These four approaches present fundamentally different epistemological and even ontological points of departure — and various implications for what it means to be futures literate. The first two approaches, though distinct, are more focused on reacting to contextual futures, either by predicting and mitigating risks (approach 1, which we will refer to as "predictive") or reflexively navigating plausible futures (approach 2, which we will refer to as "plausible"). In a sense, these engagements with the future rely on being literate about what the future may hold. The third and fourth approaches have different aims. Instead of asking what the future may hold and how one might react to that future, these approaches take a deeply constructivist view of the future, where being futures literate specifically relates to being aware of how the future is constructed in the present. The third approach, which we will refer to as "experimental" for the purposes of this chapter, aims at the collective co-creation of new futures — seeking to expand, through collective experimentation, engagement, and imagination, the range of futures imagined as possible and/or desirable, often focusing on how such futures can become present-day reality. Similarly constructivist, the fourth approach, which we will refer to as "critical", takes a more analytic view, scrutinizing imaginaries in order to shed light on their political implications.

A key point here is that these different approaches do not only have different interpretations of what it would mean to be futures literate — they are also often unaware of (or at least unreflexive about) other approaches. Often, futures researchers are not explicitly aware of how their mode of engagement with the future differs from others', because many of the differences and disagreements emerge from implicit assumptions about the world rather

than explicit methodological investigation (Vervoort & Gupta, 2018). This makes it difficult for futures practitioners from different backgrounds to "read" or decode each other's work. As a result, disagreements may remain unclear or obscured because fundamental assumptions do not surface. For non-researchers, such as policy makers, organizations who shape society and various markets and sectors (Grin, 2006), and private individuals, these differences can make futures literacy a prohibitively difficult aim. Literacy about the various ways to engage with the future is further complicated by the fact that, as Muiderman et al. (2020) recognize, these epistemological and ontological positions on futures do not enjoy equal representation in on- the-ground anticipatory practices.

In future-oriented fields of research, the majority of anticipatory practices have focused on mapping out probabilities or predicting a set of futures. Engaging with the need to navigate deep uncertainties in a more adaptive, constructivist way also happens, but less often, especially in fields dominated by technological discussions, like climate engineering (Low & Schäfer, 2019; Oomen, 2021). Imaginative and experimental futures approaches have received significantly less attention, or have been limited to exclusive, top-down, and often deeply commercial engagements with desired futures. Critical investigations of imagined futures are often contained within academia and rarely seek to actively impact societal futuring. This under-representation of both experimental and critical futures approaches, and to a lesser degree of approaches that focus on navigating uncertainty in practice, can have many different causes depending on context and scale — such as a lack of resources (Vervoort et al., 2014), lack of knowledge of alternative futures interventions (Carolan, 2016), or an epistemological preference for quantitative projections (Ezrahi, 1990; Low & Schäfer, 2019; Porter, 1995; Rijkens-Klomp, 2012) — and is often also due to the fact that they do not fit larger cultural assumptions about valuable knowledge and decision-making (Stoll-Kleemann, Riordan, & Burns, 2003).

Experimental and critical approaches open up futures to creativity, radical change, and critical reflection, making possible a more varied and reflexive view of what the future is and how to engage with it (Oomen et al., 2021). In their seminal article on wicked problems, Rittel and Webber (1973) describe how a solution for these undefined, complex social-policy problems can only emerge from a collective argumentation process. This emphasis on sense-making, as Hoffman et al. (2020) term it, is reflected in the "weaving" process that Cope and Kalantzis (2015) describe in their pedagogy of multiliteracies. This process of collective meaning- making moves backwards, forwards, and across acts of experiencing, conceptualizing, analyzing, and applying. While probabilities and prediction suit the purposes of practitioners presented with non-wicked problems, the power of prediction decreases as the time horizon and complexity increase (Swart, Raskin, & Robinson, 2004). Approaches that recognize this challenge embrace deep uncertainty, but run the risk of remaining merely adaptive, rather than transformative, by downplaying the constructive political agency inherent in the crafting of futures. Futures literacy requires a far more imaginative and reflexive understanding of what the future is and could be — and especially an awareness of and reflexivity about this multiplicity of possible approaches to the future.

In recent years, this recognition has grown both within and outside of academia. In design studies, Morrison et al. (2020: 115) describe design as "having shifted away from a techno- modernist design solutionism and to how it may engage in shaping futures through experimentation and exploration in the critical and productive engagement with techno-cultural life". Practitioners and academics in traditionally more quantitative futures disciplines, such as scenario modelling, have made considerable efforts to include more speculative, imaginative, and participatory elements in their processes (Kok, van Vliet Mathijs, Bärlund Ilona, Dubel, & Sendzimir, 2011; Mason-D'Croz et al., 2016). These developments fulfill an important condition of futures literacy: a blend of methods and hybrid approaches (Miller, 2007). For large and complex problems, however, this expansion has not been able to fully bridge the knowledge-action gap or the value-action gap: the divides that exist between the knowledge that people gather to form their futures practices, and how they process and act on this knowledge (Bendor, 2018; Blake, 1999). Furthermore, the context and staging of futures are still largely undervalued (Hajer & Pelzer, 2018; Oomen et al., 2021). What Grin (2006: 60) described as the "Aristotelian notion of metis: the craft to take contextual conditions into account" is still a futures studies blind spot.

To increase futures literacy, there is space for both academics and practitioners to clarify the fundamental aims and assumptions of futures work. In addition to this, measuring and reflecting on the outcomes of any futures endeavor is key to anticipatory practices that are fit- for-purpose. As Miller (2007) indicates in his argument about the necessity for hybrid methods and approaches, futures literacy necessarily entails being literate about which approach serves which purpose. Only based on literacy about different epistemological and ontological points of departure can such hybridity be achieved in any meaningful way. The predominance of quantitative projections that, in the words of Andy Stirling (2008) "close down" the range of options for the future — and, correspondingly, the underrepresentation of qualitative, interpretative methods — leads anticipatory practices, including governance and education, to focus on futuring tools that may not serve their intended purpose. In the remainder of this chapter, we argue for a revaluation of qualitative, interrogative, and explicitly imaginative futures methods, in order to clarify how and when certain epistemological and ontological approaches to the future are fit-for-purpose. Central to this attempt are embedded notions of agency and structure, as well as the extent to which the future can be shaped by deliberate action in the present.

2.3. Broadening the concept of the future

In this section, we aim to analyze recent developments in speculative and critical futures, and draw lessons from them to make the futures field more reflexive and thus deepen what it means to be futures literate. As Jenny Andersson states, engaging with futures is always also "an intervention into the present" and "an attempt to shape coming times" (Andersson, 2018: 4). Rather than looking at futures research as an attempt to project or predict the future most accurately, we see futures research as a way in which actors shape both the present and the "later-than-now". In such a view, approaches to the future are not simply tools for making accurate predictions or facilitating new visions for the future,

but rather "Techniques of Futuring": *"practices bringing together actors around one or more imagined futures and through which actors come to share particular orientations for action"* (Hajer & Pelzer, 2018: 225). From this perspective, while the different approaches to the future may have different tools and artefacts, their practices can still be compared as practices that bring people together around particular imagined futures (Oomen et al., 2021). The central insight of such a constructivist lens on 'futuring practices', shared by historians (Andersson, 2018; Warde & Sorlin, 2015), sociologists (Beckert, 2016; Borup et al., 2006), and anthropologists (Appadurai, 2013), is that the main social function of imagined futures and the tools/approaches that construct them is their capacity to inform meaning and stimulate action and guide choices in the present. This means that although the accuracy of certain visions of the future, such as climate models and economic projections, is (typically but not always) important for public trust in them, their primary social function is bringing people together around particular orientations for action — not describing the most accurate future. The four futures approaches outlined by Muiderman et al. (2020) make different claims about the future, but their claims still aim to fulfill a social role in bringing people together around certain images of and for the future.

Reflexive futures literacy, in our view, should include a recognition of this social function of images of the future and, importantly, the implications that the different types of approaches to the future have for acting on the future — and an ability to reflect on the different conceptions of futures literacy that might result from such different approaches. "What is the future?" (Urry, 2016) is never a question with a clear answer, because the future "has not taken material form in the present time" (Tutton, 2017: 4). Because "there are no future facts" (Brumbaugh in Bell & Mau, 1971: 9), the future is real only to the extent to which present alternatives or possibilities for the future are real (Bell & Mau, 1971). The main function, then, of the future is as an approach for action in the present, as Riel Miller (2018) also recognizes when he observes that imaginary futures and anticipation are an integral part of acting in the present. Recognizing the primarily imaginary function of the future does not of course mean that the future is irrelevant or immaterial. Anticipations of climate change, for example, fundamentally weigh on the present — and show clearly that the present also weighs, increasingly heavily one might add, on the future. But it does mean that futures literacy depends to a great extent on being able to distinguish between different types of imaginary futures and how those futures come into being, as well as the reflexive capacity to reflect on how futures imagined differently also lead to different outcomes — and different literacies. As outlined above, the four futuring approaches — probability-focused projections, engaging with uncertainty through multiple comparative pathways, experimental opening up of imaginative alternatives, and critical deconstruction of imagined futures — clearly have different tools and practices that bring people together around particular imaginary futures. Simply put, they have different social mechanisms that bring people together, and as such they have different social functions. So what are the social functions (by and large) of futures approaches, and how do they relate to futures literacy?

Predictive futures approaches focus on understanding the likelihood of different future eventualities, including low-likelihood but high-impact futures. The social function of this

approach to engaging with futures could be described as providing planners with a better grip on the future — and, arguably, inspiring confidence in plans and strategies, and in those proposing them, by identifying risks and finding ways to mitigate them. Futures literacy in this approach consists of the ability to understand/be able to interpret, as well as apply, quantitative approaches for scenario projection and the estimation of likelihoods associated with different scenarios (Muiderman et al., 2020).

Plausible futures approaches embrace the future as deeply uncertain, and widely divergent scenarios as plausible within bounded structures. Socially, this approach brings people together around a collective anticipatory capacity as a part of their overall adaptive capacity. Together, this group explores new futures that challenge previous assumptions about what might happen. It supports the collective investigations of organizational blind spots and strengths, opportunities for investment in new skills and capacities, and the need to establish buffers and back-up plans, giving organizations and communities a sense of being able to prepare for the future. The focus here is on practicing with futures (Guston, 2014). Futures literacy, as interpreted by this type of approach, means systems thinking — being able to understand how a multitude of drivers co-produces challenging and complex futures. The systems thinking lens is also applied to organizations and communities themselves, which are to be understood as adaptive systems in a changing context (Williams, Kennedy, Philipp, & Whiteman, 2017). Furthermore, futures literacy means being comfortable with deep uncertainty (Maier et al., 2016). Finally, it means being able to re-perceive the present through the eyes of many challenging futures (Wack, 1985).

Experimental futures approaches interventions aim to generate shared realities that have mobilizing power in the present. Their imaginative practices bring people together around novel futures that, once envisioned, can orient people toward the actions needed to bring such futures about. Bringing people together around such newly imagined futures is a social and political process, in continuous competition with the presence of more dominant imagined futures and the sociopolitical structures that reenact them. Experimental futures practices often center around bringing together novel groups and mixes of societal actors, especially including those involved in new niches or "seeds" of new futures (Bennett et al., 2016). Futures literacy from an experimental futures perspective means individual and collective imaginative power, the capacity to generate new realities and to inspire acts of imagination in others. Futures literacy in this mode also means the recognition that dominant futures are constructed, that they can be replaced, and that alternative futures are always waiting to be born — to recognize the "evolutionary potential of the present" (Snowden, 2011: 223). It is "worldmaking capacity" (Vervoort, Bendor, Kelliher, Strik, & Helfgott, 2015). It also means an ability to think about concrete change pathways (Hebinck et al., 2018) — to understand how transformations and transitions have been demonstrated to happen and may be possible in the future (Feola, 2015).

Critical futures approaches do not presuppose an active, formative engagement with the future as such, but rather bring people together around a reflexive deconstruction of images and imaginaries of the future. In doing so, critical interventions demystify, denaturalize,

and historicize imagined futures, showing how ideas about plausibility, desirability, and probability are not self-evident or natural. Rather, they are the result of social processes (e.g., Beck & Mahony, 2018; Beck & Oomen, 2021), deliberate interventions (Hajer, 2017; Hajer & Pelzer, 2018), power distributions (Stirling, 2018), and existing collective imaginations about both the future and the social fabric of society (Jasanoff & Kim, 2015). As such, critical engagements with the future open up the "black box" that naturalizes particular visions of the future — rendering them available for critical scrutiny. Socially, this critical scrutiny makes room both for alternative futures, such as those provided by experimental interventions, and for reflection on the assumptions that make up the interventions aimed at predicting futures or mitigating uncertainty.

While all four types of future making and future-oriented investigation can be useful, they are not equally applicable in all circumstances. Projections might be able to extrapolate current trends accurately, and even convince their audience of the inevitability of their projected futures, but they typically cannot meaningfully incorporate radical ruptures or cultural sea changes. Normative explorative futures, on the other hand, can imagine possible future worlds but often lack the sort of extrapolative rigor that projections have. Both are important. Futures literacy at a level that recognizes and can engage with these different approaches to futures work, across the board, is precisely so important because it teaches practitioners, scientists, and policymakers, as well as others, to think critically about what types of imagined futures are fit for what and whose purpose, and to appreciate its respective power-effects. As the 21st century calls for major and rapid system changes across the board — the recent COVID-19 pandemic is the most charismatic example, but climate change and other forms of environmental degradation are others — the question of what practices inform planning and governance around the world is increasingly pertinent. It is clear that 20th-century methods of projection and planning do not hold up particularly well in light of a search for systems change. Rather, there is a need for emergent and innovative approaches to the future that can both question current systems and roadmap needed changes.

Understanding futures literacy as the ability to relate to different attitudes toward the future can also be used to reflect on a strand of futures work that complements and combines different approaches to the problem of the future. Imaginative exercises and experimentation can be combined with the projective scientific rigor of predictive approaches or deep uncertainty to make transformative imagined futures socially persuasive. In such a process, highly speculative or imaginative futures are given more credence by relying on deeply embedded social technologies that are tailored for specific purposes. Such deliberate use and recombination of different types of futuring can be used to identify points of improvement and to spark creative new ideas. In such recombinations, explorative experimental futures interventions can be used to give a social life and imaginative existence to the type of projections characteristic of predictive futures approaches, predictive interventions can function as legitimation for particular imagined futures, and plausible scenarios can be used in service of an improved overall experimental approach. There are many possibilities and a large potential for combining different types of futuring (e.g., Hebinck et al., 2018; Kok et al.,

2011; Vervoort et al., 2014). Such hybrid futuring demands a reflexive futures literacy from participants in the form of the ability to switch between more context-focused and more vision-focused modes of engagement.

Hajer and Pelzer (2018) illustrate this idea with the case of "2050: An Energetic Odyssey", an audiovisual installation depicting all energy for the Netherlands coming from turbines in the North Sea. This intervention was carefully staged, with a handpicked audience of high-level actors from business and policy making present in a curated environment. For the intervention, the authors built on Shapin & Schaeffer's (1985) famous insights about how a "crucial experiment" can create a shared moment that brings people together around a shared norm or, in the case of the Energetic Odyssey, an imagined future. The goal of such an intervention, then, is to facilitate "reality effects" (Ezrahi, 2012) that suspend the disbelief people have about particular imagined futures by presenting new knowledge strategically — by fostering a collective belief in these imagined futures. In recent years, many interventions have attempted to foster such moments in the hope of opening up new possibilities for imaginaries of the future through experiential futures. Some examples are the use of future generations in decision- making processes at the local government level (Kamijo, Komiya, Mifune, & Saijo, 2017); mapping a pre-collapse society (Candy & Dunagan, 2017); and exploring water management futures under climate change in a game (Van Pelt et al., 2015). Most of these experiential futures interventions have an open-ended nature that allows for speculation and more associative imagining of many different futures. In this open-endedness, based on a reflective reading of the present, these interventions are an outflow of what Ulrich Beck (1992), John Giddens, and Scott Lash (Beck, Giddens, & Lash, 1994) called a reflexive modernity (Grin, 2006). They allow for reconsideration and course-correction of a planned pathway or imaginary through making these projections of the future their own theme. This reflexivity is also visible in the examination of the outcomes of futures interventions. In classic scenario or visioning workshops, it is possible to end the workshop with a specific plan, and to track that plan along its eventual execution. Reflexive speculative or creative futures interventions are more multifaceted and differ every time, which makes it difficult to reflect on their outcomes or even impacts.

The ambiguity of outcomes and difficulty in reporting on them is a barrier for these practices to being widely adopted in governance and planning processes. Hajer and Pelzer (2018) use a discourse analysis, tracking the expressions and pledges of funding made by their audiences in the media after their intervention. The outcomes of even more speculative interventions are often only anecdotally reported (Candy & Dunagan, 2017). Their contributions in terms of speculation, testing, experimenting, and critical reflection on such interventions, however, are also important elements of futures and arguably of governance and planning processes. This becomes even more pressing in the face of present-day large and uncertain economic, environmental, and social changes such as the energy transition at the center of the "2050: an Energetic Odyssey" case. Key to finding a futures approach that is fit-for-purpose is the identification of the desired contribution to a process. This depends on the aim of the process, but also the stage and the people involved. Adapting Rijke et al.'s (2012: 76) definition of fit-for-purpose governance, we can define a fit-for-purpose futures approach as "a measure of

the adequacy of the functional purposes that futures practices have to fulfil at a given point in time". Finding the purpose of a futures approach is crucial, both to get to a desired outcome and think about a diverse range of possible futures.

2.4. Futures literacy as reflexivity

Understanding futures literacy as the ability to relate to different attitudes toward the future can help foster a more general reflexivity about futures and the effect of specific futuring interventions. Experimental and critical futures work is important precisely because it interjects such reflexivity into the debate about the future. Reflexivity about the effect of particular futuring interventions is crucial, because imagined futures have power. They coordinate and structure action in the present, thereby giving a particular shape to the future also (Beckert, 2016; Jasanoff & Kim, 2015). Experimental and critical approaches open up the possibility to not only analyze more explicitly the politics of the future by investigating how certain actors exercise the power of the imagination over others, but also how such power shapes the future. The power to determine how people think about the future, what is conceivable and what is not, is, arguably, the highest form of power. It bestows, in the famous words of Steven Lukes (1974), "ideological power": the power to shape people's wishes and desires. It shapes, moreover, people's imaginative perceptions of power and normalcy, embedding tacit collective imaginations that organize the world (Ezrahi, 2012; Taylor, 2004). The fact that so many people think that the future of mobility is all about self-driving cars, for example, might say just as much about corporate power to shape imaginations of the future as it says about what is a plausible future, let alone a desirable future. Reflexive concepts such as the techniques of futuring concept (Hajer & Pelzer, 2018; Oomen et al., 2021) analyze the social life of futuring interventions. Similarly, a concept like anticipatory governance is explicitly framed as focusing on futures as a site for politics (Vervoort & Gupta, 2018). Such concepts allow for an understanding of how ideological power over the future is exercised by different actors at different times. Categorizations such as those proposed by Muiderman et al. (2020) paint a comprehensive picture of the futures field and the various existing epistemologies and approaches. Moreover, raising the question "whose literacy?" also allows us to think about who particular traditions of futures work are organized and optimized for. Deeply quantitative approaches "fit" within a policy-making context (Low & Schäfer, 2019; Rijkens-Klomp, 2012); commercials and advertising are tuned toward the general public and shape their "fictional expectations" (Beckert, 2013). Likewise, we can discern a predilection for the mobilization of the arts via biennales, installations, or performances in museums or public space in the more experimental and critical traditions (Pelzer & Versteeg, 2019).

It is precisely because the power to shape the future ideologically is so great that reflexivity about what types of futures the different approaches portray and circulate is important. Different types of futuring have different specific effects on the types of futures that are collectively imagined and worked toward. Some open up different spaces for action, while others narrow down the range of action (Stirling, 2008). Opening up or closing down futures is always a political act, because it always entails a certain distribution of power and resources — and presupposes a form of ideological power. This means that questions about how to

open up and close down futures are always crucially important. A reflexive futures literacy can foster awareness about images of the future, and (importantly) also the ways in which such futures are produced and performed. A reflexive futures literacy, then, embraces the shaping effect of different approaches to future-oriented action, turning our attention not only to futures as they are presented, but also to "futures-in-the-making" or futures as they are made. In doing so, it can facilitate a form of literacy that can critically reflect on what types of futuring interventions and knowledges about the future are necessary.

According to Brian Wynne (1993: 321) reflexivity can be defined as the "systematic processes of exploration of the prior commitments framing knowledge". Salmon, Priestley, and Goven (2017: 58) expand this definition by adding an explicitly active component in the "informed capacity to critically analyse one's underlying assumptions, expectations, and positioning in relation to one's involvement in outreach. It is not simply an internal thought process, but rather a type of thinking tied to action. Reflexive thinking makes possible ways of acting that would not otherwise be possible". Reflexivity, as precisely such an active mode of critically analyzing both the underlying assumptions and the effects of futuring approaches and images, can present an antidote of sorts to a linear way of thinking in which uncertainty is eliminated through ever more data and expert knowledge, much like John Grin envisions reflexivity in relationship to governance (Grin, 2006). This builds on the idea of reflexive modernization proposed by Beck, Giddens & Lash (1994), who argued that a focus on the elimination of uncertainty has left institutions with blind spots for risk and externalities. This lack of reflexivity can lead to a hubristic and narrowly technocratic relationship with the future (Jasanoff, 2003) due to a homogenization of processes and the omission of local specificity at the cost of taking into account contextual factors (Grin, 2006). This comes at great potential cost environmentally, technologically, and societally (Hajer et al., 2015). Such blinkered visions are a form of "futures illiteracy" that can be overcome by institutions and individuals that self-critically review their own prior, tacit commitments. Commitments that would need to be questioned could include visions of control and a technological fix, economic competitiveness, or the idea that technoscientific innovation as such will induce social progress (Braun & Kropp, 2010; Kuhlmann & Bogumil, 2018). Used in such a way, reflexivity can present a way to move beyond an "unstructured pluralism" that construes "scientific reliability and social legitimacy as distinct requirements that have to be pursued in parallel and traded off against each other" (Popa, Guillermin, & Dedeurwaerdere, 2015: 46). This means that reflexivity does not mean postmodern unmooring but rather a way to steer very precisely into the desired direction (Grin, 2006).

Futures literacy interpreted at least in part as reflexivity can strengthen both particular engagements with the future in any given approach and the capacity to engage with the later- than-now in principle. In doing so, it can also help one assess what types of knowledge about or visions of the future are fit for the purpose they serve in particular problem situations. When, for example, does it make sense to project certain environmental futures, and when are more open-ended, explicitly democratic forms of futuring more applicable, more likely to lead to beneficial and just futures? And what types of images and future-oriented action are now predominant in society, and why? Reflexivity can also help

to address meaningful recombinations of futuring approaches, by merging, for example, hard natural boundaries with reflexive and open-ended deliberations and visions of the future. An institutionalized form of reflexivity can also strengthen all four approaches to futures engagement themselves. For purposes of prediction, reflexivity can help see the limits, blinkered visions, and historical contingencies of models and projections, as well as potential problems created by the ways in which this approach of futuring might reinforce status quo thinking. For navigating uncertainty, reflexivity may help see blind spots and a lack of inclusivity in futures processes. More fundamentally, it can help identify the problems with an adaptive, and therefore reactive rather than transformative, stance toward the future. For more open-ended experimentation, reflexivity may help identify where the transformative and generative impulse of this type of futures engagement may create its own blindness to contextual challenges. For critical futures, whose entire engagement with the future revolves around reflexive criticism, a reflexive futures literacy can motivate a constructive engagement with the future that can help steer into the future clear-eyed, with a keen sense of power distributions and normative commitments. A reflexive futures literacy, then, can help people engage and span different types of future- making, can aid inter- and transdisciplinary collaboration between different types of futuring, and can address the ideological power that goes into shaping the later-than-now.

2.5. Conclusion

Futures literacy is increasingly important in a rapidly changing world in which the weight of the future on the present is increasing as a result of environmental fears and the immediacy of pandemics — as is the weight of the present on the future through technological and environmental change. Beyond asking "what is the future?" and "how can we anticipate and interact with the future?" it is also important to keep asking "what is futures literacy?"

From our analysis, we can draw two main conclusions about reflexive futures literacy. Firstly, reflexive futures literacy includes being able to articulate the differences between different types of futuring, being aware of the social and imaginative effects of particular futuring practices, and being able to reflect on what types of futuring are fit for what type of purpose.

This extends to institutions and policy as well as individuals. Secondly, and possibly more importantly, reflexive futures literacy facilitates asking the right questions at the right time, ensuring that our understanding and collective sense-making of the future is informed by the right metrics, careful staging, and the right type of ideological power. Reflexive forms of futures literacy, regardless of the approach and tradition they exist in, explicitly acknowledge that power, and are able to deliberately but sensitivity steer images of the future in empowering — and ideally also environmentally-friendly and democratic — ways.

Several questions for further research can aid the development of reflexive practices for the engagement with futures:

- What assumptions, values, and worldviews underlie our relationships with the later-than- now?

- What approaches exist to make sense of the future? How and when are they used? How and when should they be used?
- How can we understand and evaluate how futures approaches change relationships with the later-than-now?
- How can predominant ideas about and conceptions of the later-than-now be challenged? By whom, how, where, and when?

Reflexivity in futures literacy consistently asks how we understand, anticipate, and act on the future, how this frames and shapes the world we live in, and how we ascribe meaning to our actions in the present. This allows for a more diverse and holistic range of futures, images of which can guide decisions in the present.

3. NEW PATHWAYS FOR GOVERNING FOOD SYSTEM TRANSFORMATIONS

A pluralistic practice-based futures approach using visioning, back-casting, and serious gaming

The global environmental change that characterizes the Anthropocene poses a threat to food systems. Cities increasingly serve as the spaces where civil society, private actors, and local governments come together to strategize toward more sustainable food futures and experiment with new forms of food governance. However, much of the futures literature in the context of sustainability focuses on large-scale, global scenarios. These are important pieces of knowledge, but they often do not effect a change in local perspectives and practices. In this chapter we respond to the need for novel futures approaches to help urban coalitions of societal actors create pathways to sustainability transformations. We investigate how existing examples of good practices, or "seeds," can be used to open up novel, desirable, bottom-up futures in the case study of Kyoto (Japan). Innovative combinations of methodologies (visioning, back- casting, simulation games) are used and assessed in order to create multiple ways of experimenting and engaging with food system futures. Our results consist of a pluriform pathway to a sustainable Kyoto food system. Each method brings in its unique pathway elements: visioning to formulate a desired end goal, back-casting to create a step-by-step action plan, and gaming to practice with the future. The combination of Kyoto-based "seeds" with initiatives from elsewhere and with a new food system governance model (a food policy council) resulted in participants learning about new food system practices, extending their networks, and support for actualizing a food policy council. We conclude that multimethod futures processes that combine existing practices and new modes of governance are a promising new way to outline various pathways for sustainability transformations.

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3.1. Introduction

Urban food systems are under pressure from both global urbanization and environmental change. Currently, over 50% of the world's population lives in urban areas, and by 2050 this is projected to reach 66% (United Nations 2015). A new set of challenges arises from the need to feed this increasing number of city dwellers in the context of the Anthropocene: the current geological epoch in which human impacts on earth system processes have become so extreme that humanity can be considered a major geological force (Crutzen, 2002). Following the FAO (2011), an urban food system can be defined as all biological processes and physical infrastructure involved in feeding an urban population. It is influenced by the social, political, economic, and environmental contexts in which it operates, and interacts with the ecological and human environment in which it is located. The challenges facing urban food systems in the Anthropocene are complex and consist of intertwined drivers and phenomena across biophysical and social domains, posing threats to local ecosystems, public health, community, and social justice. This demonstrates the urgency but also the complexity of transformative food systems change toward sustainability (Bai et al., 2016).

Cities themselves increasingly serve as the spaces in which to bring together civil society, private actors, and local governments, and experiment with new forms of food governance (Moragues-Faus and Morgan, 2015). However, governing transformations toward more sustainable urban food futures first requires that those futures can be imagined. The urban Anthropocene poses significant challenges to the abilities of people worldwide to imagine novel, plausible, actionable, and diverse urban food futures. Although the field of futures studies offers methodologies for systematic and explicit thinking about alternative futures (Bell, 1996), many of the future pathways imagined for a better world in the Anthropocene focus on global or regional levels with low-resolution analyses and a strong focus on quantitative methods. In such pathways, there is generally very little direct connection to the plurality of on-the-ground practices and realities around the world (Smit and Wandel, 2006, Bai et al., 2016), which results in a lack of opportunities for engaging with the more diverse bottom-up futures that can emerge from them (Bennett et al., 2016).

Realizing truly novel, but grounded and pluralistic Anthropocene food futures requires a change in human values, assumptions, cultures, worldviews, and power relations (Bennett et al., 2016). One concept that captures all these elements is the notion of social imaginaries: collectively held spaces of the imagination that form the most general political and social parameters through which people perceive, judge, and act in the world (Steger, 2008). To guide attitudes, choices, and actions toward desirable futures, the "Seeds of Good Anthropocenes" initiative identifies "seeds": practices that strive for desirable Anthropocene futures currently operating at the margins globally, but that, under the right circumstances, have the potential to scale up, change dominant imaginaries, and contribute to making better futures. The researchers involved in this initiative argue that this can be done by using existing successful small-scale alternatives to map people's desires, the reasons for the success of specific alternatives as inspiration, combining them to generate holistic alternative futures rooted in the present (Bennett et al., 2016).

Building on this "seeds" approach, we report on efforts to create and apply a bottom-up futures process that is practice-based and pluralistic at its core. Innovative combinations of methodologies (visioning, back-casting, serious games) were used to enable a cocreation of diverse yet grounded future pathways. These novel types of content and combination of methods contributed to the creation of futures that were new to the participants — food system actors in Kyoto, Japan — and allowed for links between new futures and concrete action toward achieving them to be seen. Using these experiments as a lens, we show how bottom-up, pluralistic futures processes generated by successful existing alternative practices can outline answers to food system challenges in the Anthropocene. This also provides insights on the application of specific futures methods in such a process.

3.2. Theoretical background

3.2.1. Extending urban food imaginaries

To understand the complex set of drivers behind food practices in cities and begin to imagine new food system futures, it is important to acknowledge that food is not only a material condition that exists in people's lives, but is a vital element in their lifeworlds: the subjective perspective of every individual on their life conditions (Kraus, 2015). Social imaginaries influence the structuration of society through legal and institutional interventions, such as the shape of markets and bureaucracies. Shared conceptions of desirable and possible futures are a part of these social imaginaries, and their enactment affects decisions in the present (Jasanoff, 2015). The imaginable futures that are a part of social imaginaries thus drive societies in certain directions by shaping common practices, communal attachments, and institutional arrangements (Steger, 2008). An example with regard to food in cities is the recent rise of urban agriculture in both discourse and practice (Mayes, 2014). In this chapter, we will investigate how social imaginaries may be extended using new combinations of futures methods.

3.2.2. Combining the seeds approach with a new mode of governance

Bennett et al. (2016:442) define "seeds" as "initiatives (social, technological, economic, or social-ecological ways of thinking or doing) that exist, at least in prototype form, and that represent a diversity of worldviews, values, and regions, but are not currently dominant or prominent in the world." To identify and highlight such initiatives, the Seeds of Good Anthropocenes database and web site was launched (https://goodanthropocenes.net/showcase/seed-collection/), with the intention of using the seeds as building blocks to create novel, desirable futures (Bennett et al., 2016). Thus far, such bottom-up futures have largely been created through the combining of different seeds into new ideas (Pereira et al., 2018a, b). Many of the seeds in the database are directly relevant to changing food systems; and because cities are hubs for innovation, many seeds have focused on change in urban settings as well (Seto and Ramankutty, 2016). We aim to build on current efforts that use seeds to create new futures by not only combining seed initiatives, but also having the seeds interact with new governance conditions that allow them to flourish. This is an important contribution to the seeds approach, because such experimentation can act as practice or preparation for actual shifts in governance that encourage bottom-up-led change.

We use food policy councils (FPCs) as the mode of governance with which seeds interact. FPCs are organizations in which actors with different roles in local, municipal, or state-level food systems come together driven by aspirations for food system change (Mooney et al., 2014). Many cities in the U.S. and Canada, such as Minneapolis and Toronto, have active FPCs. In countries like Japan they are not as common. FPCs differ in the ways in which they are legally recognized. Existing FPCs are for example organized as independent action groups, NGOs, or fully embedded government bodies (Schiff, 2008). There are some standard FPC activities that most have in common: building partnerships with stakeholders, examining current policies, and generating new policy ideas related to food, and by supporting or creating programs that address food system issues (Scherb et al., 2012). Mooney et al. (2014:234) describe FPCs as ""spatially embedded" incubators that extend participation in an expansive range of experimentation in policy and practice." As such, they constitute a useful mode of governance for the various food system actors in this study and their seeds practices. In the context of an FPC, they can collectively develop strategies toward a variety of desirable, plausible futures.

3.2.3. Mobilizing complementary futures methods

The combination of seed initiatives with a new mode of governance is the first element in our pluralistic, bottom-up approach to urban food futures; the second is the use of different complementary methods to imagine and experiment with such futures. Pluralism in methods as well as in content and perspectives is a core principle of pluralistic systems thinking (Gregory, 1996, Vervoort et al., 2015). An approach aimed at opening up imaginaries to new futures is expected to benefit from the use of multiple futures methods as well as diverse reference points for content, because different futures methods allow for entirely different ways to engage with and create futures (Popper, 2008). Most combinations of futures methods so far have focused on complementary variations of looking ahead (through visioning, step-wise strategy development such as back-casting and systems analysis). We propose that by combining multiple complementary futures methods, planning-oriented foresight methods can be enriched with an entirely different type of engagement, inhabiting, practicing, and experimenting with the future.

3.2.4. Experimenting with urban food futures

For the urban environment, Daffara (2011) argues that the envisioning of future cities enables communities to create a pull toward a preferred future because the collective creation and discussion of a shared future vision can improve processes to head toward this vision, while also keeping the process agile so it can accommodate "waves of urban change" in the city's cultural, structural, technical, and other environments. Seto and Ramakutty (2016) describe how there is a need for studies that go beyond matching supply to demand, and consider urbanization and food systems jointly. Production, processing, packaging, distribution, and consumption at the table are all changing in the urbanizing Anthropocene. This also means a change in tastes, social interactions, food cultures, and values (Seto and Ramakutty, 2016). In this change process, futures methods can assist actors from all sections of the food system in both the conceptualization and initiation of transformations to sustainability. In a futures process, the various actors can shape

the futures they desire and collectively think through the pathways and plans to realize them (Hebinck et al., 2018). By mobilizing cities as laboratories (Wigginton et al., 2016), we hypothesize that this chapter can highlight existing good practices that, when combined, can show outlines of sustainable food futures.

3.3. Methods

In our study, we utilized a combination of visioning, back-casting, and serious gaming in the context of seeds and a new governance structure. The three methods were selected because they have specific qualities in common: vision-driven planning, nonconsequentiality, the provision of an experiential environment, and interaction with others in the case of back-casting and gaming. To test this approach, a combination of visioning, back-casting, and gaming was applied to the case study of Kyoto (Japan).

3.3.1. Case description

Japan's national trends of aging, slowly changing gender roles, and overconsumption of biocapacity are mirrored in Kyoto's urban food system. In the Kyoto basin, in which the city is located, overall population is trending downward and farmland has been converted to other uses at a rate of 10% in the past 10 years (Oda et al., 2018). Kyoto prefecture's food self-sufficiency rate (calorie base) is a mere 12% (Ministry of Agriculture, Forestry and Fisheries, 2017). Despite this backdrop, there are many reasons for choosing Kyoto as a candidate for leading innovative urban food system change.

Kyoto City is considered the cultural center of Japan. Numerous temples and shrines gave rise to a rich food culture represented by sophisticated cooking styles such as "kyo-kaiseki-ryori," along with traditional vegetable varieties developed and celebrated in Kyoto known as "kyoyasai." The city prides itself on being environmentally forward thinking as the site where the Kyoto Protocol was signed in 1997. A study commissioned by the city government found that Kyoto's ecological footprint was 10% smaller than that of Japan as a nation, primarily because of smaller living spaces and less motor vehicle use (World Wildlife Fund Japan, 2016). The same study pointed to food consumption as Kyoto's second largest contributor to its ecological footprint, composing 24% of the total (World Wildlife Fund Japan, 2016). A recent survey shows Kyoto residents favor using space in a shrinking Kyoto for urban agriculture and leisure (Rupprecht, 2017).

These reasons make Kyoto an ideal candidate for this study and also a place that can gain from imagining innovative sustainable futures. It is plausible that the Kyoto case could yield relevant results not just for other shrinking Japanese cities, but for other countries projected to follow a similar trajectory in the upcoming decades as well, e.g., South Korea. The literature on transition movements, renewable energy, and participatory processes details many cases in Europe, the UK, and North America, but is comparatively sparse when it comes to Japan and sites in Asia. It is therefore interesting to see what kind of results the proposed methods generate, and how well they work in the Japanese governance context.

3.3.2. Methodological background

Before detailing the methodology for the Kyoto case study, we elaborate on the background information of the three futures methods in general. A vision is the collective image of what a community wants to be like, and how it wants to look at a given point in the future (D'Hondt, 2012). O'Brien and Meadows (2001:497) describe that visioning methodologies often, and necessarily differ from case to case, depending on the "stories to tell or the process to sell." However, they identified four key characteristic dimensions underlying every visioning process (Table 1). In back-casting, a series of steps map out an action plan, starting from a vision and working back to the present (Voros, 2006). This enables participants to collectively assess vulnerabilities and aspirations, and define shared adaptation goals and action (Faldi and Macchi, 2017). There is another mode of engaging with the future that these combinations do not cover: practicing and experimenting with the future through games. Serious games are games that "intend to fulfill a purpose beyond the self-contained aim of the game itself" (Mitgutsch and Alvarado, 2012:121). They rely on playful engagement with potential futures but use this process of engagement to develop new thoughts and ideas about possible solutions for a problem at hand (Davies et al., 2012). Games can take many forms, from a narrative only to a very elaborate board game, with varying levels of technical complexity. The elements that most games have in common are a game space, set boundaries, rules for interaction and artifacts, and a goal to be achieved by the players (Gray et al., 2010).

Table 1. Key vision characteristics (from O'Brien and Meadows, 2001).

	Key characteristic	**Definition for fieldwork**
1	Current situation	The interviewee's current situation in terms of core competencies, available resources, strengths, and weaknesses; as well as the pathway to their current position.
2	External environment	Unconstrained design: participants are permitted to change any of the containing systems in their vision. Possible fellow stakeholders are identified.
3	Desired future state	One vision centered around a sustainable food system in 2050.
4	Connection of the future to the present state	Any possibilities the participant gives for relating, contrasting or connecting the vision to the present.

In recent years, visioning and back-casting have been combined with other methods using exploratory scenarios for the purpose of testing plans against contextual challenges (Kok et al., 2011, Avin, 2012, Vervoort et al., 2014), with conceptual modeling (Van Vliet et al., 2012) and with new technologies such as digital tools and datasets that give real-time feedback and visualization of the back-casting plans (Robinson et al., 2011). From these

combinations and technologies, new possibilities arise for a complementary approach with gaming. The experiential aspect of especially multiplayer role-playing games allows for the concrete and abstract sharing of experience (Kolb, 1984), which can help bring new aspects of shared imaginaries to life. A mixed methods approach is of key importance for capturing these synergies.

3.3.3. Experimental design

Figure 1 provides a complete overview of the mixed-methods design applied in the Kyoto case. The methods feed into each other in different ways: visioning outcomes are used as the base for the back-casting focus groups, and in determining participants; initiatives are used as seeds in the card game. In addition to these methodological synergies, the methods also generate different futures. With regard to the pathway elements that each method generates, we designed the visioning exercises as interviews to capture in-depth, personal ideal futures: the end goal of an action plan for a sustainable Kyoto food system. The other methods enable planning for collective action and sharing of knowledge. The visioning interviews were set up as individual interviews, while back-casting and gaming was done in group exercises. The back-casting focus groups outlined the step-by-step processes in various action plans. The two games allow participants to experiment with realistic conditions, actor constellations, and forms of governance. Their role-play elements also allow players to take on the roles of other food system actors, possibly increasing the empathy they feel for them.

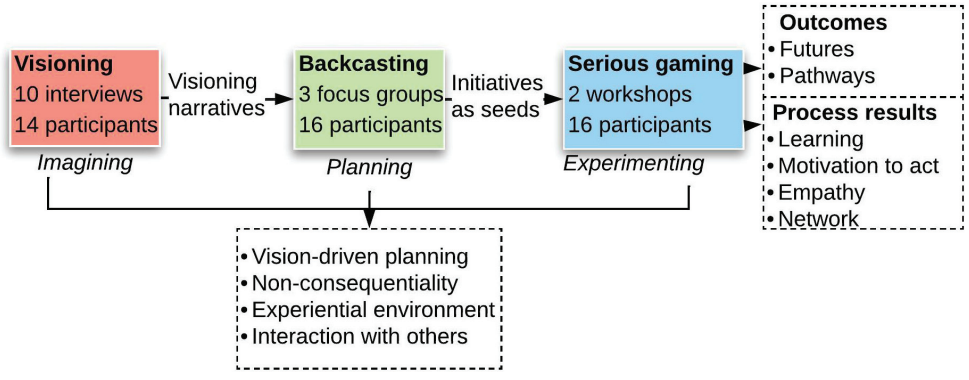

Figure 1. Conceptual model of method design.

The target pool of participants consisted of actors from all elements of Kyoto's food system (production, distribution, consumption, waste management, education, and policy making). They had to be affiliated with an initiative that could qualify as a seed. The first group of participants was recruited from a pool of participants in two seminars on food policy councils in the U.S. and Canada, organized by the Kyoto-based FEAST research project on agrifood systems in transition. The research project approached this first group of participants. Through the participants themselves, other contacts were recruited to participate as well. Missing food system elements in this group, e.g., waste management,

were subsequently filled by the research team. They cold-emailed a number of people engaging with these topics, who were sourced from local organizations or platforms such as World Wide Opportunities on Organic Farms (WWOOF) that connect volunteers and organic farms.

3.3.4. Visioning: creating images of desired futures

The first method in the complementary futures approach was a set of semistructured individual visioning interviews (Qu and Dumay, 2011). The literature on visioning processes provided a number of guidelines on which the interview questions were based. First, visioning processes try to uncover the participants' desired future for the long-term, which is generally considered to be about 30 years in the future. Choosing this time horizon offers participants the possibility to reconsider elements of their legal and social systems in which they are deeply embedded (Soria-Lara and Banister, 2017). Based on this, 2050 was chosen as the time horizon for the visioning in this study. The second step in the process is to identify barriers to and opportunities for reaching the desired future that is being described (O'Brien and Meadows, 2001).

The set of questions that guided the interviews for this study were designed around three topics: (1) the interviewee's ideal food future for Kyoto prefecture in 2050; (2) the people that she or he thought should be involved in this vision; (3) and the main issues that have to be resolved in the present in order to realize the future vision. The four key characteristics were referenced as the main labels for coding the interview data for analysis.

3.3.5. Back-casting: collective planning toward visions

The second futures method, back-casting, was designed to plan for the futures outlined in the visioning interviews. The back-casting exercises took place in a series of three focus groups. A professional external facilitator led all three sessions. At the start of each focus group, the participants received a handout with three visioning narratives based on three main themes that emerged from the visioning interviews. It was communicated that these visions were based on real stories collected from participants in the group. Subsequently, the participants were invited to discuss all three narratives and to select the one that appealed to them the most. After a short discussion about their vision of choice, they wrote the elements that they thought were most relevant on one end of a roll of paper. From there, they worked back in time from the future by writing down and posting specific activities on yellow post-it notes, and blue post-its for the people to execute these plans. They were asked to be as specific as possible, and to work up to the present, ending with activities for "tomorrow." In addition to the output of the back-cast, participants were asked to fill out a reflective survey (Appendix 1).

3.3.6. Serious games: experimenting with governing the future

We applied games in three ways: as research method, group data collection method, and research object (Mayer et al., 2014). Two role-playing games were designed for use in the workshop: a digital game and a card-based live role-playing game. They are explained by their key game elements (Gray et al., 2010).

3.3.6a Digital game: understanding food system connections

The digital game was developed by Games and Interaction undergraduate students at the HKU University of the Arts in Utrecht, the Netherlands. It was the product of a week-long game jam and a subsequent two-month course, in which the initial concept was developed further. Game jams are "social events involving the integration of various game making disciplines … to make games under constraints, such as a short fixed time" (Eberhardt, 2016:34). The game that was developed, Let'sKyoto, was still a prototype when used and feedback to further improve and balance game mechanics was also sought in addition to educational effects. Let'sKyoto is a role-playing game with six roles: farmer, supermarket owner, local restaurant owner, fast food restaurant owner, high-income consumer, and low-income consumer (Figure 2). The players take turns, navigating the food system in a simplified version of Kyoto. The farmer starts by planting crops and setting a price for the harvest. Subsequently, the supermarket, local restaurant, and fast food chains have to purchase food from suppliers. The local restaurant only has the option of buying from the farmer, but the other two businesses have the option of purchasing imported foods. After all three businesses make their purchase, the consumers feed themselves by purchasing four units of food each from a business of their choice. At the end of each round, the players all get one vote on one of three policy interventions: investing in more efficient crops (cheaper production costs for the farmer); tax fast food (increase the price for fast food); or tax overseas imports (costly for supermarket and fast food). Players have the option of choosing only in their best interests or striving for alternative goals, such as equal income distribution or a healthier food system. Table 2 gives an overview of the game, based on the key elements as formulated by Gray et al. (2010). Participants' personal experience was measured in a survey conducted immediately after playing the game (Appendix 2).

Figure 2. Screenshot of digital game Let'sKyoto (English version).

Table 2. Key elements of digital game Let'sKyoto (from Gray et al., 2010).

	Key element	**Definition for fieldwork**
1	Game space	A digital, non-moving view of a stylized Kyoto city and its surroundings. In this space, the rules for interaction (3) apply.
2	Boundaries	The game time is unlimited. The game space is a digital static overview of a city. In reality, all participants are seated together in front of a screen.
3	Rules for interaction	The turns follow a set order, as does the voting process. Participants can discuss at any point in time.
4	Artifacts	In-game visual score representation.
5	Goal	Use policy interventions to optimize the local food system and ensure a fair share of the chain for all involved.

3.3.6b Card-based live role-playing game

The second game was tailored specifically to the contexts uncovered in fieldwork conducted in Kyoto. The game took the form of a tabletop card-based live role-playing game (Figure 3), which, in contrast to the digital game, lowered the barrier to play for participants of all backgrounds and ages. At the center of the game was a card deck of thirty real-world seeds from Kyoto prefecture, Japan, and the world. In line with the Seeds of Good Anthropocenes-approach, we hypothesized that including existing seed ideas in the game would enable participants to experiment freely with futures that are still grounded in existing practices. The first initiatives to be included in the game were the food-related seeds from the Seeds of Good Anthropocenes (2017) online database. Additional initiatives were sourced from the Japan for Sustainability database (http://www.japanfs.org/), Climate-KIC's Daily Planet newsletter database (https://dailyplanet.climate-kic.org/), and from the interviewees.

Figure 3. Seed and role cards for the card-based live role-playing game, The Food Policy Council Simulator.

The Food Policy Council (FPC) Simulator game starts with all players filling out a role card for themselves based on their real-world occupation (see Appendix 3 for the detailed rules). Every player can select three main food-related issues on their role card that they think the FPC should address. These issues were based on outcomes of the visioning and back-casting exercises that had been conducted. During the introduction round, the facilitator writes down each player's priority issues on the FPC agenda sheet. Then, the FPC's first year begins. The members draw one card from each of the three seeds decks (examples from Kyoto, Japan, and the world) and share them with the group for creative inspiration (Appendix 4). They then should make a plan that includes the seed initiatives as is, or incorporates elements or reconceptions of the initiatives. The plan is written down, with a budget specification. Based on a quick assessment, the facilitator gives the FPC a feasibility percentage. Once the feasibility is set, the FPC has to roll a 20-sided dice to determine success or failure. In case of failure, the members should discuss plausible reasons why the failure occurred, spend some of their budget to improve their plan, and roll again. A final step at the end of each round is rolling for natural disasters, something that Japan is prone to experiencing, and deal with the aftermath and recovery if a disaster hits. The team with the highest number of successful initiatives wins. Table 3 gives an overview of the key characteristics of this card-based live role-playing game. To measure the participants' personal experience, perceived empathy, exposure to new ideas, and increased networking capacity, they were asked to fill out a survey after the game (Appendix 2).

3.4. Results

The results of the different futures methods generated various sustainable food futures, as well as process effects that were reported back by participants in the surveys.

Table 3. Key elements of card-based live role-playing game, The Food Policy Council (FPC) Simulator (from Gray et al., 2010).

	Key element	Description
1	Game space	A round table with 3-5 participants. In this space, the rules for interaction (3) apply.
2	Boundaries	The game time is 55 minutes per round. The game space consists of a table around which the players and facilitator are seated. All teams are situated in the same room.
3	Rules for interaction	The facilitator has the final say over the game proceedings. The players are free to discuss with the facilitator and one another throughout the game. The chairperson is the leader and main spokesperson for the groups.
4	Artifacts	Fictional "yen" in quantities of 50.000 and 100.000.
		20-sided dice that has to be rolled to determine, success, failure and the occurrence of natural disasters.
		FPC agenda sheet that contains the main points of interest.
		Seeds cards with innovative food practices from Kyoto, Japan and the world.
		Role cards that contain the player's real-life or imaginary role and her/his priorities.
		Plan sheet that contains the plan and budget.
5	Goal	To generate as many successful plans as possible within the time boundary (2), and by doing so win against the other team(s).

3.4.1 Visioning

Each visioning interview started with the participants describing their current situation and the path that had led them there. To give a brief introduction before synthesizing all visions, Table 4 lists the participants and how they described their current position in their interview.

Table 4. Current positions of participants.

Interview	Current position
1	Graduate student at Kyoto University's Faculty of Agriculture.
2	Employee in the overseas division of a Kyoto-based organic vegetable home- delivery distributor.
3	Two women who set up a pacifist collective and farmer's market in Kyoto city.
4	Coordinator at the Kyoto Prefectural NPO Partnership Centre.
5	Member of the strategic management group of a Kyoto-based corporation active in e.g. recycling food waste for biofuel in small communities.
6	An organic farmer and guesthouse owner in Nantan, north of Kyoto city.
7	International development manager for an indoor vertical farm in Kameoka.
8	Fair trade coffee importer and local produce trader.
9	Founder and owner of a vegan café in downtown Kyoto.
10	Four employees of a large food cooperative in Kyoto prefecture.

All participants outlined their ideal food future in 2050, as well as the people to involve and issues to resolve. All three differed significantly among participants. Still, one common motivating factor for starting their seed practice was the Great East Japan Earthquake of 2011, which revealed the fragility of Japan's import-dependent food system. This focus on self-sufficiency and resilience returned in almost all future visions. Many of the visions also focused on local and personal practices, such as supporting organic farming. The transformations that participants deemed necessary to make their visions a reality ranged from large institutional change, such as implementing a basic income, to a lead-by-example approach in which participants would engage in the activities they enjoyed and hoped that people would join them. There was a noticeable difference in scope among the participants, from those focused solely on Kyoto City to those with a more international outlook. There was no consensus on what would be the scope or size of an ideal future food system to feed the Kyoto area. Finally, it turned out to be difficult for most participants at this stage to identify partners with whom they could achieve their vision. The role of the government received ambiguous responses: some initiatives benefited from government support, but many had little faith in the government's ability or willingness to help.

From the visions expressed in the individual interviews, three key themes emerged: urban and rural areas, small and large actors, social and technological innovation (Appendix 5). In terms of sustainability, the visions that emerged focused mostly on social sustainability and innovation, and less on environmental and economic sustainability.

3.4.2. Back-casting

The back-casting output consists of two parts: the back-casted action plans and the process outcomes measured in a postgame playing survey.

3.4.2a Back-casting output

The back-casting focus groups started out with the three prewritten narratives for a sustainable food future in 2050 (Appendix 5), based on the key themes that emerged from the visioning interviews: urban and rural areas, small and large actors, social and technological innovations. In the first focus group the participants chose social and technological innovation, in which they placed the emphasis on the former. Over the long term, their back-cast included institutional change, preceded by a period of civil activity to create pressure for this. Over the short term the participants planned to start by taking action in their personal lives, such as taking more time for lunch and inviting people so they would not be eating alone.

In the second focus group the participants chose the urban and rural areas-narrative, in which they placed the emphasis on integrating the two rather than connecting them. Subsequently, they worked back by planning a new department of farmer's markets in every neighborhood, for which they would set up the infrastructure in the midterm. The short term consisted of a large-scale campaign to appeal to teenagers and a change in agricultural land laws enabling more opportunities for more people to produce food.

In the final focus group, the participants opted for the small and large actors-narrative, which they adjusted mostly to benefit small actors. Their back-casted plan consisted of a basic income for all citizens in the long term. In the mid-to-long-term, an FPC and an educational program should pave the way for this. The participants saw many opportunities for the short term, starting by making use of the workshop momentum, going to and inviting people for food related events, calling their local representatives, and carrying an extra business card to meet like-minded people based on interests and talents.

3.4.2b Back-casting survey results

With regard to the process effects, empathy was left out as a focus question because there was no role-playing involved. Learning about the subject through encountering new ideas proved to be very effective, with nearly all participants indicating that they heard new ideas or new approaches to existing issues. With regard to expanding people's network, the method was also quite impactful as most participants met at least two new people. Furthermore, the new ideas that participants mentioned oftentimes came from the occupations and experience of their fellow participants. Finally, the participants indicated that they felt motivated to act in two different ways: five participants saw opportunities to use the method in their daily life,

and another nine participants identified new ideas that they could apply in practice. Figure 4 provides an overview of the survey results.

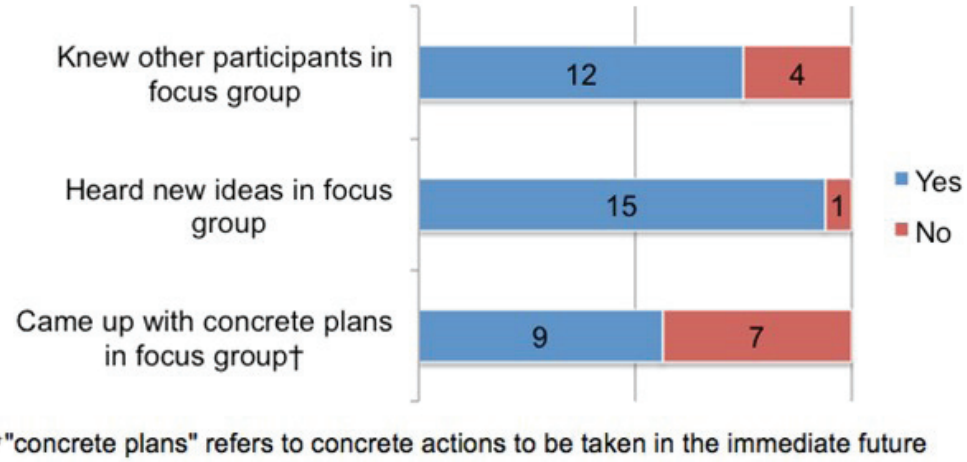

Figure 4. Survey results for back-casting focus groups.

3.4.3. Gaming

3.4.3a Digital game

The digital game was set up as a case of premade prototype testing. In addition to being direct feedback for the further development of the game, the suggestions that the participants registered gave some indication of their insight into the food system and certain issues that had priority for them, for example, a ceiling on local production to better approximate the real situation, include large-scale consumers such as hospitals and schools, punish waste or overproduction, and include (de)population issues. These suggestions corresponded to some key points of interest that resulted from the visioning and back-casting exercises, for example, in the case of the school lunches and (limits to) local production for local consumption.

3.4.3b Digital game survey results

The game's experiential process effects were measured in a postgame survey. Figure 5 shows the results of the survey conducted after the workshop. Although results vary between participants, most of the participants reported that they understood the food system and ways to intervene slightly better after the game.

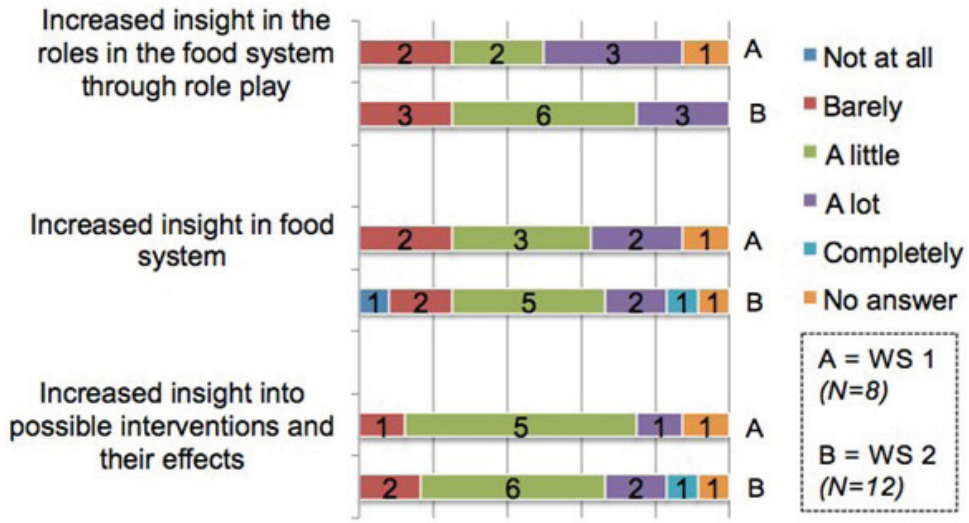

Figure 5. Survey results from the computer game. WS = workshop.

3.4.3c Card-based live role-playing game

In the first workshop, the budget that the teams received was 100.000 units of a fictional currency similar to yen per round, or per year in game time. In the first round, the two initiatives set up by the two FPC-teams were a certification scheme and Oyako Canteens, a parent-child community kitchen. In both cases the players spent a significant amount of time discussing the budget, and actively aimed to not spend their entire budget. In the second round, the two competing initiatives were an educational initiative targeting university students, and a scheme that would teach children about tea farming. Both initiatives were successful over two years: the tea farming scheme was the winner of round two because of its level of detail. In the final round of voting, the tea farm came out victorious as well.

To try and see if more innovative ideas could be stimulated, the budget was raised for the first round of the second workshop to 1 million yen. The two initiatives that were started in the first round were a combination of Edible schoolyard, ecolabel and research center, and a Vegetable Dating Service: connecting people to the farmers that farm their vegetables, and farmers to people with rare indigenous seeds. The former won the round because of the level of detail incorporated into its conception. In the second round, the budget was said to be limitless. The first team came up with the KodoMall (KidsMall), a department store filled with food related activities, running on a virtual currency that could only be spent by kids. The underlying aim was to revitalize lost shopping areas while at the same time creating a youth environment. The other team designed a plan for the Aori School, an educational tour plan in which youth would take tours all around Japan and help out and learn from older farmers on their farms. Although the KodoMall won the head-to-head matchup, in the final voting round, the Edible schoolyard label

and research center was voted best plan of the day because of its ambitious goals and high degree of specificity (Appendix 6).

3.4.3d Card-based live role-playing game survey results

Figure 6 details the outcomes of the postgame surveys conducted after both workshops. In both workshops most of the participants indicated that they encountered many new ideas. Examples that participants gave had mostly to do with the initiatives on the seed cards that were new to them. The second question that addressed learning was meant to inquire about the experiential effect of the card-based live role-playing game. The results indicated that all but one participant had an increased level of understanding what being a member of an FPC would entail. A majority of participants in both workshops indicated that they would either "probably" or "absolutely" join an FPC if given the opportunity. This indicates a motivating effect of the card-based live role-playing game. In each workshop two-thirds of the participants reported to at least empathize somewhat better with other people's roles. The survey results show that many people knew other participants in both workshops. However, most people knew only one other person, suggesting that they at most met six new people in workshop 1 or 10 new people in workshop 2. The survey outcomes were relatively the most ambiguous for empathy effects. Some participants reported that they felt uncomfortable representing other people while they were in the same group, or uncomfortable representing people when they were not there. Furthermore, the survey results indicate that participants increased their understanding of other people's perspectives more by actually playing with these people, rather than impersonating them.

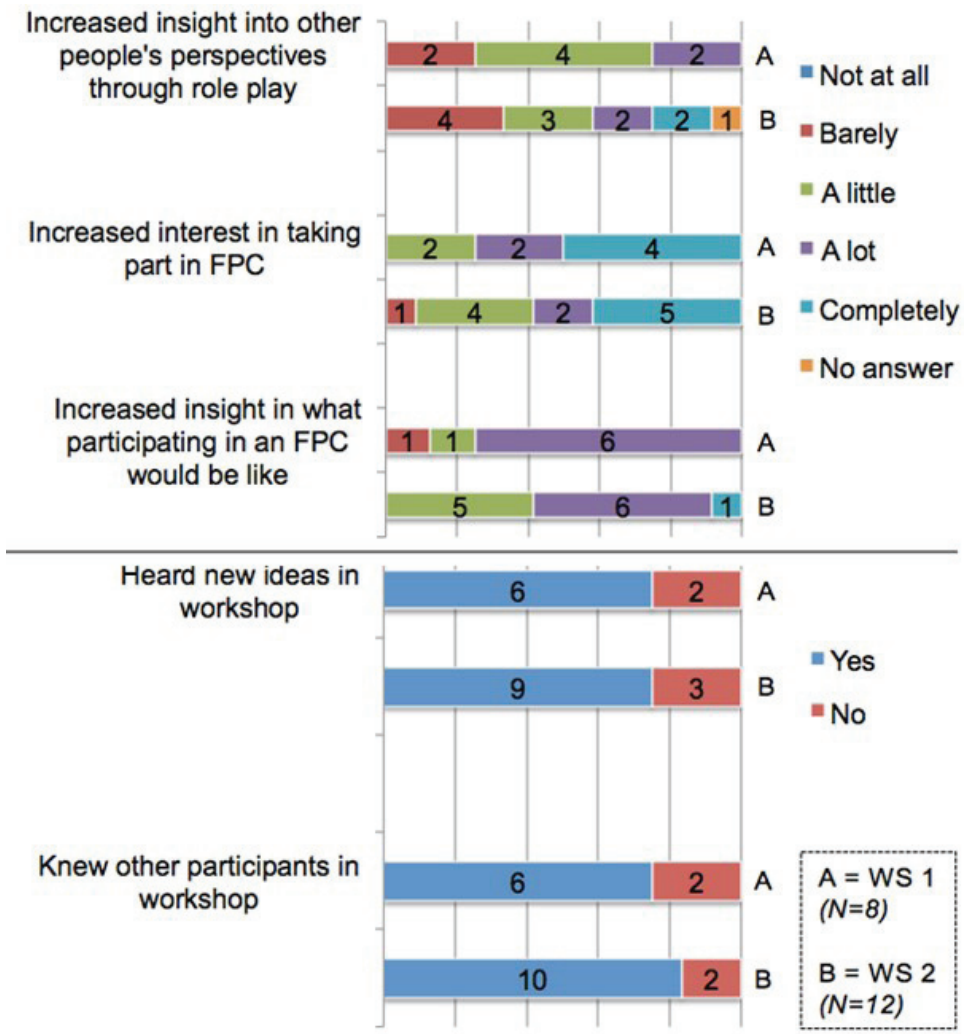

Figure 6. Survey results card-based live role-playing game. FPC = food policy council; WS = workshop.

3.4.4. Food system pathways

To capture the variety of pathway elements that resulted from the complementary methods approach, Table 5 summarizes the most important outcomes per method. The table is structured according to every method's unique contribution to the overall methods design. The visioning included integrated notions of technological and social innovation and change, as well as specific ideas about geography (urban-rural dynamics) and the desired societal roles of different actors. In terms of making these new futures concrete, in both the back-casting and gaming sessions, the participants started thinking about how either they or their envisioned civil society effort could push for changes in practice, as far

as possible given the limited time available for the processes. The inclusion of diverse seed practices from our case study, Kyoto, from elsewhere in Japan, and from around the world led to the discussion of new combinatory practices in the Kyoto food system.

Table 5. Overview of sustainable food system pathway elements per method. FPC = food policy council.

1. Visioning - goals	
Main themes	**Pathway elements**
Social and technological innovation	"Technological innovation by larger companies is being put to use to support social innovation. [...]"
Urban and rural areas	"The system has found a balance between the trends of urbanization and the exodus of people from the countryside [...]"
Small and large actors	"New, ambitious and innovative farming technologies and organic local farming methods co-exist. Their combined efforts together create a more environmentally sustainable situation [...]"
2. Back-casting (selection of examples) - action points	
Main themes	**Pathway elements**
"Social and technological innovation" - long-term institutional change	Introduce basic income (by policymakers); introduce "right to good food (by policymakers); spread FPC Kyoto through Japan (by FPC members).
"Social and technological innovation" - mid-term reforms	Reform educational systems (by parents & local government); introduce urban agriculture (by citizens & local policymakers).
"Social and technological innovation" - short-term direct action	Start growing own food (by citizens); invite others to food- related activities (by citizens); make personal business card (citizens).
"Urban and rural areas" - long-term institutional change	Long term: zero food loss (by policymakers, producers, consumers); everyone is food literate (by Ministry of Education).
"Urban and rural areas" - mid-term reforms	Mid-term: re-think working hours (by workers & national government); subsidize farmers & restaurants that use local produce (by national government).
"Urban and rural areas" - short-term direct action	Short term: Pass on family recipes (by grandparents); always cook & eat with at least one other person (by citizens); buy from Kyoto prefecture (by citizens).
"Small and large actors" - long-term institutional change	Long term: cooking cooperatives (by neighborhood groups); vegetable growing (by school children); restructuring Ministry of Agriculture (by policymakers).
"Small and large actors" - mid-term reforms	Mid-term: large supermarkets sell local fare (farmers); lobby for change at ministry and mayor's office (NPO's).
"Small and large actors" - short-term direct action	Short term: Make farming cool (by farmers); become energy self-sufficient (by citizens); set up farmer support system (by NPO's).
3a. Digital game prototype - feedback	
Main themes	**Pathway elements**
Reflections on key local urban food system issues that must be included as game elements for Kyoto	Cap on local production capacity Large-scale consumers (e.g. schools and hospitals) Large corporate actors (e.g. convenience store chains) Punishment for waste or overproduction (De)population.
3b. Card-based game - ideas	
Main themes	**Pathway elements**
FPC initiatives: Embodying & experimenting with the future by developing plans as a fictional FPC	Food education in university; Oyako Canteens (accessible children's educational canteen); Kids tea farmers program; Edible schoolyard & label; Vegetable dating service (app-based connection between small-scale farmer and consumer); KodoMall Kingdom (re-purposed mall as agricultural fun land with own currency); Aozora Food School (sustainable food education for all citizens); Local certification system for Kyoto vegetables.

3.5. Discussion

The research presented in this chapter investigated how existing examples of good practices, or seeds, can be used to envision novel, desirable bottom-up futures that have a high potential to become starting points for action (Bennett et al., 2016). Key elements of the presented approach are the combination of seed initiatives with a new mode of governance, the food policy council, new to the Kyoto context, and the use of different approaches to engage with these futures in very different ways, as visions that help direct

efforts, as achievable action plans toward those visions, and as game-based future worlds to inhabit, play, and experiment with in order to practice with a new form of governance. Together, these combined methods aimed to offer participants diverse and complementary possibilities to explore and experiment with desired futures, to let them extend their future imaginaries, learn about the present activities and desired futures of other food system actors, and be motivated to take action toward a desired food system future.

3.5.1. From future experimentation to action in the present

The extension of collective future imaginaries means that people are engaging with new futures that can be enacted in the present (Jasanoff, 2015). New networks and coalitions of actors who are committed to taking action are needed in order to move from experimentation with the future to enacting the new practices and modes of governance (Bennett et al., 2016). Foresight processes that target a specific policy or strategy usually have the best chance of translating their imagined futures to present day action (Vervoort et al., 2014, Hebinck et al., 2018). In the Kyoto process, many different stakeholders involved in different food practices were present, among whom were government workers and politicians with some level of decision-making power that could take the pathways forward. However, the lack of an overtly shared agenda or focused policy process arguably lowered the likelihood of the imagined futures being enacted in practice. On the other hand, the diversity of stakeholders also ensured the introduction of many new ideas about the future, and helped create new networks; most participants met at least one new person in their back-casting focus group session, and at least three in their gaming session. Participants reported learning much about the activities, plans, and interests of others, indicating new possibilities for collaboration.

Given the lack of a pre-existing strategy or policy to focus on, the food policy council as a new form of food systems governance to experiment with seems to have been the key to the organization of a new action coalition. The high number of participants that reported feeling motivated to participate in an FPC emphasizes the promise for follow-up steps beyond the futures process. The combination of learning about being in an FPC and feeling motivated to participate in one indicates the success of the applied simulation game method as a means of "practicing the future," with potential for behavioral change in the policy network (Mayer, 2009). In addition, the process uncovered a number of key people as "project champions" in line with work by D'Hondt (2012). Such champions can increase the effects of the interventions by keeping the momentum in the new networks and perpetuating their existence (Brown et al., 2013). The presence of key stakeholders including government representatives was important for creating realistic avenues for action.

The pathways generated by the complementary methods provide some concrete points of action for the new actor coalition. The visioning brought up the broadly shared ideal futures of balance in the relationships between urban and rural areas, small and large actors, and social and technological innovation. The back-casting focus groups generated many points of action, with personal tasks for participants in the short term, collective action in the midterm, and institutional reform in the long term. Finally, the FPC simulator game generated many

food system transformation interventions, from a vegetable dating service to a children's mall with a special local currency. All outputs can serve as important strategies for all Kyoto food system actors that aim for urban food systems change.

3.5.2. Limitations

Although the outcomes of the futures process provide a ground for real-world enactment of a Kyoto FPC, time constraints have not allowed for an in-depth longer term impact assessment on action following the process. Similarly, the processes themselves were rather limited in terms of time availability, reducing possibilities for very detailed plans. Furthermore, important to note is the slight risk of missing subtle details due to cultural and language barriers inherent to conducting fieldwork in Japan. However, conducting the study in collaboration with linguistically and culturally knowledgeable local experts balanced this risk to a great extent. A final limitation is the precarious balance between control and effect in the participatory action research design. The design of this research was to focus on one set of innovative food practices and the actors involved in them, in order to closely observe practice while influencing this practice at the same time. This also complicated the distinction of possible unexpected influences on participants' views and attitudes toward Kyoto's food future. Because it can be argued that it is nearly impossible to find a control group that matches the complex urban food system setting of Kyoto, this method was pursued at some cost of external validity.

3.5.3 Future research

The study highlighted in this chapter is part of wider efforts to use seed practices as the basic elements for developing novel, desirable bottom-up futures for the Anthropocene (Bennett et al., 2016, Pereira et al., 2018a, b). In this broader context, the combined use of seed practices and a new form of governance to support them is a useful innovation that highlights how niche practices can be a source for novel, desirable bottom-up futures that outline various pathways for sustainability transformations. This multimethod, seeds-and-governance model can be applied in other places and at other (national, subcontinental) levels as well. Major global initiatives like the United Nations Environment Programme (2018) are investigating possibilities for developing impactful bottom-up futures, and the operationalization of the seeds approach presented in this chapter provides important clues for such efforts.

In terms of methodological development, many possibilities for broadening the scope of this approach exist. For instance, by feeding back information from The FPC Simulator game into the Let'sKyoto digital game combined with the participant feedback, the digital game environment could be developed into a tool to share the experiential learning experience with a wider audience in an accessible format (Vervoort et al., 2012). To improve the role-playing experience, future research could experiment with group composition in terms of gender, age, and occupation, which in our case might have led to different levels of receptiveness for the role-playing setting. However, a number of other studies report positive results especially with heterogeneous groups, for example, in a neighborhood game (Gordon and Schirra, 2011) or groups in conflict (Belman and Flanagan, 2009).

Experimentation with different ordering and combinations of the used methods is expected to yield different results as well. Furthermore, conducting the study in countries with different governance contexts is likely to yield different results. These would be interesting on their own, or as a comparison with the outcomes in the specific governance context of Japan. More generally, the effects of using complementary futures methods could be explored further in both practice-oriented research and more controlled environments. Finally, follow-up research in a case such as this could consist of a follow-up study that tests the outcomes of the various futures interventions and of the overall action research approach. A specific focus could be the materialization of the motivation to act expressed by participants in this study, or the longer term effect of the use of the FPC simulation on food systems governance.

3.6. Conclusion

Our main aim was to test how innovative urban food practices can be used as a basis for imagining new food futures, through the use of multiple, complementary futures methods. Much of the futures literature in the context of sustainability focuses on large-scale, global scenarios. These outputs are important, but not tailored to the local scale. Our research adds a methodology for a bottom-up process that can open up a range of local futures. It offers a practical application of the newly proposed seeds approach by Bennett et al. (2016) while combining this approach with a focus on a new model of governance. This way, the approach integrates futures based on niche practices with futures focused on governance transformations.

We extended existing research on multimethods futures processes by combining visioning and back-casting with simulation gaming, allowing the process to combine planning for the future with practicing and experimenting with the future. From the visioning, collective desires for the future emerged. In the back-casting process, various food system actors strategized toward these visions. In the games, detailed interventions were experimented with by participants embodying the future. The complementary use of methods on the one hand, and new content and concepts (seeds and the food policy council) on the other contributed to a variety of rich and diverse shared futures containing novel elements for participants, arguably leading to extended imaginaries.

The extension of most participants' networks and the unexpected emergence of key "project champions" provide links between imagining and experimenting with futures, and present day action. Specifically, the use of a new mode of governance (the food policy council) as an organizing principle has led to action steps toward the organization of this new way to organize the urban food system. We conclude that practice-based futures processes that combine visioning, planning, and experimentation can offer fundamentally new ways to both imagine and realize desired futures from the bottom up.

4. EVALUATING FUTURES FOR FOOD SYSTEMS CHANGE

From imagination to transformation

Increasingly, researchers and practitioners use what we call "futures practices" - futures methodologies that are embedded in broader processes - to guide transformations in complex contexts such as urban food systems. However, deeper insight is needed on how to evaluate how futures practices may guide concrete transformations to more sustainable systems. This chapter investigates an intervention in Kyoto (Japan) where complementary futures methods were used by an alliance of food system actors interested in transforming their local food system. We draw up a framework for the evaluation of futures practices for food systems transformation. Our results show that using "seeds" - existing but alternative niches - as inputs for imagining futures had an immediate effect by connecting participants. We also conclude that the use a new concept of governance (a "Food Policy Council") was a key organizing element for the futures practice. We observe institutional change at the local level, particularly due to the efforts of key project champions who carried the futures workshops results forward. Finally, we observe that an important outcome was the spreading of the futures practice itself. We conclude the chapter with two sets of lessons: on evaluating experimental futures and on transformative food systems change.

4.1 Introduction

There is an increasing interest in foresight beyond the spaces where it has historically been used the most, notably government and major private sector settings. Increasingly, coalitions of civil society actors interested in sustainability transformations are keen to use futures approaches (Hebinck et al., 2018; Pereira et al., 2018; Marschütz et al., 2020). Researchers and practitioners increasingly engage with futures in an experimental way, for example in the Seeds of Good Anthropocenes-project (Bennett et al., 2016), which studies how innovative niche practices in the present can be combined or reconfigured to form an outline of a sustainable future. Other examples show researchers bringing together societal actors around challenging issues in "soft spaces" or art interventions (Candy & Dunagan, 2017; Pelzer & Versteeg, 2019; Bronsvoort et al., 2020). Simultaneously, there has been an increasing interest among researchers in the potential for foresight to be a tool for inclusive and democratic engagement in the imagining of transformative futures (Muiderman et al., 2020). Of particular interest are settings characterized by new alliances and networks of actors working together to create new initiatives and regimes. The development and use of futures methods is promising in such "transformative" settings, where new institutional conditions are being shaped and developed, rather than being pre-existent. Experimental, pluralistic futures processes, focused on the creation of new visions and pathways and the mobilizing of actors, are especially powerful in such contexts (Muiderman et al., 2020). However, the existing literature on the evaluation of such interventions is limited in several ways:

1. The evaluation of futures interventions is limited to either the methodology or the process itself and participants' immediate reflections, and takes place directly after a workshop or session (e.g. Shaw et al., 2009; Vervoort et al., 2012; Gugerell & Zuidema, 2016; Candy & Dunagan, 2017).
2. Existing longer-term evaluative work on futures focuses mostly on formal policy formulation processes (Hebinck et al., 2018).
3. Any work on transformational contexts is not explicitly linked to a futures-oriented intervention, but focuses on more broadly defined participatory process (e.g. Wiek, 2014; Luederitz et al., 2016).

This means that very little is understood about the ***longer-term*** impacts of ***innovative futures*** processes in ***transformative*** multistakeholder settings. This chapter aims to contribute to existing insights by investigating the impacts of a futures process where these three elements are present in the case of food systems change in Kyoto (Japan).

Firstly, the aim of the foresight process itself was highly unusual compared to more straightforward policy or strategy guidance processes: rather than focusing on existing planning processes with clear institutional framings, the process focused on allowing a diverse group of participants from across the Kyoto food system to experiment with an entirely new form of food systems governance, the Food Policy Council (Mangnus et al., 2019). Secondly, the futures methodology consisted of a novel, complementary approach of visioning, back-casting and simulation gaming, and it made use of radical niches existing in the present as inspiration for futures. Thirdly, we present an analysis that allows us to evaluate the effects of this experimental foresight process on present day actions, three years after the original intervention.

In the next section of this chapter, we draw up a theoretical framework based on the existing literature on distinct futures approaches and the extent to which evaluation of those approaches is developed. In the third section, we formulate a methodology to evaluate a novel complementary futures practice using existing niche practices and a new mode of governance, focusing on the case of the Kyoto FPC. After presenting the results, we discuss the different elements of this futures practice - a futures methodology embedded in a broader process - and its evaluation in the fourth section, drawing generalizable lessons for other contexts. Our findings are summarized in a conclusion in the final section of the chapter.

4.2. Theory

4.2.1. Futures in a transformation context

It has become abundantly clear that current human systems are fundamentally unsustainable, and deeply unfit to face the challenges of a changing planet. As a result of this, societies are not able to transform towards more sustainability. There is an urgent need for new ways to imagine societal transformations toward more sustainable futures (Bai et al., 2016).

Foresight approaches offer a set of structured ways to engage with uncertain futures, with the potential of informing present day action to help achieve desired futures and avoid catastrophic scenarios (Wiebe et al., 2018). However, there are important challenges regarding the benefits of foresight for sustainability transformations. Muiderman et al. (2020) outline four different approaches to the future, found across scientific disciplines and communities of practice. The first approach assumes that the future is uncertain and complex, but predictions can be made to minimize risk. The second approach views futures as deeply uncertain and relies on multiple possible trajectories. The third approach aims to co-create new and transformed futures, by mobilizing societal actors and develop a diverse set of pathways. The fourth approach focuses on the critical assessment of existing future imaginaries. Out of these four approaches, many of those engaged with foresight in a sustainability context still focus on predictive methods, aiming for risk mitigation to support linear planning processes. Others recognize deep uncertainty when it comes to sustainability challenges, but promote a relatively reactive, adaptive stance focused on "navigating" uncertain futures. Both of these dominant forms of foresight are also often primarily engaged with powerful, incumbent actors (Mangnus et al., 2021).

By contrast, the experimental and experiential modes of foresight that are still under-utilized based on the recognition that imagined futures are fundamentally pluralistic between different societal actors, based as they are on pluralistic understandings of the past and the present (Vervoort et al., 2015). Moreover, these approaches also focus explicitly on the understanding that creating futures is a fundamentally social activity influenced by different problem frames, interests and world views. Claims about desirable futures are in competition with each other, seeking to frame the real and the possible (Escobar, 2020), and to mobilize different societal groups toward making their preferred futures a present day reality. These experimental and critical futures are particularly

relevant for new groups of actors interested in transformation - because it can offer an explicit focus on providing and realizing radical, transformative alternatives to societally dominant narratives of the future.

4.2.2. Frontiers in futures evaluation

While the popularity of futures practices is growing among societal actors aiming for sustainability transformations, the evaluation of these practices is complex and underdeveloped. The more clear, quantifiable and simple the objective of the intervention is, the easier it is to revisit a situation to see if the objectives are met. In a scenario exercise that aims for an impact on sustainability, policy researchers can revisit the case at a later date and see if this objective was met. However, usually the aim is more broad, such as building anticipatory capacity or other learning effects, coalition building and ultimately progress towards more sustainable cities or communities (e.g. Iwaniec et al., 2020). Moreover, experimental and critical futures are especially difficult to evaluate due to their exploratory nature. After all, some of these futures practices are, above all, meant to open up a range of futures and expand possibilities, or scrutinize existing futures and identify dominant epistemologies in order to challenge them (ibid.).

Current evaluation practices focus on the outputs and their potential, such as visioning documents or back-casting pathways produced through novel methodologies (e.g. Vervoort, 2014), and longer-term effects fall outside of that scope. The same holds for experiential futures approaches, where participants explore new worlds and develop storylines or scenarios about possible futures in this world (e.g. Candy & Dunagan, 2017). Applied games that explore sustainable futures can also be considered experiential futures. There are many evaluations of the educational effects of sustainability games (e.g. Liarakou et al., 2012; Mayer et al., 2014), but not as much on their effects when used in governance processes aimed at sustainability transformations. Their perceived potential in this space stems from their successful application in the military and security fields, which also pioneered other anticipatory approaches such as modelling and simulation (Mayer, 2009). Experiential games, in which players embody and enact different futures, provide possibilities for challenging futures, co-creating futures and secondary storytelling (Vervoort, 2019). However, the effects of these outputs on sustainability transformations and the way in which they are governed are seldom evaluated systematically.

Currently, a number of authors are trying to develop methods to trace specifically the outcomes of futures practices. Firstly, Hebinck et al. (2018) distinguish between the conceptualization of new futures, and their initiation: any way in which they are realized in policy and society. They analyze the conditions for transformative change in a number of cases of visioning and participatory scenario development, distinguishing the layers in the structuring process that influence the impact of a foresight practice. Another example of tracing the effects of a creative futures practice on sustainability transformation can be found in Hajer & Pelzer's (2018) analysis of their experiment with the Energetic Odyssey. An intentionally designed and staged process brought high-level actors from the public and private sectors together around this multimedia installation, which visualized

far-reaching possibilities for wind energy in the North Sea area (2018). Through this "technique of futuring", it was hypothesized that the participants would come to share a new image of the future. This can be evaluated by tracing how the participants change the discourse on wind energy in for example media appearances, debates and official documents. However, Hajer & Pelzer note that the "attribution gap" remains a challenge: in a complex, constantly changing context, how to distinguish the exact impact of a futures intervention? Notably however, the aforementioned examples do not revisit their case after some time has passed to trace their effects over time. Rather, they formulate conditions for potential effects.

As part of a practice-oriented futures process, Kantamaturapoj et al. (forthcoming) conducted visioning, scenario role-play and evaluation, and backcasting workshops with food system actors in Bangkok to envision policy interventions and chart policy pathways beyond conventional approaches (forthcoming). Participants in the process acknowledged that the emphasis on future practice scenarios helped embed them in everyday future living and allow them to imagine what policies would lead to the establishment of such practices in the future. Kantamaturapoj et al. (forthcoming) note that the complex and interrelated nature of social practices presents a challenge to tracing impacts to specific futures or policy interventions and that revisiting them in the future might be an option.

4.2.3. Criteria for evaluating futures

A useful entry point into evaluation practices can be found in the literature on sustainability transformations and transitions, that don't include an explicit futures methodology focus. Walter et al. (2007) and Luederitz et al. (2016) distinguish between input features, process features and outcome features of a transition experiment. Hebinck et al. (2018), in their reflection on a set of futures processes, propose a similar distinction between the governance context and social dynamics, similar to the aforementioned input features, and the methodological factors, similar to the aforementioned process features and output. For the purposes of this chapter, we have formulated a set of criteria sorted according to the framework by Luederitz et al. (2016): 1-2 describe the input, 3-7 describe the process, 8-10 describe the outputs, and 11-13 the outcomes. The criteria that each category contains are based on Hebinck et al. (2018) for the contextual factors, with more criteria added that are essential to include in a longer-term evaluation. Each set of criteria and the types of knowledge they represent is detailed below.

Input criteria

The input criteria consist of the opportunity for change and the institutional support at the start of the futures practice. This type of system knowledge (Rauschmayer et al., 2015) gives insight into the institutional and governance contexts at the start of a futures practice (Hebinck et al., 2018). Knowledge of these contextual factors can help explaining the impact of a futures intervention.

Process

The ambition for change is an example of target knowledge: information about the necessary change that the futures practice aims at (Rauschmayer et al., 2015). The different types of participants (niche, dominant and target) represent transformative and system knowledge: niche actors bring in new, transformative ideas, while dominant participants bring knowledge about the institutional context. The role of the researchers involved in the futures work is also an important factor to evaluate: they also influence the outcomes with their agency and level of involvement in the futures practice (Hebinck et al., 2018).

Outputs

The output consists firstly of key project champions that emerge as leading change makers. These participants play a key role in the initiation of transformative change, and have a high level of transformative knowledge (Rauschmayer et al., 2015). Secondly, the institutional embedding is an important aspect of the output: if there is a place in the governance context for the futures outcomes, they are likely to have more impact. Thirdly, the imagined futures are the most direct output of a futures practice. Depending on the methodology, these futures may expand transformative knowledge by being challenging, pragmatic, creative, opening up futures or narrowing down options to a tailored set (Rauschmayer et al., 2015; Hebinck et al., 2018).

Outcomes

The outcomes consist mainly of target knowledge, developed by particpants in the futures workshop. They can report this knowledge of what is needed for a sustainability transformation back to researchers when evaluating the process. The mobilization of actors is first important aspect to evaluate: did the futures practice motivate people to change habits and start new initiatives? (Hebinck et al., 2018). Secondly, an important aspect is the actual change towards the ambition formulated at he start of the process. Finally, the capacities that the participants developed as a result of the futures practice consists of the knowledge they have gathered about the enabling conditions for change: transformative, systems and target knowledge (Rauschmayer et al., 2015).

Table 1. Evaluation criteria

Input criteria	
1. Opportunity for change	An opportunity for transformative change in the governance context of the futures practice.
2. Institutional support	Support through resources or advocacy in the governance context of the futures practice.

Process	
3. Ambition for change	The transformative objective at the start of the futures practice.
4. Participants (dominant)	Participants with a high level of agency and influence.
5. Participants (alternative)	Participants that are involved in niche practices.
6. Participants (target group)	Participants that are essential to realizing the ambition for change.
7. Role of researcher(s)	The role of the researchers in shaping the futures practice.
Outputs	
8. Leading change maker	Participant who takes ownership of the results and influences the initiation of transformative change.
9. Institutional embedding	Embeddedness of the futures practice and its results in its institutional context.
10. Imagined futures	The types of futures generated in the futures practice.
Outcomes	
11. Mobilization of actors	Initiatives started as a result of the futures practice.
12. Realization of ambition	The change that took place towards the ambition stated at the start of the futures practice.
13. Capacity building	The capacities developed by participants as a result of the futures practice.

4.3. Methodology

4.3.1. Case: Complementary methodologies and new modes of governance

In this chapter, we use the set of evaluation criteria in Figure 1 to trace the effects of a series of workshops using back-casting, visioning and simulation gaming. The workshops were part of an effort to establish a Food Policy Council in the city of Kyoto in Japan. These participants were all invited based on their activity in the local food system, and more specifically in niche sustainable food practices. Combinations and configurations of these "seeds", as defined by the Seeds of Good Anthropocenes project (Bennett et al., 2016), can outline the values and features of more sustainable urban food futures, outline the processes that lead to the emergence and growth of initiatives that fundamentally change human–environmental relationships, and generate creative and inspiring pathways to these

futures. We hypothesized that bringing these practices or seeds together could outline more sustainable food futures for Kyoto.

The process was characterized by the framing of a new governance format in which participants were organizing: the Food Policy Council. This fits into a larger trend of citizens striving for democratic reform or development to formulate better answers to the environmental crisis. Niemeyer (2019) describes how small centres of citizen-level deliberation can lead to a more democratic process, and to a polycentric system of locally tailored solutions. Moreover, organizing locally increases reflexivity as it makes actors more critical of dominant top-down strategies. When coupled with an explicitly anticipatory methodology, the practices of bottom-up organizing can also lead to increased futures literacy: their capacity to act on the future (Miller, 2007). A reflexive futures literacy allows citizens to consider different engagements with the future, and what these different approaches can offer future-oriented action respectively (Mangnus et al., 2021).

The workshops were the first step for this group to potentially organize in a Food Policy Council (FPC), a non-governmental group that actively advocates for food systems change (Harper et al., 2009). The workshops used a methodology consisting of complementary futures practices: visioning, in which participants outlined their ideal food futures; Back-casting, where they developed strategies towards these futures working back to the present; and gaming, in which the players played and experimented in a Food Policy Council simulation. Due to the open-ended nature of the process, the desired future was not determined at the beginning of the process. Rather, it follows what Robinson (2003) describes as a "second generation" futures process, where desirable futures are "an emergent property of the process of engaging with users and project partners".

4.3.2. Timeframe of evaluation

In the literature, there is no real consensus on the optimal time frame for study of the outcomes and impacts of transdisciplinary work and/or foresight workshops. In the Kyoto FPC case, about three years have passed since the first research interventions. Since the FEAST project is only halfway and many project-related activities are still ongoing, it could also be argued that this one-year period is quite short. However, this is the same amount of time as the fictional Food Policy Council plans, and is a long enough period of time to assess the materialization of back-casting intentions (concrete plans - to do tomorrow) and some of the mid-term plans. Compared to other studies where the foresight projects sometimes took multiple years (e.g. Quist et al., 2011; Walter et al., 2020), the activities we organized were quite brief. While (or because) the "seeds" community we focused on is still very active, a longer period of time might make it increasingly difficult to distinguish between project impacts and unrelated other new ideas.

4.3.3. Data collection

This chapter analyzes the developments from 2017 until 2020 in the Kyoto food system that were initiated by the previous foresight processes. The first step of the fieldwork consisted of the mapping out of the entire futures process, the level of involvement and

its outcomes thus far. Table 2 served as an interview guide for semi-structured interviews with both members of the research team and participants, in which they reconstructed the futures process and its effects. Due to the variety of participants in the workshops, their different levels of involvement and background knowledge, each interview differs and does not strictly adhere to this framework. However, after the interviews, the categories are the foundation for coding the interviews.

Table 2. Interview questions

Input criteria	
1. Opportunity for change	Was there a clear **opportunity for** (food systems) **change** at the start of the futures interventions?
2. Institutional support	How would you describe the level of **institutional support** for the futures interventions?
Process 3. Ambition for change	 What was the **ambition for change** at the start of the futures interventions?
4. Participants (dominant)	How would you describe the **participation of people with high levels of institutional power** during the futures interventions?
5. Participants (alternative)	How would you describe the **participation of niche practitioners** with alternative points of view during the futures interventions?
6. Participants (target group)	To what extent was the **target group** (a broad representation of food system actors from Kyoto) represented?
7. Role of researcher(s)	• What was the role of the research team and their involvement in the futures activities? • What do you see as the responsibility of the researchers as actors contributing to the conceptualization and the initiation of food system transformations? Where does this responsibility stop?
Outputs	
8. Leading change maker	Who were the **leading change makers** during and after the futures interventions? To what extent did the FEAST project act as a change maker?
9. Institutional embedding	How would you describe the **institutional embedding** of the outputs of the futures activities?
10. Imagined futures	How would you describe the **futures** that emerged from the visioning, back-casting and game interventions respectively?
Outcomes	
11. Mobilization of actors	To what extent were participants **mobilized** by the futures work, and what activities did you see emerge after the futures interventions?
12. Realization of ambition	Can you provide a **timeline** for the work the research team conducted/your food system activities from before the foresight interventions to the present?
13. Capacities	How much **knowledge about the enabling conditions** for the process in the questions above did you have when you started the process?

4.3.4. Data analysis

The interview transcripts are coded using Nvivo software. the answers to the various questions are combined and compared. Following from the interviews, we have gathered supplemental documentation on two aspects of the impact of the Kyoto FPC futures practice. Firstly, we collected and analyzed documents on the establishment of the Kyoto FPC. Secondly, we have gathered and analyzed documentation and reports on futures practices that followed from the Kyoto FPC workshops. Participants indicated that they repeated the workshops among their own network or within their own organizations, and the FEAST project repeated the workshops in other cities that aimed to set up a Food Policy Council, such as Nagano and Kameoka. We analyzed the documents to track the developing discourse on sustainable food and anticipatory governance (Hajer & Versteeg, 2009).

4.4. Results

The results are intended to increase insight into the effect of futures practices, and empirically support the distinction between conceptualization and initiation in transformations processes.

4.4.1. Interview results

In total, 20 participants were interviewed, 17 participants from the initial workshops took part. They were selected based on their background in various areas of the Kyoto food system: production, distribution, consumption, government and non-profit or activist organizations. In addition to this, three researchers connected to the FEAST research project, organizers of the initial workshops, participated.

A significant part of the successful transition from the conceptualization to the initiation phase of futures work lies in the continuation of the process by key stakeholders of initiators after the conceptualization has finished. In the Kyoto case, the initiator of the futures work was the FEAST research project. The three researchers and the project leader who participated in the workshops and focus groups as well are therefore relevant participants in an interview. In the interviews, preceding the interviews with the other participants, an outline can be drawn up of activities in the year that has passed since the futures interventions. This outline shows the details of the institutional embedding, whether or not change is prioritized, the ability to mobilize actors, and the leading change agent(s) and their activities so far (either FEAST or other participants).

Out of the three types of interventions that were used in the complementary futures approach, only the people who participated in the back-casting focus groups and gaming workshops are eligible for the study of transformation initiations, since these were the group interventions with an activating element. The back-casting focus groups also contained a communal visioning component, so the section of people who have formulated their thoughts on their "desired 2050" is preserved in the sample. The people interviewed for the visioning process were mainly surveyed to learn about their desirable futures, so an impact assessment does not seem relevant or valid in their case.

Two main project champions emerged from the accounts of interview participants: one from the research side and one from the citizen's side. The other people that were interviewed referred back to the project champions, citing them as the individuals who brought them into the Food Policy Council initiative. The project champions themselves described how they were involved with the Food Policy Council before the futures workshops, and have been central to carrying the initiative forward since.

4.4.2. Input criteria

The first category of interview questions focused on the starting conditions: the opportunity for change, institutional support and ambition for change. We found that especially the ambition for change was large. This was cited mostly by the members of the research team, who initiated the process, but also by the participants who were strong advocates for implementing the Food Policy Council mode of governance in Kyoto. One participant described that *"Kyoto is an interesting place because you have all these different kind of people that are a little bit more aware of, for example, environmental impacts of the food system who are thinking about food and health and things like this […] but at the same time, there was no real issue to just sort of galvanize everyone".* The fact that the research team could act as a connecting force for the local niche food system actors was mentioned in both groups as an opportunity for change, albeit partly self-created. One participant described how the local sustainable food practitioners are *"In a geographical area, close. But there's no strong network, there's no other knowledge exchange."* Multiple participants came to the workshop to connect with like-minded people *"searching the next step to make [an] organization."*

However, the institutional support for example was largely absent. Some participants had ties to the local government through their network or previous employment, but this was not translated into official support at the start of the FPC development process. The participants cited various reasons for this. One participant had had more success in the city of Osaka with their food initiative, and explained: *"because to be successful rather than Kyoto you need a progressive city."* One of the key project champions referred to the size and complexity of the local government as a barrier for new transformation initiatives: *"It depends on the size of government, if it's a small city government or big city government. They are very strict, rigid organizations. Difficult to change their mind. […] Like Kameoka city [smaller, neighbouring city, red.], if the mayor decided: we must change, then all of them must change somehow".*

4.4.3. Process

The second group of questions focused on the process of conceptualization of new futures, analyzing the participants, their objectives and the role of researchers. The participants had many different ambitions for change in the Kyoto food system. The key project champions and the research project aimed for the Food Policy Council and the change it could bring, but the participants joined the futures workshops with their own experiences and objectives in mind, from small-scale farming to organic school lunches to simply curious citizens. As described in the input criteria, many participants aim for some kind of network growth and opportunity for community organization. Furthermore, multiple participants described how they enjoyed the variety of people in the workshops, especially young people: *"I think a lot of ages in the population joined the workshop. So it's also ideal that a lot of generations are there. Also that young generation people join that workshop."*

We found that the FEAST project as organizer and presence in the Kyoto area was a strong advocate of the futures developed in the workshops. They were strengthened by the key project champions, who brought in participants that they felt were valuable potential members, and kept advocating for the FPC after the workshops. Partly, this was due to the exchange of their "seeds" practices: the fact that the participants were almost all involved in niche food practices. The majority of participants cited this as being inspiring, and reported keeping in touch with other participants out of interest for their seed practice. Conversely, a member of the research team described that *"if you think about it in terms of who was not there, you can talk about the mainstream: we didn't have JA there [main Japanese agriculture organization, red.]. We didn't have those kinds of folks there. Sometimes having too many dominant players in the room can almost push the whole discussion in the direction that may not be where we want to go to".*

4.4.4. Output

The final group of questions considered the initiation of change. Here we found that some leading change makers in the Kyoto area had been instrumental in advancing the Kyoto food policy council, and that the methodology and the "seeds" niche practitioners learning about each other's activities was very motivating and mobilizing for the group. In terms of

the materiality of the workshop, one participant reported that he had the back-casting outcomes framed on his office wall. Multiple others referred to the cards used in the simulation games, that contained many seed initiatives focusing on food. They had kept the cards and still recalled their contents. Others mentioned no direct adoption of the entire workshop plans, but a change in behaviours and routines due to people they encountered in the workshops. One participant mentioned changing his breakfast routine to more seasonal vegetables, while another had visited local Japanese tea fields. The network around the FEAST project was also strengthened after the workshops, with participants reporting holding seminars and workshops at FPC- or FEAST-related events, visiting follow-up workshops and being connected to other initiatives in the FEAST network. One of the key project champions described previous stakeholder-fatigue among the local food system actors: they *"were invited too many workshops and always they talk at the workshop but they don't understand: what is the next step, what is the clear goal?"*. They mentioned that with FEAST, the seed practitioners could engage in a kind of ongoing partnership.

Still there remain some barriers to the use of the futures generated in the workshop to initiate food system transformations. One participant mentioned that back-casting is *"a very useful framework for involving people" but that it is "very difficult to think about ideal, ideal future. If we think of ideal thing, so we have to have the kind of criteria that we measure"*. This echoes the experience of two other participants that the simulation game was not complex enough to enable participants to make solid plans. On the other hand, the institutional support remained a difficult point: the participants reported running into difficulties either due to economic arguments or institutional complexity in which policymakers have *"numerical targets for annual goals. If the Food Policy Council was connecting their goal, it would be easy but they don't understand how to connect and how it is useful for their urgent issues"*.

4.4.5. Outcomes

The futures workshops for the Kyoto FPC took place at the start of the process of setting this new mode of governance up. Many of the participants joined out of curiosity or due to their ambitions of organizing and enabling change, mobilized by the enthusiasm of the key project champions. The research team mentioned that some more skeptical participants also joined, who were drawn into the plans by the methodology and group of participants in the workshop. The involvement of these more reluctant groups in the Food Policy Council initiative continues to be high.

Over the past three years, the Food Policy Council has developed successfully, first by establishing a fledgling NPO that allowed for an office at the prefectural office. Presently, they have been fully established and continue to develop their position in the Kyoto food system. Participants recalled a number of themes from the futures workshops that were still on their mind, like human and technological development, time poverty, children's food poverty and a basic income. These were still themes that the FPC members organizers as important to them. Specifically, addressing children's food poverty through

organizing community canteens and recycling urban organic waste through a composting scheme were two ideas that emerged during the futures workshops that the FPC has taking concrete action on.

The futures workshops also helped to generate consensus on new language that allowed for the ideas within the workshops to spread. For example, the Food Policy Council simulator game encouraged workshop participants, and later Kyoto FPC members, to think deeply about how "local food policy" should be defined and what delineates local food policy in the context of city and prefectural governance structures. A broadly disseminated magazine on agriculture and economics featured an issue on the theme of "local food policy" and detailed the various futures workshop processes from Kyoto and how they had influenced other food policy activities across the country. "Ideal future meal," "school lunch from the future," and "future transition pathway" are other examples of new vocabulary introduced to Japan due to the futuring process in Kyoto.

Figure 1. "Agriculture and Economics" magazine featuring local food policy and examples of futures methods emanating from Kyoto (photo: Akitsu Motoki)

One relatively unexpected but recurring topic in terms of outcomes was the methodology. Nearly half of the respondents reported that they had organized or been involved in a replication of the methodology, either the back-casting or the gaming exercise. On the one hand, participants used the methodology for the development of Food Policy Councils in other cities. For example, one key project champion recounted that *"the back-casting, we used this method at the Kameoka workshops"*. Another participant described how the

simulation game was used with a large local NPO, in *"an annual kind of meeting, but then as an activity with it. And we essentially did the Food Policy Simulator game with those members."* One participant also adapted the food policy council game to be played by Kyoto schoolchildren. A FEAST project member organized a Serious Board Game Jam in Kyoto, citing the Food Policy Council Simulator process as the main catalyst for his idea. Over 100 participants from various Japanese cities developed games on transdisciplinary sustainability concepts like the commons, SDG's and multispecies sustainability (Rupprecht et al., 2020)

4.5. Discussion

This chapter investigates how futures practices can be evaluated in terms of their ability to guide systems transformations. To do this, we investigated a case study that is an example of foresight in a new mode, with a new group of actors, and with a new methodology – aimed explicitly at a food system transformation. In Kyoto, Japan, a community of niche food system actors participated in a complementary series of visioning, back-casting and simulation gaming, in the context of organizing as a Food Policy Council for the city. Evaluation of such futures practices with transformative goals has so far been limited and has not been developed in a systematic manner.

The results that emerged from the futures practice was a broadly shared vision of a pluriform pathway to a sustainable Kyoto food system. Each method brought in its unique pathway elements: visioning to formulate a desired end goal, back-casting to create a step-by-step action plan, and gaming to practice with the future. The combination of Kyoto-based "seeds" with initiatives from elsewhere and with a new food system governance model (a food policy council) resulted in participants learning about new food system practices, extending their networks, and support for actualizing a food policy council, thus enhancing the resilience and learning capacities of the networks in the food domain. After the series of futures workshops, we concluded that multi-method futures processes that combine existing practices and new modes of governance are a promising new way to not only outline various pathways for sustainability transformations but also to guide the initiation of such pathways, as we will discuss below.

4.5.1. Evaluation: main themes

From the return to the case in semi-structured interviews with participants, we distinguished effects in terms of input criteria, process, output and outcomes. Considering these results, we can distinguish three recurring themes. Firstly, the continuation of the FPC organizing after the series of futures workshops was crucial. One the one hand, the FEAST project acted as a center and catalyst for the FPC organizers, and the key project champions kept collaborating with the FEAST members to drive the process forward. Secondly, a number of seed initiatives that came together in the workshops have grown since, partly due to the connections and knowledge in the workshops. Finally, and arguably most unexpectedly, there was a strong proliferation of the futures methodology in various situations. These three elements are interconnected and amplify each other and the transformative effect of the original futures practice. They embody different types of dissemination: institutionally,

at the futures practice level and at the citizen or bottom-up level. While in the interviews various connections were made to the workshop, the attribution gap still complicates the evaluation process: not all of the effects and transformational processes can be traced back solely to the series of futures practices.

The effects of the workshops were framed in the context of FPC as a new mode of governance in the Kyoto food system, and in the longer-running process of establishing this in the institutional context of Kyoto. The futures practice was organized in a very open situation: the results indicate that there was little institutional support or participatory culture, but a very active and involved ecosystem of local niche food actors (Mangnus et al., 2019). The workshops were meant for the group to connect and set their agenda, and vested interests and predetermined goals were largely absent. To guide this very open, bottom-up process, the FPC framing was important. Making visions, plans and simulations for this future organization gave focus to the futures and grounded them to go beyond blue-sky thinking. After the workshops, the follow-up steps in establishing the FPC kept members organizing and coming together. Practicing with the FPC, especially in the Food Policy Council Simulator game which successfully enthused participants to join, appears to have been essential. This provides an important lesson for ambitious, out-of-the-box experimental and critical futures: grounding them in a relevant mode of governance can increase and prolong their transformative effect.

A second important element in the futures workshops were the seed practices. The participants indicated that network growth and learning about the work and activities of others was the most positive point about the workshops for them. Some of the connections led to immediate action, such as visiting one another's' store or event, and some of the seeds grew as a result of new connections and ideas exchanged in the workshops. Arguably, the involvement with a niche practice and encountering others in the same situation brings out an experiential version of the combining and reconfiguration of seeds to outline a more sustainable future (Bennet et al., 2016). In addition, successful examples and models can motivate practitioners to act. As a group, the niche practitioners got a new perspective on what would be possible if they united as an FPC.

The effects of the seeds practices were amplified by the material aspect of the Food Policy Council Simulator game. Multiple participants took home the seed cards, listing seeds from Kyoto, Japan and worldwide, for inspiration. Another group of participants emailed after the workshops to ask for digital copies for themselves and colleagues. This was one way in which the materials and methodology excited participants to spread it further. Other examples were the organization of back-casting workshops by members of a local NPO within their own organization, and back-casting and gaming sessions in other cities where the FEAST project was involved in establishing local FPCs.

A final important element of the impact of the futures practices were the organizing actors and key project champions. Unlike some research partners who engage with practitioners only for the duration of the research and then retreat back to their labs, the FEAST research

project committed to developing long-lasting ties in the communities they worked, acting as "residential researchers." The FEAST research project also had appropriate resources, manpower and a local network to be a stable hub for the FPC activities. This worked in symbiosis with the local project champions, who were energized by FEAST and in turn energized the FPC efforts. An important lesson about impact is that the workshops should be properly embedded in a longer-term process, with the right amount of driven people and resources available. In addition to that, the drive and enthusiasm of the workshop participants may be attributed to the fact that the majority of them describe engaging in their niche practice for social interaction and general enjoyment. The participants describe an institutional context that is hierarchical and divided into silos. On the other hand, Japan and Kyoto especially has a lively and active ecosystem of non-profit-organizations (NPOs), stimulated by various policies. In these NPOs, citizens can organize to advocate or work towards a transformation of certain issues in society.

In the case of the Kyoto Food Policy Council, a large number of participants were active in an NPO, for example aiming to improve school lunches or improve urban-rural relations. The organizing at the bottom-up level, to the enjoyment of all involved, can be perceived as a weakness of the process, keeping its impact small and local. On the other hand, the strong social ties that were built in this process motivated the participants and arguably provided a foundation upon which the FPC could be built over time, institutionalizing this group in higher levels of governance.

4.5.2 Transformative significance of impact

The various elements in the futures process focused on the establishment of an FPC can be said to have transformative significance at different levels: 1) the institutional context; 2) the participatory futures culture in Kyoto, and 3) the practical level. Firstly, the fact that the futures process supported the establishment of the FPC implies a structural change at the institutional level that can enable further transformations to sustainability by facilitating and stimulating various new initiatives and practices. Secondly, the results indicate that there is a transformation in commonly used approaches to anticipatory governance in the participating networks, through a spreading of anticipatory tools and increasing futures literacy (Miller, 2007; Muiderman et al., 2020; Mangnus et al., 2021).

In addition to dominant modes of engagement with the future that predict and limit uncertainty, the Kyoto FPC workshops have created broader enthusiasm among the participants for a more creative, experimental approach. Beyond replicating the practice itself, participants disseminated the results and language from the process to communicate these ideas in their own networks. Such dissemination could further help the spreading of futures practices that help create a momentum for transformative food systems change. Finally, at the immediate and practical level, the participants develop new ideas and activities as a result of encountering each other's niche practices.

The Kyoto FPC process, or any innovative experimental futures practice, is in essence a mix of process, outcomes, key concepts, key actors and methodological design. Evaluation

of its outcomes and impacts must take all these elements into account, as they are interconnected and all contribute to the transformative capacity of the futures practice. As has been stated in other literature, it is key to not consider a futures practice as a single intervention that will change the course of a governance process. Rather, the Kyoto FPC shows the power and complexities of considering urban sustainability transformation as organic, experimental trajectories in which new futures are conceptualized and initiated through replication, iteration and structuration. The case shows that replicability and communicability of the elements that make up the futures practice, can increase its scalability and adaptability. In a futures process such as the case of the Kyoto FPC, the key project champions and organizers act as knowledge brokers. They connect the local niche practices and the futures they conceptualize to the institutional context (Norström et al., 2020).

4.5.3. Limitations and future research

This chapter takes the first step to evaluating complex processes of transformation to sustainability after a futures intervention. Future research can expand the evaluation process, by for example developing longitudinal studies, evaluating different kinds of processes or different groups of actors. Another avenue for future research is a comparative study across networks: comparing different cases and their input criteria, processes, outputs and outcomes. Future research can also focus on the attribution gap and develop more systematic ways of distinguishing the effects of specific futures practices.

4.6. Conclusion and key lessons

This chapter sought to investigate how futures practices can be evaluated on their capacity to guide sustainability transformations, responding to a gap in current literatures. We investigated a process where different, complementary foresight approaches were used by an alliance of food system actors interested in sustainability transformation. By developing a methodology to evaluate the impact of this process, we aimed to answer the question: how can the application and effects of experimental futures practices be evaluated? Our evaluation shows that the Kyoto FPC process, as an example of a transformation-focused futures process, should be examined in terms of its input criteria, process, outputs, outcomes, key concepts, key actors and methodological design. All these elements matter for the design of an innovative futures practice, and should be evaluated as such. Our multi-dimensional evaluation revealed different types of outcomes that might otherwise have been missed. In the Kyoto case, we found that the use of existing seeds practices had an immediate transformative effect, and connected participants to one another. The Food Policy Council was established at the local level, due to the efforts of key project champions who carried the futures workshops results forward. Finally, the futures methodology was adapted and repeated many times by participants, scaling the transformative potential of the workshops up and out.

From our results, we distinguish six key lessons that can be drawn for communities seeking to organize a set of experimental futures practices Lesson 1 and 2 confirm lessons learned in other cases on futures practices. Lesson 3 and 4 also support previous findings, but

were very important new insights in the effect of the Kyoto futures work as well. Finally, lessons 5 and 6 on the importance of the FPC governance mode and the importance of the proliferation of futures practices are new insights:

1. It is important to connect to the local context and take advantage of its local specificities.
2. It is important to embed the futures practice in existing active networks and collaborations.
3. Thirdly, organizers benefit from ensuring that the futures practice can be embedded in a longer process, and preventing it from being a one-off event with little transformative impact in the long run. To do this, there should be enough expertise, social capital, human and financial resources and enthusiasm for a long-running and in-depth process.
4. Build on existing relationships and shared interests in order to foster trust and enthusiasm.
5. Enthusiasm can also be incited through the methodology, for example using existing niche practices, and through the framing of a new governance mode.
6. This enthusiasm can carry the methodology and its outcomes into other places and contexts, scaling it up and out (Lam et al., 2020).

Moreover, since the chapter focuses on evaluation, we draw four lessons that can be drawn on the evaluation of futures practices involving bottom-up groups and experimental or critical methodologies.

1. It is important to look out for the proliferation of key concepts and practices. Especially for experimental and critical futures, the increased futures literacy and reflexivity that this indicates is a key objective (Mangnus et al., 2021; Jasanoff & Kim, 2015)
2. New connections between people and organizations are important to evaluate, both because they increase transformative power and because these new links can indicate the building of an organized community around a shared future (Hajer & Pelzer, 2018).
3. The realization of new governance arrangements is important: this indicates a beginning of transformations to sustainability at the institutional level.
4. Involving existing niche practices can provide a link to the present, and can have a direct transformative effect on the participants' behavior with regards to the food system around them.

These findings and lessons can provide a start for further evaluation of the transformations to sustainability catalyzed by the growing number of innovative futures practices.

5. ENVISIONING ALTERNATIVES IN PRE-STRUCTURED URBAN SUSTAINABILITY TRANSFORMATIONS

Too late to change the future?

In the governance of urban sustainability transformations, participatory futures practices are increasingly popular. Yet there is a rising awareness that the success or failure of these practices depends on how they are staged and the context in which they are conducted. These contextual factors are often less than ideal, and futures practices take place at the crossroads of many pre-determined agendas and priorities. We distinguish four factors that shape the effects of participatory futures practices: 1) how the institutional landscape constrains or enables a project aimed at urban sustainability transformations; 2) the participatory culture surrounding the project; 3) the project design; and 4) the futures methods applied. We assess these factors in three cities within the European H2020 IRIS Smart Cities project. In each city, project members participated in sessions where they designed citizen engagement using a futures methodology: the novel Scope and Ladder models. Each city reflects a different combination of the four contextual factors. We find that space for exploration and re-imagining can be found and optimized under imperfect conditions. Drawing on the results of the three cases, we conclude with a set of recommendations for the funders, project members and futures organizers of urban sustainability transformation projects.

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5.1. Introduction

Global environmental change is threatening urban systems and demands urgent transformations toward sustainability (IPCC, 2018). Societal transformations emerge from complex, co-evolutionary dynamics that often involve both top-down governance and bottom-up processes (Patterson et al., 2017). A sense of urgency can be used as an argument to push the space for citizen engagement out of urban transformation processes – and this can be exacerbated when a small group of powerful stakeholders seeks to pursue its own interests. Waylen et al., (2015: 112) refer to this as the "'*participation-prescription tension': a potential tension in attempts to simultaneously encourage participation and achieve prescribed goals or targets*". With the right process design, citizen engagement processes can open up space for observation, reflection, interpretation, discussion and expression for all parties involved. However, the path to the future is paved with a diversity of interests, political visions and values. Opening up processes and their outcomes to the influence of citizens and other stakeholders can lead to unexpected or unwanted outcomes and even conflicts (Glucker et al., 2013).

Participatory futures practices can create space for open-endedness and plurality in relatively closed or pre-structured projects (Stirling, 2008). They offer a way to explore both future worlds and the transformations to practices that would be possible or desirable in these worlds (Sanders & Stappers, 2014). Space for consideration of alternative technological possibilities and alternatives to current policy orthodoxies can contribute to exploring more flexible, more inclusive and, arguably, more effective approaches to transformation processes (Beck & Mahony, 2017; Keith et al., 2020). For the purposes of this chapter, we define "space" as the possibility for the inclusive consideration of alternatives in a pluralistic manner. The implementation of these alternatives should be seriously considered.

The majority of futures literature focuses on the preconditions that make for an effective futures process (e.g., Vervoort and Gupta, 2018; Hebinck et al., 2018). However, a reverse order is arguably possible as well: one where the process is partly pre-structured, and space for participatory futures needs to be carved out at a later stage.

We aim to understand to what extent and how futures practices can guide the design of citizen engagement in large projects that aim for urban sustainability transformations. The main contribution of this chapter is a framework that describes the contextual factors shaping the space for alternatives that result from the futures practices. The chapter focuses on three case-study cities in sustainability transformations, each characterized by different contextual factors.

Insight is drawn from the citizen engagement process design within the international, multi-city H2020 IRIS Smart Cities project. This project comprises a variety of stakeholders with diverging interests and levels of power. The project, a consortium of European cities led by Utrecht (the Netherlands), aims to co-create smart and sustainable cities by testing and implementing a wide range of measures to improve mobility, lighting and heating, in

collaboration with citizens. This chapter assesses the limits and possibilities for the use of a novel urban-futures design tool to open up this space and change practices within the project. The next section of this chapter consists of a conceptual framework drawn up from a literature review, followed by a description of the cases and methodology. The results from the different cities are presented in the fourth section, and the fifth section discusses these results in context in order to formulate a set of recommendations. The final section of the chapter provides a conclusion and recommendations for different scenarios.

5.2. Futures in citizen engagement

Large projects that aim at sustainability transformations are often characterized by pre-described objectives. Examples are prescribed reductions in pollution levels, transitions to renewable energy sources, and sustainable or shared mobility. These goals can be the reason a project is started and can be tied to its funding. This may be especially the case with projects that aim to implement smart-city measures. Much has been written about the smart city since the emergence of the term in 1994, and especially since it took flight in 2010 when it became a pillar of EU development strategy (Cocchia, 2014). The concept of the smart city was initially driven by new technology and ICT developments. Only recently has it been adopted by local governments as a comprehensive strategy for economic and environmental development (ibid.). However, the technocratic and corporate orientation of the smart-city concept and its perceived oversimplification of the societal context are often criticized (Hajer, 2015; Kummitha & Crutzen, 2017; Lam & Ma, 2019).

A traditional definition of citizen engagement is "the involvement of citizens in a wide range of administrative policy-making activities [...] in order to orient government programmes toward community needs, build public support and encourage a sense of cohesiveness within society" (Fox & Meyer, 1995: 20). More recently, citizen engagement and participation have expanded beyond the realm of policymaking, and are considered as a range of techniques that lead to interaction between citizens and decision makers (Bronsvoort et al., 2020).

In line with this broader definition, citizen engagement practices that are explicitly futures-focused can aid a complex system of actors, interests and institutions in conceptualizing and initiating future practices (Hebinck et al., 2018). Hebinck et al. (2018) define "Practices bringing together actors around one or more imagined futures and through which actors come to share particular orientations for action" as "techniques of futuring". Here, careful staging of futures practices in terms of sequence of events, participants and their interaction can cause particular ideas about the future to lose or gain traction. For more effective conceptualization and initiation of desirable futures, there are some guidelines: allow actors to break out of their usual routines, reiterate the process rather than organizing a one-time event, tailor the staging or "mise-en-scène" to the actors and interest at hand, involve materiality and boundary objects, and create an immersive experience, in which the participants can engage with different futures (ibid.)

In addition to the pre-defined objectives in projects that aim for sustainability transformations, a majority of futures literature is focused on the pre-conditions that make for a successful futures practice. In recent work, the governance context, social factors and methodological constraints have been synthesized and explored (Hebinck et al., 2018; Vervoort and Gupta, 2018; Muiderman et al., 2020).

We draw up a framework of four factors that shape the way in which participatory futures practices can open up space for consideration of alternative interventions and solutions. We build on Hebinck et al. (2018), who recognize three main factors: governance context, social dynamics and methodological design. We have adapted those three key factors to the cases studied in this chapter as institutional context, project plans and futures practices, and have added a fourth: participatory culture. This extra factor allows for a deeper analysis of existing citizen engagement practices and the "participatory culture" within the process: the way in which project managers view citizen engagement, including as co-creation, as a means of control or out of compliance with laws that prescribe participation (van de Grift et al., 2020).

The four factors build on one another: participatory culture, transformational project plans and futures practices are shaped by the institutional context in which they take place. Subsequently, the participatory culture shapes the project plans and futures practices. The project plans also determine the futures practices – their material aspects, tailoring them to the project and embedding them in the larger set of plans – and possibly methodology.

1. The first factor is the institutional context of the transformation process. Institutions make projects that aim for urban sustainability transformations possible, and can influence the way they are set up and how they are evaluated (Salmon et al., 2017). As such, space in the institutional context can be expected to significantly determine the open-endedness of transformation projects. If an approved project plan has already been pre-determined in terms of actions and timing, there will be very little perceived scope and time to shape participatory futures practices (Hebinck et al., 2018). Prescribed goals and participatory practices can be balanced, or there can be a tension between the two: the participation-prescription tension (Waylen et al., 2015). This starts at the institutional level when a project is incubated, and can subsequently carry on in the project plans.

2. The second factor is the participatory culture. If many of the stakeholders involved have experience with participatory processes and are working in a culture that encourages participation and has certain protocols for this in place, the role of participatory futures processes in generating alternative and more effective outcomes may be easier to achieve (Truex & Søreide, 2010). A strong participatory culture can enable a more critical distinction between types of citizen engagement (Arnstein, 1969), and enable project members as well as citizens to make participatory futures practices meaningful and effective (Groot et al., 2018). The expected benefits are also culturally determined. Generally, these fall into one of the following three categories: (1) "substantive" benefits, i.e., an improvement of decision-making through citizens" place-based knowledge and values; (2) "instrumental" benefits,

i.e., improving the acceptability and transparency of a plan, and thus its implementation; (3) "normative" benefits, where inviting stakeholders into decision-making increases the legitimacy of decisions and supports democracy (Glucker et al., 2013; Waylen et al., 2015).

3. The third factor is project plans among the project members and within the governance of the project. Firstly, space is created if there is a mandate to conceptualize and initiate alternative and better plans. This space can then be reflected in the design and steering of project plans, citizen engagement and futures practices (Hebinck et al., 2018; Truex & Søreide, 2010).

4. The fourth factor is the intentional staging of the futures practices within the project. The methodology is important here: is it imaginative, open, planning-oriented or experimental? Material aspects are important as well: this includes the material aspect of the methods, but also the staging of the futures practices in space and time. Finally, the level to which the futures practices, and those in charge of them, are embedded in the local context is also relevant. If those organizing futures practices and the methods they use are strongly embedded, this creates possibilities for continual engagement, the building of trust and mutual understanding, and adaptation to changing conditions as needed (Davies et al., 2012; Vervoort et al., 2012; Hebinck et al., 2018; Hajer and Pelzer, 2018).

Subsequently, the aim of any futures practice is to outline alternative pathways and solutions. This can create space for consideration of alternatives in a pluralistic manner in the project plans. With the right mandate, this will have an effect on the project plans and strategies. While this change in project plans is the explicit goal of a participatory futures practice, we hypothesize that its effects can also feed further back and open up more space in the participatory culture and institutional context, depending on execution and impact.

Figure 1 provides a visual synthesis of the various factors in the framework. It outlines how the space created in the larger institutional context, urban participatory culture and project plans shapes the conditions surrounding any futures practice, and consequently the possibility for such a practice to create space in turn for alternatives within the project plans and arguably the participatory and institutional contexts.

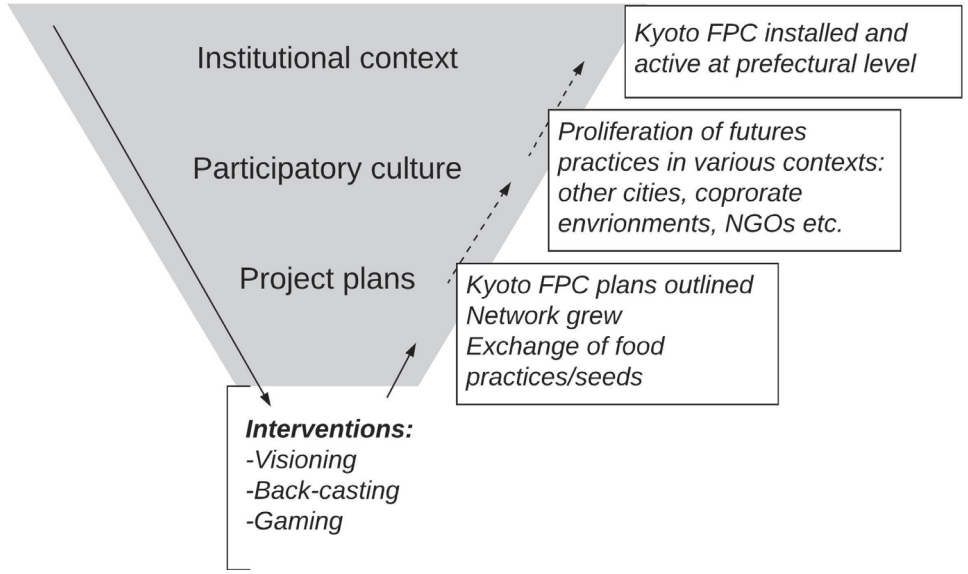

Figure 1. Factors that shape the effectiveness of futures practices in creating space.

5.3. Methodology

5.3.1. Case description

This chapter examines three cities within a European network of cities: Nice in France, Gothenburg in Sweden, and Utrecht in the Netherlands. All are members of the H2020 IRIS Smart Cities research project, carrying the title of leading "lighthouse" cities whose best practices are passed on to "follower" cities. One of IRIS's aims is to incorporate co-creation practices, as formulated in the project description:
"IRIS (Integrated and Replicable Solutions for Co-Creation in Sustainable Cities) is a Horizon 2020 EU funded project beginning October 2017 for a duration of five years. The project has been developed around three lighthouse cities - Utrecht (The Netherlands, coordinator), Nice (France), and Gothenburg (Sweden) - who will work as collaborators and test-beds for follower cities Vaasa (Finland), Alexandroupolis (Greece), Santa Cruz de Tenerife (Spain) and Focsani (Romania). Each city will draw upon a mix of universities and research organisations, local authorities, innovation agencies and private expertise to accelerate entire communities to adopt ambitious energy, mobility and ICT initiatives" (IRIS Smart Cities, 2018 [emphasis added]). One of the project's eight objectives is the following: "Demonstrate active citizen engagement solutions providing an enabling environment for citizens to participate in co-creation, decision making, planning and problem solving with the Smart Cities" (ibid.).

The project runs for five years, and each city has formulated its own set of targets regarding smart energy grids, lighting, mobility and citizen engagement. While the aims are ambitious and strive for an answer to the present-day problem of adequate citizen representation and engagement, the number of actors and the variety of (fixed) project aims indicate

tensions in the project design. The challenge in this case is twofold: there is the question of how to choose the most appropriate urban-futures methodology for specific cases on the one hand; and how to create space for the methods within the context imposed by a large project with diverging vested interests on the other.

5.3.2. Statement of research positionality

The group of authors on this chapter consist of IRIS project members based in Utrecht as well as outside academics. For this reason, a brief reflexive statement of positionality is appropriate. The authorship's main expertise is at the intersection of governance and design. This is the lens through which the framework and methodology presented in this chapter have been developed. The research was funded by the project which is under analysis in this chapter. To mitigate the bias that is inherent in this, the lead author observed the futures process, which was designed by one of the co-authors. Data collection was done by other co-authors. Furthermore, three external co-authors have collaborated on the manuscript, providing an independent perspective. They also reviewed the contributions of the IRIS project members to this chapter and adjusted where necessary it to filter out biased observations and uncritical reporting.

5.3.3. The Ladder & Scope models

Within the IRIS project, one of the five "Transition Tracks" is entirely dedicated to citizen engagement (IRIS Smart Cities, 2018). For the purpose of designing citizen engagement within the project, the Innovation Studio, based at Utrecht University of the Arts (HKU – a project member), has designed and set up two futures tools. The first tool, the Ladder model, is intended to take stock of existing smart-city solutions and the type of citizen engagement that would be most appropriate. The designers argue that whenever integrated solutions are planned to be implemented without possibilities for citizens to learn or to exert influence, there is only communication and no engagement. The Innovation Studio defines four distinct levels of possible citizen involvement, that are based on the steps of Arnstein's (1969) ladder. In the Ladder model used for the purposes of this chapter, Arnstein's eight steps are condensed into four levels. This was done to simplify the model slightly so it would fit the needs of the IRIS workshops: i.e., it could be more easily used as a first step, followed by the Scope tool. The levels are as follows:

1. Informed: Citizens are transparently informed and aware of impending actions and changes in their neighborhood.
2. Involved: (Some) citizens are actively engaged in storytelling about the impending actions and changes in their neighborhood.
3. Contributing: Citizens help create active ownership of existing touchpoints to positively contribute to key performance indicators (KPIs) in the IRIS project.
4. Creating: Citizens co-design new products, services and initiatives to meet the project's KPIs.

The first two levels are forms of communication to or between citizens. The last two levels are forms of meaningful citizen engagement and co-creation. The IRIS project members participating in the workshop are asked to rank their planned urban interventions within the project on this ladder. This group of members consists of local government actors,

local businesses and researchers. In assessing their projects with regard to these levels, they need to pay special attention to all touchpoints within the intervention – that is, to all of the contact points between the customer and the service provider where there is an interaction with a human need in specific time and place (Risdon, 2013). Touchpoints can either be passive or active. Passive touchpoints are those where citizens can learn about a measure, and be informed or instructed. Users are not put in active control of a measure. Examples of these are information letters, leaflets, meetings, blogposts and articles. Active touchpoints are those where citizens can take active control of a measure and use it, configure it, change it or adopt it. Usually this implies some kind of interface. Examples are a physical object, a controller, an interactive display, an app or an interactive web interface.

The Scope model (Figure 2) builds on the solutions that participants ranked on the ladder as having the highest potential for citizen engagement. It standardizes citizen engagement practices across the different cities in the project. This design tool is aimed at planning ahead and experimenting with solutions (fiches) and the necessary time investment (block) for each solution. There are four types of fiches, that represent different project stages. The orange fiches represent the discovery of new solutions. The blue fiches represent the development of these solutions, the plans for their implementation. The green fiches represent the delivery of the solutions: their realization in urban communities. The final, purple fiches represent the upkeep of the solutions, and possibly a reiteration of the development and delivery processes. Participants also reflect on who is responsible for the realization of each block. Mapping out the entire project in this way is a first step toward reflecting critically on the possibilities and limitations of the project and its context. Facilitating this reflection is an essential part of the Ladder and Scope model workshops.

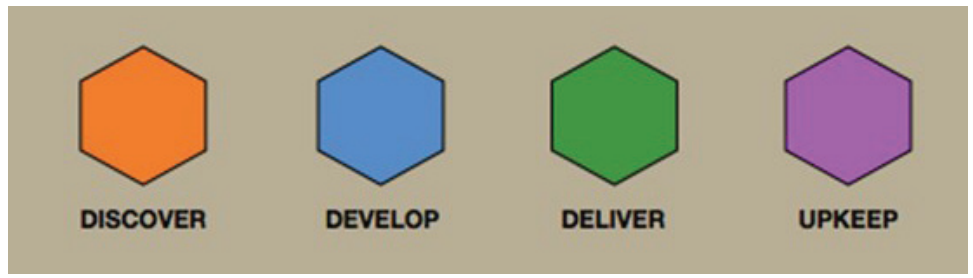

Figure 2. The scope model elements.

5.3.4. Participants

The workshops involved local project members from each work package, with 13 to 20 people attending each session. These members were mid-to high-level stakeholders representing local government, private or semi-public companies (such as public transport providers and housing corporations), and academia: Utrecht University, Chalmers University of Technology and Université Nice Sophia Antipolis (Broekman et al., 2019; De Canson et al., 2019; Reuter Metelius et al., 2019).

5.3.5. Data collection

In Utrecht, the home city of the Innovation Studio employing the Ladder and Scope models, multiple sessions using the tools were held over time. The citizen engagement team was able to observe the developments over time. In both Gothenburg and Nice the main foundation for citizen engagement practices was laid in one workshop. Additional data on the Nice and Gothenburg workshop outcomes was collected in pre- and post-workshop surveys and semi-structured interviews with select participants. The questionnaires consisted of open questions. The pre-workshop survey contained questions about participants' previous citizen engagement experience, current citizen engagement practices and the participants' expectations of the workshop. The post-workshop survey contained questions about the Ladder and Scope model experience, points for improvement of the tools and the participants' intended future citizen engagement practices and takeaways. The complete questionnaires are included in Appendix 1. The interviews took place directly after the participants completed the workshop. These 10- to 15-min interviews were meant to provide further in-depth insights into the citizen engagement practices they described in their surveys. They were transcribed and coded using Nvivo software.

The futures workshops were set up and hosted by the local project officer. The citizen engagement plans that were a result of the futures workshops in all three cities were captured in publicly available mid-term reports to the funder, the European Commission (Broekman et al., 2019; De Canson et al., 2019; Reuter Metelius et al., 2019). These reports were used as a main source of data on the incorporation of the workshop outcomes in the project plans.

5.4. Results

The three "lighthouse" cities each have their own institutional context and pre-determined objectives for the project, mainly related to key "smart city" areas such as shared or electric transport and renewable energy. The results in this section are structured according to the contextual factors that are described as the baseline in the project reports, and subsequently the workshop outcomes. The results for each case follow the four layers of the framework of factors that shape the effectiveness of futures practices (Figure 1).

5.4.1. Nice

5.4.1a Contextual factors

In Nice, the Éco-Vallée, a block of three areas with mixed industrial and residential use, was assigned as the testing neighborhood. At the institutional level, the main objectives are energy-neutral mobility and improvement of the grid for renewable energy. The baseline situation in the demonstration neighborhood, Éco-Vallée, in terms of socio-economic factors and attitudes is compared to a control group. It scores relatively low on knowledge exchange and entrepreneurialism. On resource mobilization, market formation, knowledge exchange and guidance of search the city scores the same as the control group. This section of the report ends with a set of questions and barriers to citizen participation, such as the aforementioned resistance to change, a language barrier in the immigrant community in this neighborhood and distrust toward institutions. The report describes the need to raise

interest in and motivation to adopt new measures. There is no mention of engagement, participation, or other terms that are at the core of the project title and description.

In Nice, the plans in the project consist of three parts. Firstly, in a public awareness campaign on air quality, three solutions will be implemented: an urban awareness campaign, a project educating students on air pollution and an initiative to develop practices of car sharing for a cleaner commute. Secondly, there will be a public awareness campaign on energy and the environment, with the objective of both awareness and behavioral change. Finally, smart home appliances will be further developed, in order to engage citizens individually with their overall energy consumption. (De Canson et al., 2019).

5.4.1b Workshop focus: Services Bleues

In Nice, the Ladder and Scope model workshop led to a distinction between different project plans. Before the workshop, the majority of participants reported that they were cautiously optimistic about the workshop. The Ladder model outcomes feature heavily in the reporting. Certain measures were ranked as only in need of citizen information, not engagement. However, in the development of certain web-based tools, there was room for citizen engagement. In the Scope model, one plan with high potential for citizen engagement was mapped out. The "Services Bleues" form a system of "smart" shared mobility, such as bicycle and car sharing. Key project members are updating and expanding the existing infrastructure in Nice and much of the Cote d'Azur region.

They were able to use data supplied by citizens in this expansion, and co-design the expansion plan with those citizens. The Scope model exercise showed that besides this, there was little room for adding on citizen engagement with regards to the Services Bleues. However, it became clear that by testing halfway through the implementation, there was further room in the timeline of the intervention for some design iterations (Figure 3). While the participants reported that the workshop was useful to them and they had the intention of using its outcomes, the report contains no explicit plan for the Services Bleues (De Canson et al., 2019).

5.4.2. Gothenburg

5.3.2a Contextual factors

The project plans consist of four parts. The first is to utilize the game Minecraft as a tool for citizen engagement, by involving it in planning processes, organizing a summer camp around the game, and educating citizens about the citizenship model of Gothenburg city by allowing them to play with the digital version of the city in Minecraft. The second objective involves using the citizen platform Min Stad as a tool for citizen engagement, by turning the platform into an online hub containing all smart-city plans: data describing ongoing plans, ongoing street work, planned events or documents, and information about political decisions, all geocoded to a geographic location or area. It can also be used as a dialogue-stimulating tool, for example in a challenge investigating what constitutes a "good life" for Chalmers university students, and to survey citizens. Thirdly, the project aims to demonstrate 3D VA/AR Sensor data in the office building "A Working Lab". The AR/

VR Building Information Modelling demonstrator will virtually immerse users in the inner workings and properties of a building, and can give property managers an insight into the status of the building. Finally, the project aims to launch an app that monitors energy usage and gives feedback to users regarding their energy consumption.

5.4.2b Workshop focus: MinStad & Minecraft

Gothenburg was the first city where a one-day Ladder and Scope model workshop was held. The City of Gothenburg has developed Min Stad, a platform where citizens can engage with new plans and regulations. There is also a central role for a Minecraft-inspired app that allows citizens to alter their environment and give feedback to local decision makers directly though the app, as a tool for education and co-creation for children in the city. In the app, the entire city is mapped out in Minecraft, and students get to play and explore there. It exists for mobile and desktop.

Both interventions were mapped in the Ladder model and were deemed to benefit from meaningful citizen engagement. In the Scope model, the appropriate points for citizen engagement in this process were mapped. In the post-workshop survey, the participants were quite critical of the Ladder model, but the majority was positive about the Scope model exercise. The participants found that in online platform Min Stad, the space for citizen engagement was limited due to the platform already having its final form. Engagement possibilities thus emerged at the end of the map in the Scope model. For Minecraft, there were more possibilities. Accessibility is also key: maps are sometimes missing and they require digital skills and devices. There are opportunities to increase this in collaboration with citizens, as well as to add a feedback option in both apps. For both apps, detailed plans containing new decisions from the Scope model are included in the report (Reuter Metelius et al., 2019).

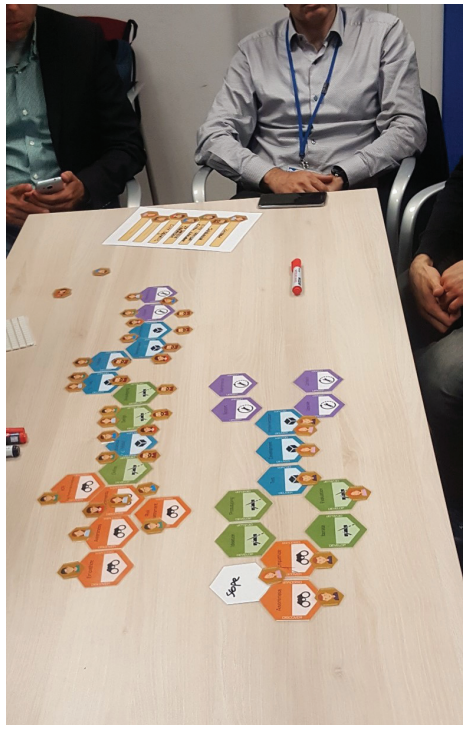

Figure 3. Scope Model workshop in Nice. Photo: Astrid Mangnus.

5.4.3. Utrecht

5.4.3a Contextual factors

In Utrecht, two important partners are a large public transport organization and a public housing corporation. They have assigned the relatively new and large neighborhood of

Kanaleneiland as their testing ground for an increase in PV-panels, electric mobility and decrease in use of natural gas. The base line section of the report opens with the "Utrecht participation standard": a five-step protocol to involve citizens in the city's plans and projects. The five steps are: 1) mapping stakeholders; 2) determining the desired level of participation; 3) matching desired input from stakeholders to steps in the project; 4) making plans to involve citizens; 5) deciding on methods of engagement and suitable participation tools. The report describes extensive experience at the municipal level with this approach, including in the demonstration neighborhood of Kanaleneiland, which shows some socio-economic similarities to the Éco-Vallée in Nice. At the baseline, the report for Utrecht also compared Kanaleneiland to a control group in terms of citizen experience with sustainable practices, traffic and green space in the neighborhood. The section ends by naming similar barriers to those mentioned in the Nice report, but also suggests "co-creation of attractive and inclusive services that support people in their own motivations to engage, express ownership, and change behaviour" (2019: 18) as a potential solution.

There are five key points of attention in the project plans. The first aim is to recruit "change agents" who can help in community building in Kanaleneiland. They can inform their neighbors about upcoming measures that are part of the IRIS project and their purpose, and raise support for them. The second aim is to involve schools in the district: these can serve as a gateway to the parents, who are otherwise difficult to reach. Children will receive special training in using smart solutions such as energy meters, and can pass this knowledge on to their family. The third aim is to co-create smart energy-meter interfaces with Kanaleneiland inhabitants. The fourth aim is related to this and involves co-creating a smart street-lighting system. The final aim is to develop a VR platform where tenants can experience their new homes, including infotainment and interactive training about the new smart energy and mobility services they may expect (Broekman et al., 2019).

5.4.3b Workshop focus: smart street lighting

In Utrecht, the project members ranked the intended project interventions according to the Ladder model exercise. This indicated that in some instances, such as in the case of placing solar panels on the roofs of social housing blocks, citizen engagement would not be meaningful or required. In other interventions, most notably in a plan to implement smart city lighting, the project members found lots of room for citizen engagement. This was partly due to the fact that preparations for this measure had not yet begun and targets and details were not pre-defined. Due to the citizen engagement team being based in Utrecht and part of the monthly meetings, the citizen engagement design process was elaborate and closely monitored by the team.

The project members designed a Scope model pathway in which citizens were involved from the start, co-designing a smart street-lighting plan that would be well loved in the neighborhood. They distinguished various steps and allocated time to each: a co-creation workshop with citizens, a feedback workshop with citizens, and development of the final product. The citizen engagement team set up three iterative workshops to gather information from all stakeholders, design solutions in collaboration with citizens and

divide responsibilities for the realization of the solutions among the participants. In the report, the project members describe this steering of the intervention through a citizen engagement process as highly successful (Broekman et al., 2019).

5.5. Discussion

In this chapter, we have developed and tested a new framework for the use of participatory futures to design citizen engagement in urban sustainability transformations. We note that in existing futures studies literature, much of the focus is on optimizing the conditions needed for a futures practice to succeed (Hebinck et al., 2018; Vervoort and Gupta, 2018; Muiderman et al., 2020). On the other hand, there is a body of literature on experiential and design futures, where the futures practice is at the core of the process and is thought to break open the process by speaking to the imagination of an unspecified public (Bendor, 2017; Candy & Dunagan, 2017). The literature on citizen engagement recognizes the need for attention to be paid to institutional context, power relations, interests and cultural differences, but often there is no explicit focus on the imagination of alternative futures (Glucker et al., 2013; van de Grift et al., 2020; Waylen et al., 2015). We argue that in many sustainability transformations, there is no perfect control over the starting conditions. However, through an honest assessment of the given institutional context, participatory practices and project plans, and an intentional design of the futures practices, the space for citizen engagement to shape alternative pathways can be maximized.

We investigated a number of cases where the same futures design methodology was adapted to different contexts – each reflecting different combinations of the factors outlined in the conceptual model. The model is the main contribution of this chapter, and is tested empirically by applying it to the different cases. The more favorable the preconditions, the more effective a futures practice is expected to be. However, certain individual preconditions can also create some space for the imagination of different futures and the active engagement of citizens. If the driving forces behind the futures practice are more embedded in the project, their efforts can have more impact. Moreover, if the futures practice is spread out over a longer period of time or iterated on multiple occasions, space for futures and engagement is more likely to open up. Existing project plans that can incorporate engagement and open-endedness can provide this space as well, and a strong participatory culture can ensure ownership of the futures practice after one-time workshops or sessions.

Ideally, a multistakeholder process is designed with careful attention to representation, the structure of the process, the information that is used in the process, and the purpose of the outcomes of the process (Abelson et al., 2003). In an ideal futures practice, careful attention has been paid to scripting and staging a practice that can both break out of deadlocks and open up new possible futures (Hajer and Pelzer, 2018). There is a significant body of literature that supports the need for early involvement of stakeholders in change processes (Berner et al., 2011; Edelenbos & Klijn, 2006); alternatively, if stakeholder involvement is not considered relevant for certain elements of a change process, this should be clearly defined and explained.

In the Utrecht case, there were a number of pre-set objectives with regards to implementing renewable energy solutions and car sharing. The participatory culture may be categorized as "substantive" according to Waylen et al. (2015): the project hopes for an improvement of decision-making through citizens' place-based knowledge and values. Especially due to the strong embeddedness of the method and those who led it, significant changes could be made to the project plans. This retroactively created space for process co-design using design futures methodologies, illustrating the value of repeated sessions and tweaking (Hajer and Pelzer, 2018), and two clear spaces for citizen engagement: co-design of smart meter interfaces and co-design of a smart street-lighting plan.

The Gothenburg case is an example of conditions where plans have been pre-designed and allow for little formal space for process co-design; where the futures practices and the organizers are not yet embedded in the larger process; but where there is good involvement and governance of stakeholders, and a culture of participation practices. Gothenburg has a very strong participatory culture, which could be categorized as "normative": inviting stakeholders into decision-making is seen as vital to increasing the legitimacy of decisions and even supporting local democracy (Truex & Søreide, 2010; Waylen et al., 2015). However, the future design practice was led by outside facilitators and in a single event rather than through a process of continual engagement. As a result, the influence of the future design practice on the project plans can be characterized more as a general opening of space (for instance, extending the scheduling of the project) rather than more clearly demarcated changes to project plans such as those seen in the Utrecht case.

The Nice case is an example of a pre-designed change process, where the futures practices and the organizers are not yet embedded in the larger process, where governance of the process practices and stakeholders is fragmented, and where there is a limited pre-existing culture of citizen engagement practices. In addition to certain pre-set goals for bicycle and car sharing and changing energy systems, the participatory culture expressed in the project reports seems elementary. It could be categorized as "instrumental": by being transparent about plans and decisions, the project members hope to improve the acceptability and transparency of their plan, and thus its implementation (Waylen et al., 2015). Similar to Gothenburg, the futures workshop was a one-off event and led to limited change in project plans. In the absence of these enabling conditions, however, the futures methodology has still been valuable in outlining the participation challenge and getting stakeholder inputs in a consultative mode.

This comparison of the three cases within the framework proposed in this chapter demonstrates that each factor impacts the way in which a futures practice can create space in a larger project for urban sustainability transformations. The expectations from the futures practice should be adjusted accordingly. An intentional design or "staging" is also essential for futures practices, and should take into account all factors that shape its context (Hajer and Pelzer, 2018). This may mean that expectations should be kept low and the focus should be on one or a few concrete urban interventions. However, the more favorable the institutional context, participatory culture and project plans are to the

futures practice, the more systematically the effects of this practice can resonate, such as in the Utrecht case, where the futures team was embedded in the project and changed the plans and arguably the participatory culture.

We would like to emphasize that the framework offered in this chapter is also useful for more utopian or radical urban futures than the ones offered in our case study. Imaginative and radical ideas can open up space in urban sustainability pathways, even if the transformations are not part of a project. For example, art installations, climate fiction and design practices can paint new and different pictures that re-shape how we see topics such as energy use, social sustainability and mobility (Candy & Dunagan, 2017; Hajer and Pelzer, 2018; Pelzer & Versteeg, 2019; Ashtari & de Lange, 2019). By mapping the institutional context, participatory culture and current plans regarding a topic within a city, such practices can be designed and staged better and their effects can be traced.

5.5.1. Limitations and future research

To put the results and discussions of this chapter into perspective, a few limitations to our research should be noted. The empirical base for the study was relatively small and consisted partly of "learning-by-doing" through participatory observation. However, it indicates that the futures practice and the conceptual framework were appropriate and can be applied to various multistakeholder change processes. Applying the model to a larger case or project is an opportunity for future research. This larger empirical case could also serve to balance control and effect, which is a recurrent challenge in action research like this.

In this chapter, we have made certain assumptions about the four pre-conditions of institutional context, participatory culture, project plans and futures practices. However, future research into each of these four levels can deepen our understanding of their composition and influence. In this chapter, the futures practice is the same design-focused futures practice in all three cities. By repeating this study with different methodologies, it would be possible to see their effects, as well as any similarities and differences between them. Moreover, it would be interesting to repeat these futures practices in a more iterative, repetitive way, online, at a larger scale and at various governance levels. This may also serve to reduce the biases that we have identified in our statement of researcher positionality, by offering different conceptual lenses and separating designers from the research team, and the research team from the project in which they operate.

5.6. Conclusion

This chapter took on the challenge crucial for many organizers of participatory futures practices: how to use "futuring" to design citizen engagement and create space for alternative solutions in the middle of ongoing sustainability transformations? We noted that while a large section of the literature on futures studies and citizen engagement focuses on the conditions for success, in reality, many of these conditions are oftentimes imperfect. Building on literature on participatory futures and anticipatory governance, we developed a framework that comprises four factors that shape the effectiveness of participatory futures practices in their contexts and explicitly includes the participatory culture. The framework consists

of the space in the institutional landscape of a multistakeholder project; the participatory culture around the project; the project development; and the futures practices itself. We applied the framework to design citizen engagement with the support of futures tools in three "lighthouse" cities that are part of the international, multi-city H2020 IRIS Smart Cities project. From the results, we conclude that under imperfect conditions it is still possible to find and optimize space for exploring and re-imagining different pathways to urban transformation, provided that there is an intentional engagement with the context, culture and sustainability transformation project plans.

5.6.1. Implications: four scenarios

Building on our findings, we provide a set of scenarios that provide guidance for members of urban sustainability transformation projects when navigating the factors that shape the effect of a futures practice. We specifically provide possible avenues for action for funders, project leaders and organizers of futures practices within the project. The four scenarios speak to all four levels, going from more to less control over the conditions that shape the effect of futures practices. We have added an extra set of recommendations for the most open, unstructured circumstances.

In an ideal situation, where all four factors can be influenced, funding call parameters and terms of reference for participatory futures work can encourage openness to futures-oriented participation from the outset. Project leaders have the opportunity to be crystal clear about what space there is for citizen engagement, including stipulating when and with what potential effect it can occur. Under such open conditions, futures design practices are expected to have the most beneficial results for transformation processes. Organizers of futures practices within the project would benefit from being made more aware of the conditionalities for effectiveness, and training could emphasize the significance of their role to further successful citizen engagement within the project.

When the institutional context is pre-structured, but the other factors are open, it is important for funders to pay attention to progress reports from the project leaders in the policy context and the futures practice organizers throughout the project. When there are signals that the project needs to be amended, the funders can accommodate this. Project leaders can make an effort to retroactively create space for participatory futures in the project plans to relieve the participation-prescription tension. This has consequences for the futures practice organizers working as part of the project: ideally, these organizers are embedded in the local context to maximize the effects of their efforts. In a multi-city project where this may not be possible, the best option is to select futures practice organizers that have experience within the local context to ensure clarity about process governance and stakeholder involvement, and that have experience of using participatory methods with local stakeholders. Ideally the futures methodology would accommodate multiple sessions and opportunities for repetition and revisions, rather than one-time sessions and workshops.

When both institutional context and the project are pre-structured, but there is a strong participatory culture, futures design methods can be combined with continuous engagement to create mutual trust, understand local leverage points and adapt the process where necessary. If such locally embedded co-leadership is not possible, the next best option for project leaders is to take special care to come to the planning process with very concrete proposed changes, for which champions are identified to help make their implementation more likely. Futures practice organizers can benefit substantially from extensive collaboration with project co-leaders who are more embedded in the local context, and can focus on building local capacity for the design of meaningful citizen engagement by developing local future design expertise among their partners.

The funders of large urban sustainability transformation projects should allow space for participatory futures that are critical of their context if that context proves to be pre-structured in important ways, in order to highlight challenges and avoid allowing only positive messages to come through. In that way, the project funders can benefit from the insights coming out of such critical futures work by using these insights as learning experiences and input for the design of next funding round. For the project leaders, it is important to clearly identify the space for participatory futures in the process, and adjust the ambitions of the process to reflect what is feasible in the context. In the absence of all enabling factors, organizers of futures practices within a project can use their methodologies to highlight the challenges of the project and gather stakeholder perspectives that can still inform the change process later on, but in a consultative mode rather than a co-design mode.

6. PICTURE THE FUTURE, PLAY THE PRESENT

Re-imagining sustainable cities through a large-scale location-based game

The urban sustainability transformations that are urgently needed will have significant effects on the daily lives of city dwellers. As ways to imagine and co-design sustainable urban futures, experiments within the present-day urban environment are increasingly popular. This chapter investigates how such an experimental approach can serve as the base of an applied urban futures game that enables its players to reflect on and imagine ways to address complex sustainability problems. We developed a large-scale mobile urban futures game, Utrecht2040, that provides its players with sustainability content, reflection, and motivation for action. The digital infrastructure of the game and large number of players provided unique opportunities for measuring outcomes. Our results indicate that this type of experimental gaming offers a new way for players to collect existing sustainable practices or "seeds", and use them to collectively create glimpses into relevant sustainable urban futures. At the individual player level participants reported an increased understanding of sustainability and motivation to act. We conclude that large-scale collective experimental futures games in socio-spatial urban environments are a high-potential avenue for overcoming the "crisis of the imagination" by creating inclusive urban futures that inspire action.

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6.1. Introduction

Historically, cities have often served as arenas for testing utopian ideals and alternative visions of society (Bulkeley & Castán Broto, 2013). Now, cities have an important role to play in meeting sustainability targets such as those stated in the Paris Agreement and the UN Sustainable Development Goals. They are centers of innovation and change, but they also bring about many of today's complexly intertwined social, economic, and environmental problems (McPhearson, Iwaniec, & Bai, 2016). In more sustainable cities, city dwellers would experience profound changes in areas of their daily lives such as eating, dwelling, education, shopping, and travel.

In this chapter, we zoom in on a recent development in futures studies literature that allows for new forms of engagement with sustainable urban futures. This development can be described as the "experimental turn", which consists of work that argues for a reconsideration of practices, innovations, and institutional arrangements in the present. An experiment in this context can be defined as *"an inclusive, practice-based and challenge-led initiative designed to promote system innovation through social learning under conditions of uncertainty and ambiguity"* (Sengers et al., 2016: 153). Experiments offer "glimpses" into transformed future worlds: glimpses that offer inspiration and aim to shift the boundaries of what is considered permissible, desirable, and possible; glimpses of pathways toward change that diverge from business-as-usual; or glimpses of niche interventions that are close to finding a larger audience. The overarching design objective for these is that they evoke possibilities for new system architectures in every domain of life, such as water, food, energy, transport, and shelter (Ryan et al., 2016).

Such glimpses can be created through active experimentation with existing components of sustainable urban futures. Bennett et al. (2016: 442) offer a useful framing of such present day practices and projects as *"seeds"*, which can grow into more mature futures. The act of experimenting with "seeds" and the resulting glimpses into new futures could enable urban dwellers to reflect on complex sustainability problems, imagine ways to address them, and develop pathways for action (Pereira et al., 2021).

Such "seeds"-based experimentation depends on strong interactive formats and process design (Mangnus et al., 2019). Applied games represent an increasingly popular and diverse suite of methods that have the potential to bring both approaches together. Such games can be designed to offer playful settings and systems that engage with "serious" content, topics, narratives, rules, and goals to foster a specific purposeful learning outcome (Mitgutsch & Alvarado, 2011). They are already used in governance, planning, and futures processes, and to think through complex sustainability problems (e.g., Valkering et al., 2013; Tan, 2014; Vervoort, 2019; Van Hardeveld et al., 2019). While a number of successful Alternate Reality Games (ARGs) have been developed, such as *World Without Oil* and *Evoke* (Hansen et al., 2013), when it comes to experimental futuring, the potential of using these futures games at scale and measuring their effect systematically can be further realized in the governance sphere (Vervoort, 2019). This chapter aims to contribute to the literature on experimental futures by documenting and

analyzing the effects of a large-scale, location-based game on the ability of its players to reflect on and imagine ways to address complex sustainability problems. The research question that guides this chapter is as follows:
What elements of a large-scale, location-based futures game enable players to reflect on and imagine ways to address complex sustainability problems?

6.2. Theoretical framework
In this first section, we explore the urgency of urban transformations in sustainability and the role of future visions of daily life. Subsequently, we give an overview of literature on experimental futures to determine the criteria for an effective urban futures game.

6.2.1. Urban transformations toward sustainability
The UN Environment Program declared sustainable cities of the future *"the ultimate design challenge"*, for which a *"planning revolution"* is needed that will make urban environments more compact, green, just, and low-carbon (2018). Historically, cities have been arenas for testing new ideas that have a constitutive role in generating social, cultural, and material spaces of innovation and experimentation (Bulkeley & Betsill, 2013). The practical implications of the sustainability transformations that are now necessary will have major reverberations in the daily lives and environment of city dwellers. Moreover, the support and cooperation of residents will be crucial to making such a planning revolution successful. A key failure of sustainability transformations lies in not including societal stakeholders in transformation plans (Bai et al., 2016). Increasingly, cities are actively thinking about more sustainable and desirable futures, but an unfulfilled potential remains with regards to creating consensus and shared visions through participatory methods (McPhearson et al., 2016).

In contrast to the work done at the forefront of futures research and by urban innovators, practitioners and policy makers oftentimes still adhere to a "solutionist" way of thinking in the face of complex sustainability problems. They identify a limited range of problems and accompanying future solutions (Strengers, Pink & Nicholls, 2019). Arguably, this focus on narrowly defined, isolated solutions and effects is not only ineffective, but misses the contexts of the local, social, and political systems that always connect seemingly isolated elements of futures. It is thus crucial to include discussions of values, emotions, and everyday experiences (Dulic, Angel & Sheppard, 2016). Moreover, if experts are the ones that mostly feed visions, scenarios, and pathways into policy, they risk *"locking in 'futures' on behalf of the wider public"* (Garduño García & Gaziulusoy, 2021). In an era of human-induced global environmental change, the recognition of individuals as active agents in a social-ecological system opens up a range of possibilities for transformative change. Their interactions shape institutions, which in turn influence individuals (Bai et al., 2016; Strengers, Pink & Nicholls 2019).

Bendor (2018) describes how the path to sustainability is obstructed by our own inability as individuals and as a collective to imagine what a sustainable future may look like. In his words, *"we are facing a crisis of the imagination, or more accurately, crises of our*

social, economic, and political imaginaries" (ibid.: 132). Bendor (2018) also proposes an approach to this that touches on the ideas behind the experimental turn. He calls this *"worldmaking interactions"*, or forms of interaction that *"aim to promote the public's own ability to imagine alternative futures – to encourage the public to find ways to collectively reformulate a sense of what is possible and gain an increased feeling of individual and collective efficacy. Their aim is to evoke and create traffic between the individual's imagination and the more collective, social imaginaries."* This kind of approach can make the *"sociology of expectations"*, or the range of future visions circulating as a result of the modes of analysis and prediction, more inclusive (Strengers, Pink & Nicholls, 2019).

6.2.2. The frontier of experimental futures research
Recent developments in experimental futures approaches offer opportunities for engagement with a variety of sustainable urban futures at the citizen level. Both approaches are complimentary in the way in which they make futures tangible, engage citizens in future worlds where they can get a sense of their own agency, and provide opportunities for co-design, imaginative participatory visioning, and addressing the *"crisis of the imagination"* (Bendor, 2018). Experimental futures manifest small-scale or partial futures in the present, testing the potential of innovations and institutional arrangements (Sengers et al., 2016).
Caniglia et al. (2017) define experiments as: *"a scientific practice that relies primarily on an intervention and that allows for the production of empirical evidence"*. Due to this production of new knowledge and data, experiments are often conducted in collaboration with societal stakeholders, such as energy providers, housing corporations, or citizens. They also have a certain level of popularity among policy makers, who feed or scale the results back into the larger urban context (Potjer, 2019).

Some gaps remain in the knowledge of experimental futures interventions. The city is the space where many urban experiments take place, for example in living labs or workshops (Bulkeley & Castan Broto 2013; Meijer & Rodriguez Bolivar 2016). However, such experiments often lack an explicit futures focus (Vervoort, 2019). Secondly, the scale of experimental futures interventions in urban settings is mostly small, which is understandable due to resources and local cultural specificity (Garduño García & Gaziulusoy, 2021). This is a barrier to scaling up or out (Roddell & Moore 2015). Finally, there are very few empirical insights into the effects of these interventions (Kuzmanovich & Gaffney, 2017). When designing interventions that aim to create change in real-world socio-environmental systems, measuring the outcomes or impacts is crucial (Mangnus et al., 2019).

By including the everyday, the objects, activities, and events we spend a lot of time with and the attitudes and relations we hold toward them, futures become democratized and concerned with the textures of the lives urban dwellers lead, instead of only focusing on extreme events (Candy, 2010; Garduño García & Gaziulusoy, 2021). One way of collecting and experimenting with everyday good practices is through "seeds", as defined and developed by Bennett et al. (2016: 442): *"initiatives […] that exist, at least in prototype form, and that represent a diversity of worldviews, values, and regions, but are not currently*

dominant or prominent in the world". These examples of existing sustainable practices can be collected, and together they can be experimented with in order to from outlines of possible sustainable futures that are rooted in the present. According to Bennett et al. (2016: 442), such inspirational and believable images of the future are highly important, since *"they can help shape the very reality they forecast or explain"*. The original "seeds" database consisted of initiatives and practices that could be considered ingredients of a "Good Anthropocene". They have since been used to guide local and regional planning processes (Pereira et al., 2018; Raudsepp-Hearne et al., 2019; Mangnus et al., 2019) and to offer novel ways to add bottom-up futures to global assessments (Pereira et al., 2021).

As results of experimentation with "seeds", visions of for example a "good Anthropocene" or a sustainable city of the future arise. Because of the different worldviews, values and characteristics in each of the "seeds", they generate a plurality of different sustainable futures (Bennett et al., 2016; Pereira et al., 2018). When visualized, such visions can be considered "glimpses": *"evocations of possible future states that are sufficiently 'open' that they encourage interpretation and translation for the context of the viewer to 'experiment with' rather than a highly defined future that could be interpreted as a blueprint"* (Ryan et al., 2016: 65).

6.3. Criteria for an experimental futures game

For the purposes of this chapter, we propose an experimental worldmaking interaction that can be applied at scale in the form of a large-scale location-based game. Applied games are designed to offer a playful environment that provide "serious" content, topics, narratives, rules, and goals to foster a specific purposeful learning outcome (Mitgutsch & Alvarado, 2011). The environment of a game offers players a chance to explore future urban worlds (Vervoort et al., 2010), and challenge their boundaries, imagine futures, expose the invisible, and construct reality (Dulic, Angel & Sheppard, 2016). A change process that is connected to the local level in compelling and interactive ways is a crucial motivator for visioning, designing, and practicing futures. By carefully designing such a process, it moves beyond cognitive reflection and creates tangible and multi-modal experiences (ibid.). Games like *World Without Oil*, *Superstruct*, and *Evoke* (McGonnigal, 2011) demonstrate that games can engage large groups of players in new worlds, let them engage with complex sustainability problems, and experiment with possible ways to address them.

To contribute to the work done so far at the forefront of experimental futures, we propose a set of criteria for an effective large-scale location-based game, divided into three categories: game content, reflection, and motivation to act. These criteria are based on insights from experimental futures literature, and literature on applied games. Firstly, for game content, we argue that this type of game should offer a balance of new knowledge and insights regarding the sustainability issues at hand, and an exchange of knowledge by the players as they work together to identify "seeds" in the environment of the game. Venturing out into the city and looking for sustainable practices is a crucial element for a learning process based in experiences rather than a purely cognitive transfer of knowledge (Kolb, 1984; Weiland et al., 2017; Garduño García & Gaziulusoy, 2021).

Secondly, we argue that this type of game should allow for reflection. The first type of reflection is on the participant's individual attitude to the future (Garduño García & Gaziulusoy, 2021). The second type of reflection takes place by thinking about and finding sustainable "seeds", and receiving feedback from other players (Dulic et al., 2016). Immediate feedback is a key characteristic of games, and this can be provided by rating the "seeds" uploaded by others or by receiving such ratings from others. A debriefing at the end of the game also provides feedback on uploads, and more importantly, on the complete vision or "glimpse" of the future that is visualized by the complete set of uploaded "seeds". These feedback procedures are an important element of successful experimentation (Sengers et al., 2016).

Thirdly, we argue that this type of game should provide players with a motivation to act: through the new sustainable seed practices that players encounter, as well as individual and collective feelings of efficacy that illustrate a solution to the crisis of the imagination and provide a sense of efficacy (Bendor, 2019). The game motivates each of the players to act, individually and collectively. Individual outcome efficacy refers to *"a judgement of the extent to which individuals' actions can contribute to the collective goal"* (Koletsou & Mancy, 2011: 199). Koletsou & Mancy (2011) define collective efficacy as *"a measure of individual judgements of the ability of the collective to conduct a particular behaviour"*. Collective outcome expectancy is then defined as *"a measure of people's judgements of whether collective action can help achieve the collective goal".*

Table 1 summarizes our proposed criteria for an effective urban futures game.

Table 1. Game criteria

Criterion	Objective
1. Game content	
1a. Knowledge of sustainability	The player's knowledge about complex sustainability problems increases.
1b. New ideas for sustainable practices	The players collect examples of sustainable practices that were previously unknown to them.
2. Reflection	
2a. Attitude to the future	The player's sense of optimism, neutrality, or pessimism about the future shifts positively.
2b. Re-interpretation of the present to generate futures	Players develop visions of sustainable futures that consist of sustainable "seeds" from their present-day environments.

3. Motivation to act	
3a. Individual outcome efficacy	Positive change in *"a judgement of the extent to which individual's actions can contribute to the collective goal"* (Koletsou & Mancy, 2011: 199).
3b. Collective outcome efficacy	Positive change in *"a measure of people's judgements of whether collective action can help achieve the collective goal"* (Koletsou & Mancy, 2011: 199).

6.4. Game description: Utrecht2040

Based on the theoretical framework and proposed criteria, we developed the game Utrecht2040, a smartphone app. As an intervention, Utrecht2040 was designed with a focus on scale, in terms of both measuring its outcomes and offering the possibility to play it with a large number of groups and in various contexts. The experimental aspects of the game are crucial: both the digital experience, as well as the connection with the urban socio-material environment. The location where the game takes place plays an important role: the players can collect, re-arrange and re-imagine "seeds" from their present-day socio-material environment and submit them as uploads to their location on the digital map. Because Utrecht2040 is a smartphone app, the game can be played in the city itself, adding a new immersive layer to this futures experience. From both the game data and futures process design, we are able to collect empirical data to measure the effects of the game.

6.4.1. Underlying principles

The game's core learning aim is to let players determine their perspective on various sustainability problems and provide a framework for individual and collective action toward sustainability transformations. Directing the players to venture into the present-day socio-material environment of the city of Utrecht together, it creates an immersive process in which players seek "seeds" of possible, probable, or desirable sustainable futures. In the game, we call the uploads made by the teams "solutions" for clarity and to motivate players to complete or solve their mission. The elements of playing outside, competing in teams, and searching for ways to address urgent sustainability problems are added to the game to contribute to a "let's go!" mentality or a sense of optimistic agency among the players.

6.4.2. Player principles

The basis of Utrecht2040 is the eponymous smartphone app. However, it was designed with a holistic approach to its staging (Hajer & Pelzer, 2018). The staging follows principles laid out by Shaffer (2007), who argues that everything, from the players travelling to the place where they will play the game to the debriefing and subsequent impact, is part of the world that the game builds. Utrecht2040 starts with an introductory lecture, with all of the players gathered in one place. A lecturer introduces the game, its background, and the game objective: to imagine and visualize the most sustainable version of the city of Utrecht in

2040. Then, the players watch a movie clip that introduces the app, as well as the challenges and "solutions" they will engage with. The speaker is a sustainability professional with experience in broadcasting, displayed as a large talking head on a lecture screen, who brings the futuristic "mission" of the game to life. This clip is meant to further frame the futures perspective of the players and make them excited to go out into the city and play.

6.4.3. Game principles

The first action players take after logging into the Utrecht2040 app is the creation of a player profile. To capture a holistic perspective on sustainable development with humans as crucial agents of change in the game, we use the set of Sustainable Development Goals (SDGs) formulated by the UN. The app contains 16 "dilemmas": two statements between which players have to choose. For the first set of eight dilemmas, players have to indicate which they find more important, e.g.: "Invest in food production" or "Invest in forest protection". For the second set, players have to indicate what they would rather do, e.g.: "Participate in a women's march" or "Participate in a climate march" (Figure 1). The player profile is meant to determine the position of players in a system that incorporates social, economic, and environmental sustainability. It also aims to provide a starting point for discussion between players, and to motivate players to start looking for "solutions" to issues that matter to them.

After creating the profiles, the players create teams. They can name their teams (groups of 3–5 persons) and add members by finding others through a search engine in the game. After creating and naming their teams, the players are free to leave the room. They receive no specific spatial guidance, but are encouraged to go out into the city and follow the information and challenges provided by the game.

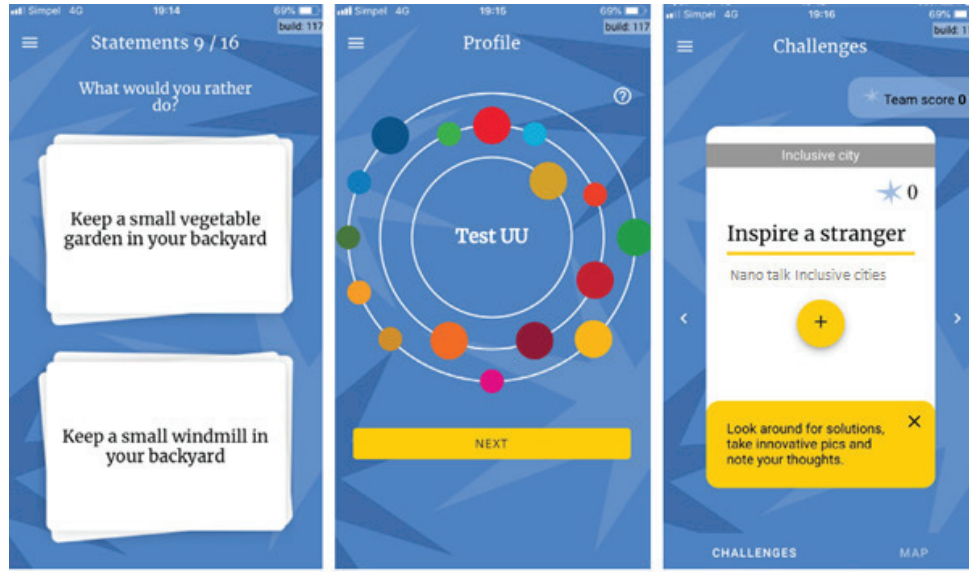

Figure 1. Game screenshots. L-R: statements, player profile, and challenge

The teams first watch a "nano-lecture": a 40-second clip of an inspiring Utrecht sustainability professional. The lecturers present the players with a complex, multifaceted, and not neatly delineated sustainability problem that is keeping them up at night. There are three nano-lectures in the game: "Inclusive cities" (on non-inclusive public space), "Preserving oceans" (on ocean acidification), and "Eat like you say it" (on the value-action gap in the behavior of consumers with regards to sustainable food).

After watching the lecture, the players receive a number of open-ended challenges, e.g., "Inspire a stranger" or "Solve it with coffee". These challenges are designed to set the teams in motion and incite creativity and inventiveness. The teams can capture their answer to this challenge in an upload: a photo and a piece of text describing the initiative or solution found by the team. This upload is then pinned onto a digital map of Utrecht where it is visible for all teams in the game. The activities in the game enable players to earn "Quality of Life points", the virtual currency of Utrecht2040. The Quality of Life points indicate which team has made the most uploads and received the most "likes" from other teams. It is a built-in feedback system and quality control for the future of Utrecht. Players can earn points by adding initiatives or rating other teams' initiatives on the map, and in the end can win prizes that are handed out in the awards ceremony during the closing lecture.

The closing lecture is the final act of the game, after the players have finished playing the game outside. For this debriefing session, the teams regroup in a lecture hall, where the complete map of "seeds" is presented on the screen. This allows for highlighting best practices and for the teams to reflect on their own uploads and on what others did. The focus of Utrecht2040 is on active and creative participation. Participants experience the learning objectives by coming up with small-scale "solutions". A transfer is needed for the players to be able to subsequently generalize and apply the futures game experience to situations outside the game. This transfer requires reflection as well (Renger & Hoogendoorn, 2019). The communal setting of the closing lecture thus allows for a debriefing, which is vital in a process like this, and a collective reflection on the initiatives and the change in profiles that emerged from the game (Crookall, 2010). In the debriefing session, the players see how their "solutions" are actually "seeds" in a larger, dynamic picture of a sustainable future Utrecht.

Figure 2 shows the outline of the Utrecht 2040 game concept. The flowchart is structured according to the various game elements, from the learning aim to the player's own game perspective. The model is based on the "playful design canvas" by Renger & Hrehovcsik (in Renger & Hoogendoorn, 2019).

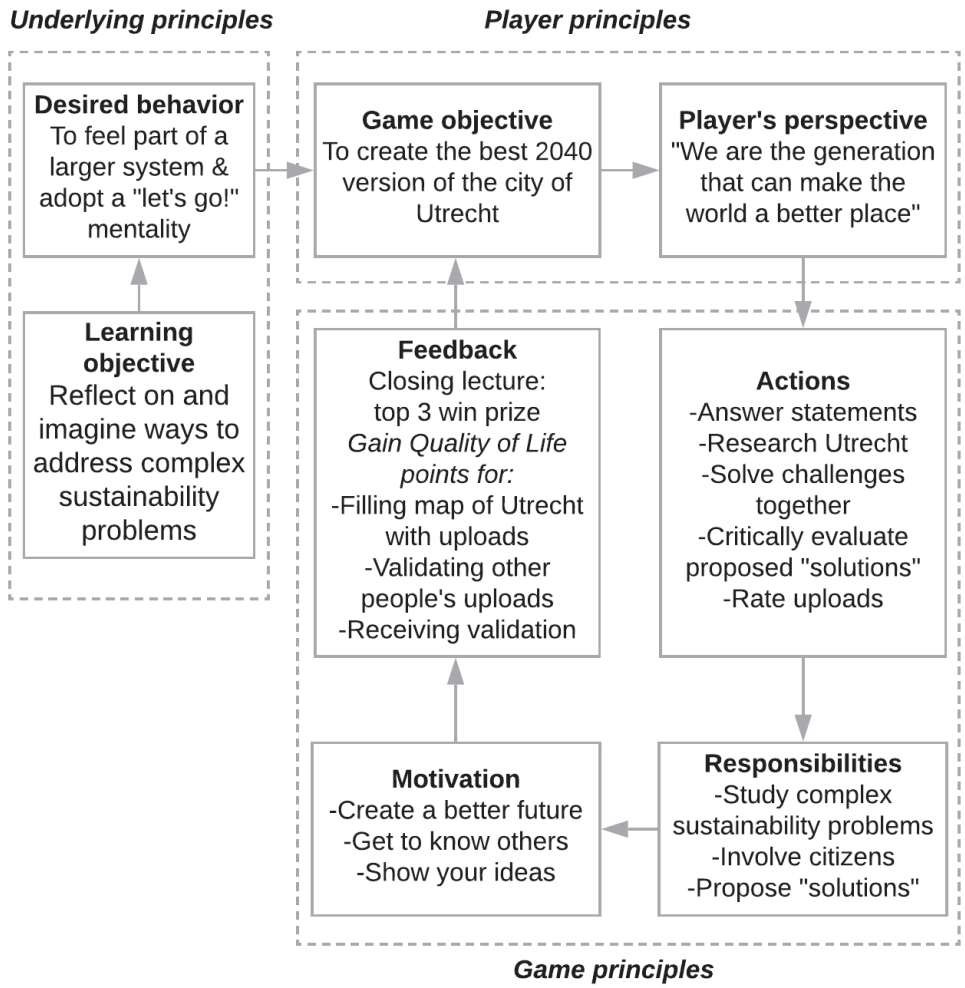

Figure 2. Utrecht 2040 Play Design

6.5. Methodology

6.5.1. Participants

In our case study, we played Utrecht2040 with four groups of Utrecht University students. The BSc students that played the game are enrolled in Global Sustainability Science (GSS), Human Geography and Planning (HGPL), and Politics, Philosophy, and Economics (PPE). For the groups of students enrolled in GSS and PPE, the game play took place in their university introduction week. The game teams were the teams in which they participated in this introduction. They had multiple days between the start of the game and the closing lecture to play. For the HGPL students, the game was part of a tutorial, and they played for four hours. The game was also played with slightly more advanced students enrolled in the master's program in Green Media and Civic Engagement (GM). These students played the game as part of a lecture and played for four hours.

6.5.2. Data collection

We collect data in a mixed-methods approach to capture this process empirically in a representative way (Bauer & Aarts 2000). This comprises surveying the participants before and after the intervention, analyzing player engagement with the intervention in the form of game data, and analyzing the futures output in the form of images. To analyze which futures were salient in the game, it is necessary to extract certain data from the game itself. We analyze which problems and challenges were chosen the most and the least; how many uploads the players made; and how many likes they gave and received. This entails making an inventory of all images generated by the players, and categorizing their choice of subject and solution (Penn 2000). After coding the inventory, patterns and salient future components can be discerned from the game output.

The survey was built into the Utrecht2040 smartphone app. After login, the survey screen opened and the players were given some time to fill out the pre-test survey. After the closing lecture, the post-test survey opened up in the app and players were able to fill it out. Due to the fact that the final survey was the last step in the game, the response was lower than that of the first survey. Adding to the uploads generated in the game, Table 2 contains a set of survey questions to track the players' experience. Koletsou & Mancy (2011) provide a framework and operationalization for both individual and collective outcome efficacy. It should be operationalized via statements that measure perceptions of the extent to which the outcomes of individual behaviors contribute to achieving collective goals (Koletsou & Mancy, 2011). Individual actions can be independent of one another in social dilemma situations. Furthermore, the decision to cooperate may depend on the decisions of others, especially when the benefit is only attained if a threshold of cooperation is achieved. All questions are rated on a 5-point Likert scale where 1 is the most negative answer and 5 is the most positive answer. This data is categorical, and thus requires a non-parametric test. Since we collect paired pre- and post-intervention data from the same set of participants, the analysis requires a paired difference test. The variables consist of ordinal data, which is why the Wilcoxon paired signed-rank test is the appropriate option (Meek, Ozgur & Dunning 2007). The post-game questions contain one extra question on the extent to which players gained new insights, which is analyzed by calculating mean scores and comparing groups.

Table 2. Survey questions

Pre-game questions	**Outcome (# in Table 1)**
1. How familiar are you with the UN's Sustainable Development Goals (SDGs)?	Knowledge of sustainability (1a)
2. How would you characterize your view on the future of the planet?	Attitude to future (2a)
3. Please indicate your agreement or disagreement with the following statements: a. I would describe myself as environmentally conscious. b. My personal actions can make the world a better place. c. By acting collectively, people are capable of making the world a better place. d. I have ideas for solutions that can make Utrecht a better place.	 a: Knowledge of sustainability (1a) b: Individual outcome efficacy (3a) c: Collective outcome efficacy (3b) d. New ideas for solutions (1b)
Post-game questions	
1. How familiar are you with the UN's Sustainable Development Goals (SDGs)?	Knowledge of sustainability (1a)
2. How would you characterize your view on the future of the planet?	Attitude to future (2a)
3. Please indicate your agreement or disagreement with the following statements: a. I would describe myself as environmentally conscious. b. My personal actions can make the world a better place. c. By acting collectively, people are capable of making the world a better place. d. I have ideas for solutions that can make Utrecht a better place.	 a: Knowledge of sustainability (1a) b: Individual outcome efficacy (3a) c: Collective outcome efficacy (3b) d. New ideas for solutions (1b)
4. To what extent did you gain new insights from playing the game?	d. New ideas for solutions (1b)

To collect more detailed information on the topics of players' knowledge, desired futures, and sustainable attitudes, the questionnaires are supplemented by a group feedback discussion with each group of players. In these focus groups it is possible to gain in-depth insights into the desirable futures as conceptualized in the game. The group feedback discussions took between 15 and 30 minutes. In every group, the semi-structured discussion was based around four main questions:

- What was your general experience playing the game? (opening question; ice-breaker)
- Did you learn new things from the game? (general)
- Did you encounter new solutions for sustainability problems in the game? Which ones stood out to you? (specific)
- How was the experience of playing in the city of Utrecht?

The participants were free to elaborate in depth on any of the questions, or contribute other experiences they found significant. The audio recordings of the sessions were later

transcribed. The sessions were always conducted in pairs, with an observer present to register non-verbal feedback.

6.6. Results

6.6.1. Participants

A total number of 284 participants participated in both the pre- and post-tests. Appendix 1 contains the number of students in each group. It should be noted that our sample of university students is not representative of a larger demographic. In the pre-survey, the players indicated their prior knowledge of the UN SDGs, as well as their perceived level of optimism, individual outcome efficacy, and collective outcome efficacy. For some questions, certain groups had prior knowledge that was significantly higher compared to others (e.g., GSS students' prior knowledge of the SDGs significantly exceeded that of other groups). For other questions, such as individual efficacy, the differences were not significant. A perhaps surprising trend is that participants who indicate that they have a high knowledge of the SDGs and consider themselves environmentally conscious (GSS and GM), also report low levels of optimism and individual outcome efficacy. A second result that stands out is the score for collective outcome efficacy: this is very high both before and after playing, with an average score of between 4 and 5 for every group.

Table 3 displays the number of uploads per topic per group. GSS received all nano-lectures at once, and they show an even distribution in uploads. The other groups show a majority of uploads for "Inclusive cities". The "Inclusive cities" nano-lecture was accessible for the longest period of time, followed by "Eat like you say it", and finally "Preserving oceans", so an even distribution is not necessarily expected. Notably, the students who played in the context of a course (HGPL and GM) submitted many more uploads, even though GM only had one afternoon of playtime. These groups also had significantly more students than PPE and GSS.

Table 3. Uploads per topic and study program

Topic	GSS	PPE	HGPL	GM
1. Inclusive cities	37	78	786	410
2. Eat like you say it	34	12	398	264
3. Preserving oceans	30	29	175	154

6.6.2. Game content

This paragraph reports the results of the survey, game output and feedback discussions per criterion. Appendix 1 (descriptive statistics and pre-post comparison) and 2 (between-group comparison) contain the complete tables with all survey outcomes sorted by question as provided in Table 2.

6.6.2a Knowledge of sustainability

Between the pre- and post-game surveys, the players reported a positive effect on their knowledge of the SDGS, with the mean score increasing significantly across all groups from 2.69 to 3.55 on average (Appendix 1a & 1b). About 50% of the game uploads featured some type of knowledge exchange. This was depicted in the upload as an exchange between group members, from the group to the map (e.g., by sharing a favorite sustainable practice), or between the group and other people in the city, like children, passers-by, or family members. In the group feedback discussions, a PPE student mentioned that his main learning point *"was getting involved with the SDGs from the United Nations, and also to see actually in real life what perhaps we don't really do or things like plastic […], that are already surrounding us and tied up with what is happening in the oceans"*. Similarly, in other groups, students reported having gained knowledge from seeing the complex sustainability problems posed by the nano-lectures. On the other hand, students in the HGLP and GM groups mentioned that they felt that a more information-dense, rather than open, game would have taught them more about sustainability.

6.6.2b Uploads

The uploads submitted by the players were closely related to the futures approaches or relevant visions for everyday life that they encountered while playing. In the PPE focus group, one participant mentioned that he was positively surprised by the number of sustainable "seeds" already implemented or supported by Utrecht's government, while another player mentioned experiencing plastic pollution when he went looking for a piece of trash for a photo. Other players mentioned that playing in a group and interacting with Utrecht citizens on the street also gave them new insights, for example about children's dreams for the future (GSS) or buying vintage clothing (PPE).

6.6.3. Reflection

6.5.3a Attitude toward the future

GSS, HGPL, and GM reported a significant positive change in their attitude toward the future (Appendix 1a & 1c), although the average score was quite low overall: an average increase from 2.6 to 2.93 on the 5-point scale for each group (Appendix 1a & 1b).

6.6.3b Re-interpretation of the present to generate futures

The uploads were coded and sorted by topic. Waste, (food) consumption, and individual behavior were the most frequently recurring topics. About 25% of uploads were quick snapshots or jokes. About 25% of the uploads featured the group or engagement with people in the city. These uploads generated the most likes. Across the uploads, the "seeds" varied from creative to pragmatic. Existing sustainability interventions in the city of Utrecht – such as green roofs at bus stops and electric public transport – were featured in uploads quite a lot: about 20% of the uploads across groups featured these. In the feedback discussions, both relevant future visions for the personal as well as the larger scale were mentioned. Two examples from the PPE group illustrate both cases. At the individual level, one student mentioned a shift in perspective inspired by a group member: *"one of our group members, he told that he got most of his clothing from secondhand stores, and that*

inspired me to do the same because his clothes look really cool and I didn't realize that you could get such a cool outfit at a secondhand store". At a macro level, another student mentioned: *"I noticed that Utrecht is already quite sustainable somehow and has a lot of greenspace and especially for example parking, bus stations, and a lot of water because it is all somehow linked to the climate in the city, and that inspired me"*.

The number of ideas to improve the city of Utrecht that students reported changed significantly after playing the game: players reported 2.55 on average on the five-point scale before playing, and 3.16 on average after playing (Appendix 1a & 1b). The HGPL and GSS groups especially reported feeling positive about the amount of imagination and fun they experienced during the quite open assignments. In the PPE group, a student also credited the quality of the app with increasing the "futuristic feeling" of the intervention: *"I liked that we were walking around with our actual phones, because I think that is so common nowadays, and we had to take pictures and talk with strangers and get new ideas, but already future-oriented somehow while we were doing it"*. Moreover, in the feedback discussion groups, students reported that the interaction with the socio-material environment of Utrecht gave them many new insights. In every group, at least one participant brought this up without prompting. The students mentioned how searching the city for "seeds" gave them a deeper sense of both the good and bad in the city, and what issues needed change. In the HGPL group, a student described the game as *"a new lens through which to see Utrecht"*. As for uploads, about 20% expressed an explicit goal for the future, for example a photo of a student shaking hands with the manager of organic supermarket chain Ekoplaza, which in the future *"hopes to be larger than [current supermarket market leader] Albert Heijn"*. Perhaps more importantly, each session of the game also generated a map for Utrecht2040 featuring all of the individual uploads, together creating a future pathway out of existing routines and structures (Figure 3).

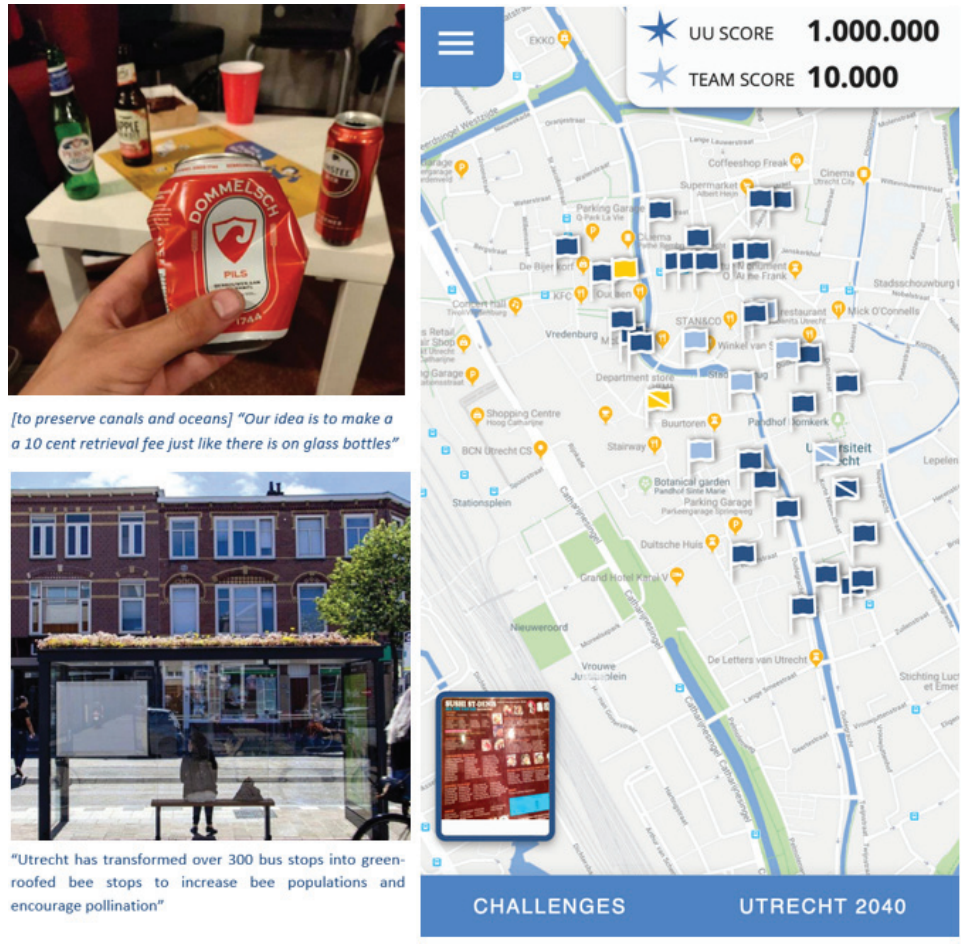

Figure 3. L: two uploads: picture and description; R: Map of a sustainable Utrecht in 2040

6.6.4. Motivation to act

6.6.4a Individual outcome efficacy

For individual outcome efficacy, in the separate groups of players the change was only significant for HGPL and again the average score was rather low: it changed from 3.14 to 3.34. The entire sample of players increased significantly from 3.45 on average to 3.60 (Appendix 1a-c). In the feedback discussions, some students expressed feelings of motivation to act. One PPE student summarized his view on the relevance of local "seeds" versus large abstract problems: *"I actually got inspired to think more about practical solutions in the city, whereas a lot of times you talk about sustainability and things and stuff but actually like, what is going on there in the place where you actually are, there you yourself can change things. That gave me new ideas."*

6.6.4b Collective outcome efficacy
In contrast with individual outcome efficacy, collective outcome efficacy scored very high before and after the game sessions (above 4 on the 5-point scale for all groups, with a median of 5 among all groups). The average score decreased slightly but not significantly, from 4.52 to 4.49 on average (Appendix 1a & 1b). The high score is an indicator of a strong belief among the participants that humans do have the capacity to effect transformative change as a collective.

6.7. Discussion
This chapter investigates how large-scale location-based futures games can help addresses the need to stimulate urban imaginations through experimental futures. The challenge is to develop and implement approaches that engage diverse actors involved in or affected by urban sustainability transformations meaningfully in urban futures, allowing them to experiment and take action in shaping the cities of the future. Our empirical work can be understood as an answer to the call for futures engagement at scale, and for clearer links between futures and action (Mangnus et al., 2019).

We analyzed the urban futures game Utrecht2040 according to three sets of criteria for an effective experimental game: game content, reflection, and motivation to act. Utrecht2040 aims to stimulate players to collectively imagine actionable futures based on what they encountered in their present-day environments. The game depends on the input of players to create new futures all over the city, populating a city map, and thereby collectively imagining a future city. This visualization of a map and the associated photography by the students, both rooted in the present, generated a range of different ingredients for sustainable urban futures. This section discusses the novel futures and motivations for action that game and its results offer.

6.7.1. Gaming futures
Wiek & Iwaniec (2016) formulate ten quality criteria for future visions: these should be visionary, sustainable, systemic, coherent, plausible, tangible, relevant, nuanced, motivational, and shared. These criteria provide a useful lens through which to judge the visions of Utrecht in 2040 produced in the game. Firstly, when we consider the various images of Utrecht in 2040 resulting from the game, we can argue that the visions are "sustainable" in terms of the sustainability knowledge communicated through the game, and more importantly, the knowledge exchange around more sustainable ways of living in the city that forms a core game mechanic. The roots of the images in the present-day city of Utrecht lead to "glimpses" into systemic, coherent, plausible, tangible, and relevant futures (Ryan et al., 2016). Lastly, the collective, large-scale experience made the futures represented in the game motivational and shared. Overall, the way that Utrecht2040 brought imagination into the urban environment already serves to a promising extent as a way *"to explore and create possible, performable, livable, and viable worlds"* (Ezrahi, 2012).

At the start of the game, players were encouraged to adopt a futures-oriented mindset by means of an opening lecture, and debriefed by reflecting on their sustainable futures

map in a closing lecture. Despite this staging and positive feedback from the players with regards to the futuristic layer that the game placed over the urban environment, we note that the strong connection to the present due to the constant physical boundaries of the "now" in the urban environment arguably takes away from the visionary and radical aspect of these futures. On the other hand, the game realized a number of the opportunities and challenges brought forward in previous literature on experimental futures. Firstly, the game engaging 284 players in the same futures exercise addresses the challenge of designing this type of futures interventions at scale (Mangnus et al., 2019; Kuzmanovich & Gaffney, 2017). Secondly, the relatively large number of players and the methodology developed to analyze their data provides empirical insights into experimental futures (ibid.). By engaging the socio-material environment as a stage for futuring, in which players can experiment with the ingredients of their daily lives, the game is a starting point for addressing the challenge formulated by Garduño García & Gaziulusoy (2021): it shows one way in which interactive mass media such as large-scale games could open up futures to a wider public.

Finally, the game opened up a new, location-based avenue for engagement with the collection of "seed" initiatives and ideas, contributing to a new strain of "seeds"-based futuring that is emerging but that has so far not been embedded in the exploration of real locations (Bennett et al., 2016; Pereira et al., 2018; Raudsepp-Hearne et al., 2019; Mangnus et al., 2019).

6.7.2. Motivation for individual and collective action
The second aim of Utrecht2040 was to provide players with motivation to act toward a more sustainable future. In addition to encountering sustainable "seeds", feelings of both individual and collective outcome efficacy are crucial. A lack of motivation to act, or perceived individual and collective outcome efficacy, in the face of complex and wicked problems is arguably one of the greatest barriers to transformations toward sustainability at this moment. It lies at the heart of the value-action and knowledge-action gaps, and of the "crisis of the imagination" – when people feel no agency over their situation, even if they find that situation undesirable, and see no alternatives (Bendor, 2018). Interestingly, in the Utrecht2040 survey results the players reported very high levels of perceived collective efficacy both before and after game play: above 4 on the 5-point scale on average and never lower than 4. However, reported individual outcome efficacy was lower in comparison. For the HGPL players this increased significantly after playing the game, but not for the other groups. This indicates that the game's focus on generating action does not directly translate to the overall experience of all students. The gap between feelings of collective and individual efficacy shows the outlines of a collective action problem. There is consensus about the importance of the common goal and belief in the ability of the collective to solve the issue, but perceived costs of participation or other issues stand in the way of individuals coming together as a collective (Rasch, 2019).

Another important element in terms of impact on players was the development of new insights into complex sustainability problems and possible ways to address them. In the group feedback sessions after the game, without prompting, players reported that the act

of surveying the socio-material environment for "seeds" gave them a much more profound understanding of environmental problems. The collective element also received many positive responses: players mentioned that their points of view were altered both through their teammates' input as well as the uploads of other teams on the game map. These insights led to reported feelings of optimism and motivation. By collectively bringing more futures into the realm of the possible, it appears that the players' attitudes to the future were changed and expanded.

6.7.3. Reflection and future research

Concluding that the game has a minor impact on collective and individual perceived self-efficacy, and may be a way to open up new imaginaries among its players, leads us to a number of directions for further design and analysis. First of all, developing an explicit link between the collective imagination processes of the game play and actual urban governance processes could arguably increase the impact of the game intervention in many ways. It means that whatever new futures are generated by player groups and collectively are much more likely to be actually useful for the urban governance context. It also means that the player experience is likely to change: if players know that their efforts have a good chance of impacting the city, effects on perceived individual and collective efficacy can be hypothesized to increase substantially. Bridging the gap between perceived collective and individual efficacy by providing concrete steps or plans to organize the collective or utilize the large number of players could further increase a player's motivation to take action. Furthermore, more integration with urban governance actors and processes will most likely open up far greater possibilities for knowledge sharing. In the case of Utrecht, there is already strong interest from the City Council in this kind of game play. Creating player groups that consist of a mix of students, researchers, policy makers, civil society actors, businesses, citizens, and others could further increase such positive effects. There are myriad concrete ways in which the game could be integrated with urban governance – for instance, by using it to collect input for city planning cycles, as a way to inform the city's broader efforts at communication with citizens, or by integrating present-day initiatives by businesses and civil society actors more comprehensively into the game and game locations.

Due to time constraints, the participants could not be followed over a longer period of time. We therefore tracked the expressed intentions of the players rather than the actual change in their study and life choices. We also chose to compare various groups, but developing a version of this intervention with a control group would strengthen the analysis further. It would be instructive to divide the participants in terms of their level of activity in the game and compare results. The survey conducted at the beginning and end of the game sessions may also have interfered with the futuristic experience. Although we received no negative feedback on the survey and had a large number of respondents, many fewer participants filled out the survey at the end, which may indicate that it was an obstacle of some sorts in the process. Interesting avenues for future research are firstly more longitudinal studies of this intervention, possibly also in other countries or contexts. Variations of the game can be played by a wide range of urban actors. These include local governance actors,

who can engage in the game as a policy simulator or to use the game outcomes. Actors from local businesses or academia can also benefit from playing the game, both to gain a new perspective on their city as well as on local possibilities for urban sustainability transformations. While the game focuses on the urban level and in this case is specific to Utrecht, the format can easily be adapted to other cities.

Finally, integration with existing "seeds" databases might open up new avenues for the use and collection of "seeds" using such futures games. Arguably, this would also improve the quality of the "seeds". In Utrecht2040, the uploads made by the players could be anything they considered an existing good practice. As a result, the "seeds" in the game ranged from existing initiatives that fit Bennett et al. (2016)'s definition, but also uploads that would perhaps be better classified as "proto-seeds": snapshots of sustainable ideas that are not tied to a larger practice or initiative. Such "proto-seeds" run the risk of inadvertently feeding into a "solutionist" tendency of the game. Bendor (2018) describes how a focus on achievable, practical alternatives, especially technological "fixes", may increase experienced self-efficacy, but tame or even hinder the development of more radical futures. "Solutionist" tendencies may also lead to consideration of very extreme measures without consideration of alternatives, out of a fear for looming environmental disasters. Experimentation, or open-ended learning that takes both successes and failures into account, is considered an antidote to the "solutionist paradigm" (Asayama et al., 2019). Future iterations of Utrecht2040 could benefit from leaning further into its experimental characteristics, by using existing "seeds", allowing for reflection on both failures and good practices, and moving away from overly simplistic, solutionist "proto-seeds".

6.7.4. Looking ahead: combining the experimental and the experiential turns

Utrecht2040 was built mainly on principles from the "experimental turn" in futures studies. However, there is also a growing body of work that suggests that there is merit in engaging with futures as more complete experiences, which has brought about the "experiential turn" in futures studies. This turn consists of a surge in futures interventions that design environments where participants move beyond a cognitive mode and into a visceral mode of understanding futures, inching closer to *"life as it is apprehended, felt, embedded and embodied in the present and on the ground"* (Candy & Dunagan, 2017: 137; Pelzer & Versteeg, 2019). While they arguably address similar concerns with regards to more traditional futures approaches, experiential and experimental futures differ in character and execution. Experiential futures are generally more speculative and imaginative, conducted by designers, artists, and academics with a background in humanities disciplines. Experimental futures have a more pragmatic component, which manifests in experiments in the urban context like the one at the center of this chapter (Meijer & Rodriguez Bolivar, 2016; Bulkeley & Castán Broto, 2013).

Combining analytical and experiential futures tools leads to a demonstrable increase in engagement with and understanding of different futures (Vervoort et al., 2010). It may also allow for a more speculative approach to futures, that works against the trappings of the "solutionist paradigm" (Asayama et al., 2019). For this chapter, we have already

used some notions from the experiential futures literature, for example in the experiential learning component of Utrecht2040 (Garduño García & Gaziulusoy 2021). We believe that the game is an interesting first exercise with a game of this kind, that can be further extended into other domains, for example by building on its potential to be developed into an experiential futures intervention. Hajer & Pelzer (2018) describe how experiential futures aim to build worlds in which people can immerse themselves and temporarily suspend their disbelief about possible, sometimes radically different, future worlds and events. However, designing circumstances or situations in which the collective imagination of a group of people can emerge is a challenge in itself (Candy & Dunagan 2017). Thus far, experiential futures research still faces the dual challenge of 1) conducting interventions at scale, and 2) connecting imagined futures to present action (Mangnus et al., 2019) – there is a lack of knowledge on the concrete effects of these interventions.

In future research, combining approaches from the experiential and experimental turns in futures studies can address the aforementioned knowledge gaps, and the two are a natural fit in a number of other ways. There have been explicit calls in experiential futures literature to engage more with experimental futures methods (Kuzmanovich & Gaffney, 2017), as well as developments in experimental futures literature that would encourage increasing the experiential character of experiments (Ryan et al., 2016). A combination of the two may allow for a *"lab approach to everyday futures"*, as Kuzmanovich & Gaffney describe it, which would enable the *"prototyping [of] speculative scenarios in the present"* (2017: 115–116). This would allow for experimental data to be generated in an experiential setting. For Utrecht2040 specifically, this would mean adding a more immersive futures layer through for example role play or improvisational theatre. This could take the visions of the future generated through the collection of "seeds" to a more radical and creative level, and amplify the effects we observed with regards to knowledge, reflection and efficacy.

6.8. Conclusion

There is a need for large-scale urban futures approaches that connect imagined futures to action in the present. Location-based games offer unique possibilities in this regard. We documented and analyzed the effects of the large-scale, location-based game Utrecht 2040 on the ability of its players to reflect on and imagine ways to address to complex sustainability problems. We used evaluation criteria focused on game content, reflection, and motivation to act. We found that this kind of experimental game can contribute to learning, generates many relevant ingredients of sustainable urban futures rooted in the present and can increase feelings of efficacy for some players and groups. We conclude that large-scale location-based gaming has strong potential for reconceptualizing sustainable cities of the future in inclusive and mobilizing ways. The digital infrastructure and large number of players also provided new opportunities for documenting and measuring the outcomes.

7. SYNTHESIS, DISCUSSION, AND CONCLUSION

7.1. Introduction

This thesis is rooted in the idea that the distinct ways in which futures practices are organized matter. This may sound small in light of the enormous sustainability crisis the world is experiencing. The science on the detrimental effects of environmental change caused by human behavior has mounted up over the last decades (McPhearson et al., 2021) and we have now come to a point where it is evident that solutions can no longer be found by tweaking and tinkering within existing systems. Instead, processes to find completely new images of sustainable urban futures are needed (ibid.). There is an urgent need to rethink how transformations to more sustainable urban environments are approached. Yet surprisingly little is known about much of the essential elements of such processes — the roles of various contextual factors, the new images of the future that are created, and how to evaluate their effects on transformation processes. Hence, perhaps especially when it comes to something as big as the sustainability crisis, details matter.

The research reported in this thesis set out to connect to connect futures practices to action in urban communities working towards sustainability transformations. It was hypothesized that by experimenting with innovative approaches to sustainable futures at the local scale, the conditions for successful new modes of interaction in governance for urban sustainability transformations could be found. Those findings provide a first step towards transformative action that can help us reach ambitious environmental targets. I opened with three stories from communities around the world that wanted to take action toward achieving sustainable futures. Did the motivated, active group of change-makers in Kyoto develop its vision for the future? And how could they organize to make this dream reality? Did the Gothenburg group design a process in which citizens can also bring their ideas for the smart cities of the future to the table and make the project really inclusive and successful? Could the Utrecht2040 game really make a new generation feel like they have a key role in a large sustainability transformation? This concluding chapter gathers the findings from the three cases plus the theoretical work in this thesis, to draw important insights for connecting futures to action in urban transformation contexts and formulate an answer to the main research question:
How can futures practices lead to action on urban sustainability transformations?

Section 7.1 synthesizes the findings from chapters 2-6. It does so by following how urban communities in all three cases responded to the four challenges identified in chapters 1 and 2 (see Figure 1). From this, a set of ckey insights and conditions for futures that inspire action are formulated in section 7.2. Section 7.3 formulates an answer to the main research question, building on the three case study stories and their answers to the questions that they set out with. Section 7.5 returns to the scientific and societal contribution of this research and elaborates on how its findings may further the work of researchers and practitioners. The chapter ends with a reflection on the research process (7.6) and a conclusion (7.7).

7.2. Findings from the chapters seen through four challenges

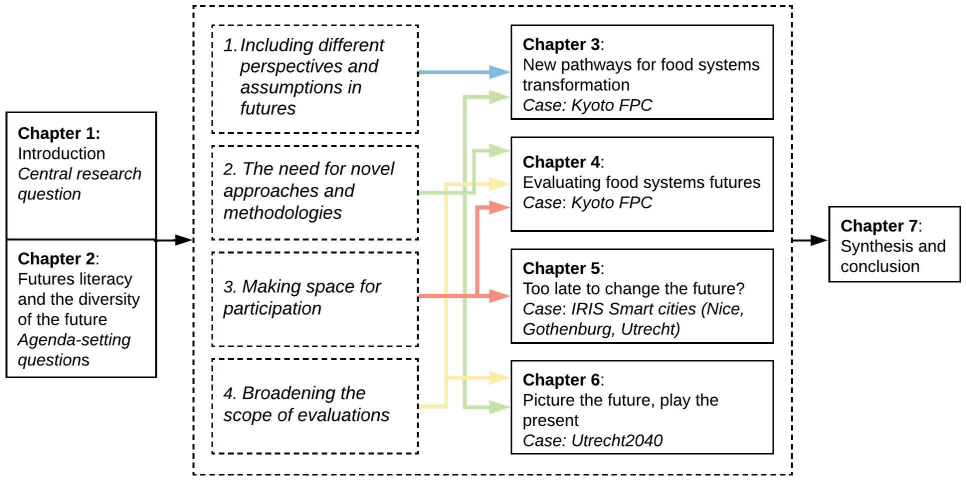

Figure 1. Research framework

Chapter 1 distinguished four challenges to futures practices aimed at urban sustainability transformations: 1) including different perspectives and assumptions in futures, 2) the need for novel approaches and methodologies, 3) making space for participation, and 4) broadening the scope of evaluations. It was hypothesized that addressing these challenges would yield a holistic perspective on futures for transformative change. Chapter 2 formulated the challenges as a set of agenda-setting questions based on a more in-depth literature review. These four themes link the separate chapters and provide elements for reflection across the chapters.

Including different perspectives and assumptions in futures

The first challenge asks what assumptions, values, and worldviews underlie our relationships with the later-than-now. This was first discussed in chapter 2 itself, which reflects on futures literacy and its implications for governance. The reflection revealed that futures literacy is an increasingly important capacity in a rapidly changing world in which the weight of the future on the present is increasing as a result of environmental challenges and fears. However, experimental and critical futures are underrepresented, which is unfortunate since they have the capacity to trigger images of new and transformative futures that inspire action in the concrete cases that were examined. Reflexive forms of futures literacy, regardless of the approach and tradition they exist in, explicitly acknowledge that power, and are able to deliberately but sensitively steer images of the future in ways that are empowering and, ideally, also environmentally-friendly and democratic. The subsequent chapters each find communities and situations where assumptions, values, and worldviews are different. Chapter 3, in particular, describes a process where different, complementary foresight approaches were used by an alliance of food system actors interested in sustainability transformation. These approaches were tailored to the specific perspectives on the future

shared by the participants, who were searching for a more creative and experimental kind of engagement with the future than they were used to in their local governance environment. These differences in perspectives on the future have various causes, and the cases contrast in some ways and are alike in others. The different communities and their assumptions and approaches also have unique effects on the organization and outcomes of the futures practices. Chapter 2 illustrates that it is therefore important not merely to ask "what is the future?" and "how can we anticipate and interact with the future?" but to keep asking "what is futures literacy?". Reflexive futures literacy includes being able to articulate the differences between different perspectives on the future, while being aware of the social and imaginative effects of particular futures methodologies and being able to reflect on what types of approaches are fit for what type of purpose. This ability relates to institutions and policy as well as to individuals. Secondly, and possibly more importantly, reflexive futures literacy makes it more likely that the right questions are asked at the right time, ensuring that our understanding and collective sense-making of the future is informed by the right metrics, careful staging, and the right type of ideological power.

Key insight: Reflexivity about fundamental assumptions regarding the future and how it is understood to impact the present is a crucially important type of futures literacy for any actors involved in governance or sustainability governance. Currently, experimental and critical perspectives on the future are used less than perspectives that focus on predictions and plausibility, and hence researchers and practitioners miss out on important opportunities to think about futures in the engaging and innovative ways that are urgently needed to motivate people to take action and make cities and societies more sustainable.

The need for novel approaches and methodologies

The second challenge asks what approaches exist to make sense of the future, how and when they are used, and how and when they should be used. The empirical chapters of this thesis demonstrate that futures approaches suitable for transformative contexts, mixes of complementary methods, and processes that center niche practices or "seeds" are all underdeveloped but essential. The IRIS case, for example, found that the contexts of futures practices are often not entirely open. Rather, they are framed by pre-existing objectives that leave relatively little space for more open, creative, and non-linear approaches (Hajer, 2016). In contrast, the Kyoto and Utrecht cases were very open processes, but the methodology in Kyoto included a governance framing (the FPC) in which the participants could organize, while the Utrecht process was aimed at effects at the personal and interpersonal level. ***Chapter 3*** describes how the complementary use of methods on the one hand, and new content and concepts (seeds and the FPC) on the other can make a significant contribution to a variety of rich and varied shared futures containing novel elements for participants — arguably leading to extended imaginaries. From the visioning, collective desires for the future emerged.

Chapters 3 and 4 both show that after the mixed-methods futures approach, the extension of most participants' networks and the unexpected emergence of key "project champions" provided links between imagining and experimenting with futures, and present-day action.

Specifically, the use of a new mode of governance (the FPC) as an organizing principle has led to action steps to implement this new way to organize the urban food system. In another example of methodological innovation, chapter 6 demonstrates how location-based games offer unique possibilities for connecting imagined futures to action in the present. The large-scale, location-based game Utrecht 2040 took the role-play from chapter 3 one step further, by motivating its participants to go outside to experiment with futures in their own city. The results indicate that an experimental futures game can contribute to learning and has the potential to generate many relevant ingredients of sustainable urban futures rooted in the present. Moreover, for some players and groups it can increase feelings of efficacy and motivate them to act.

Key insight: Creative, innovative, and immersive methodologies can draw people in, surprising and engaging them. There is a wealth of possibilities to explore by combining methodologies and making use of new and emerging multimedia and communication technologies. However, as expected, the way in which the process design is approached is highly important as well. In other words: how we meet matters (Parker, 2018). This extends to who is invited, how the meeting is structured, and what is the communal experience of the participants. Subsequently, the futures methodology can further increase its transformational effects if participants become champions, replicating the methodology and process design and allowing them to spread.

Making space for participation

The third challenge concerns how predominant ideas about and conceptions of the later-than-now can be challenged, and by whom, how, where, and when. Futures practices that target the imagination are intended to challenge existing ideas and conceptions and usually do so, which circles back to the first theme of perspectives and assumptions. However, the institutional context (whether open or closed) matters, as does the subsequent design of anticipatory practices. Chapter 5 is the main chapter to address this challenge that is crucial for many organizers of participatory futures practices: how "futuring" should be used to create opportunities for transformation in the middle of ongoing processes with pre-framed agendas and priorities. For the contrasting Kyoto case of chapter 4, a methodology was developed to evaluate the impact of this process. As an example of a transformation-focused futures process, the set of evaluation criteria describes how this type of futures work should be examined in terms of its input criteria, process, outputs, outcomes, key concepts, key actors, and methodological design. Since the process stood on its own and had no clearly defined objectives at the start, the initial conditions could be optimized to some extent. In general, a large section of the futures studies and citizen engagement literature focuses on the conditions for success. However, in reality, oftentimes many of these conditions are not in place. Chapter 5 indicates that under imperfect conditions it is still possible to find and optimize space for exploring and reimagining different future pathways. Chapter 5 builds a framework of four factors that shape the effectiveness of participatory futures practices in their contexts. It explicitly includes the participatory culture. The framework consists of the space in the institutional landscape of a multistakeholder project: the participation culture surrounding the project, the project development, and the futures practices themselves.

When applied to futures practices by IRIS smart cities project members in Utrecht, Gothenburg, and Nice, the outcomes indicate that under imperfect conditions it is still possible to find and optimize space for exploring and reimagining different future pathways but this depends on an intentional engagement with the context, culture, and practices of any project aimed at sustainability transformations.

Key insight: *Sustainability transformations are characterized by struggle:* between those aiming for such a transformation and others, but also within large transformation projects. A supportive institutional context can increase the transformational power of a futures practice and ensure that all voices are heard and alternative outcomes are considered. However, other elements of the futures practice, such as a strong participatory culture or an attractive methodology, are also levers for success. Using these levers strategically can open up space for a more diverse range of futures and avenues for action.

Broadening the scope of evaluations

The fourth challenge is to understand how we can and evaluate how futures approaches change relationships with the later-than-now. Chapter 4 found that evaluating this change is difficult and far from standard practice. All three cases involved novel methodologies, and therefore required new ways of measuring. Utrecht2040 was a more personal and interpersonal experience, while the IRIS Smart cities outcomes could be found in policy and project documentation. The evaluation of the Kyoto FPC case deepens the understanding of outcomes beyond those that were expressed by the participants themselves immediately after the futures workshops. Evaluating a longer period gives insights into unexpected results and proliferation of futures practices. Together, all four empirical chapters give insights into the design and effect of transformative spaces (Pereira et al., 2018).

Chapter 4 aimed to evaluate the Kyoto FPC process. As an example of a transformation-focused futures process, the set of evaluation criteria describes how this type of futures work should be examined in terms of its input criteria, process, outputs, outcomes, key concepts, key actors, and methodological design. All these elements matter for the design of an innovative futures practice and should be evaluated as such. In the Kyoto case, the use of existing seeds practices can be said to have had an immediate transformative effect, since it connected participants to one another to allow for new collaborations. The FPC was established at the local level, due to the efforts of key project champions who carried the futures workshops results forward. Finally, the futures methodology was adapted and repeated many times by participants, scaling the transformative potential of the workshops up and out. The six key lessons at the end of the chapter can be drawn on to aid communities seeking to organize a set of experimental futures practices.

The evaluation of Utrecht2040 in chapter 6 required a different set of considerations, as it was a process that took place in the socio-spatial urban environment and that was aimed at motivating players to take action. In the chapter, a set of different elements was evaluated: attitude towards the future, and individual and collective efficacy. The evaluation of the game intervention indicates that large-scale location-based gaming has strong potential

for opening up new social practice imaginaries and for reconceptualizing sustainable cities of the future in inclusive and mobilizing ways. The digital infrastructure and large number of players also provided unique opportunities for gathering and analyzing the outcomes with the many players. This provides a different perspective on futures and action than the smaller-scale, workshop-style work evaluated in chapter 4.

Key insight: Futures practices have the ability to create images of the "not yet" that stick in the imagination and thus trigger action. In that sense, futures practices are a crucial tool of an anticipatory governance approach. Rather than evaluating their efficacy in a coded way, researchers and practitioners should develop open, inclusive ways to spot how futures practices have facilitated governmental decisions.

7.3. From challenges to conditions for transformational futures practices

From the key lessons learned about the four challenges to futures practices for urban sustainability transformations, a set of conditions emerges for transformational futures practices and the extent to which they inspire action. The six conditions are outlined and defined below.

1. Futures perspective

The futures perspective refers to the perspectives, assumptions, and values about futures that exist in a specific group engaging in a futures practice. This condition is derived from the first key insight on the need for novel approaches and methodologies. Chapters 2 and 3 found that the futures perspective that prevails in a futures practice determines the mode of engagement with the future. This perspective may be predictive, may seek to remove uncertainty, and be creative, critical, or experimental. All participants bring their own perspective on the future to workshops, interviews or planning processes, and so do the organizers of futures practice. Depending on the objective of a futures practice, a different perspective on the future may need to be assumed. Chapter 3 demonstrates how a more creative, immersive perspective on the future may help participants to engage in new and surprising ways.

2. Institutional context

The institutional context refers to the goals, resources, rules, and structures that shape a futures practice. This condition can be found in the empirical work of chapters 4 and 5 and the key insight on the need to make space for participation. It is part of the challenge of the institutional and participatory contexts. The institutional context can be supportive of and open to the input from a futures practice, provide no such support, or even thwart the outcomes of such a practice. In this list of conditions, institutional context and participation culture emerge as two separate conditions of a futures practice aimed at sustainability transformations. This distinction is mainly based on the work in chapter 5, where the institutional context of the futures work was supportive but there were many other interests and priorities which made this institutional context unreceptive.

3. Participation culture

The participation culture refers to participants' experience with participatory practices, and the support and resources available for such practices. Like the previous condition, it is related to the challenge of institutional and participatory context and the key insight on space for participation. The findings from this thesis indicate that under the conditions of a strong participation culture, this closed off context could still be "opened up" with space for ideas from the futures practice to be taken up.

4. Process design

The process design is the deliberate "mise-en-scène" (Hajer & Pelzer, 2018) of a futures practice: how elements such as the environment, interaction, and location are staged. This condition emerged from the empirical work of chapters 3-6 and the key insight on the need for novel approaches and methodologies. Every futures practice found that the process design was an important condition for success: in Kyoto (chapters 3-4), the process was designed to bring together a community in a relaxed, creative setting, while in the IRIS project (chapter 5) the process was more formal, with strategically invited members and efficient interaction. The Utrecht2040 process in chapter 6 was set up to be immersive and creative, and the results indicate that there may be a benefit in taking this even further. Process design is key to inviting more creative or radical ideas and allowing participants to engage with and accept them.

5. Methodology

The methodology is the futures methodology or set of complementary methodologies that is at the heart of the futures practice. This condition is derived from the empirical chapters (3-6) and the key insight on the need for novel approaches and methodologies. Throughout the empirical work, it emerged that attractive methodologies are a crucial condition for the success of a futures practice: both the Kyoto and Gothenburg cases found that the methodology engaged people who were not initially interested, steered the sustainability transformation in a new direction, and to some extent could open up an unsupportive institutional context.

6. Participants

Participants are all the people involved in a futures practice. In most futures methodologies used in this thesis, knowledge is co-produced (Norström et al., 2020) and hence the researchers are also considered to be participants. Linking back to the first condition, the futures perspective, it should be noted that the researchers or practitioners setting up a futures practice could be considered to be participants who have a strong impact on the perspective that guides the engagement with the future. In the Kyoto case, there were also "key project champions" among the participants, whose contribution to the organization of and ownership of the results of the process was instrumental to its success. This condition was added following from the key insights on the need to include different perspectives and assumptions in futures, and on making space for participation.

7.4. Answering the research question

It now is almost commonplace to argue that the present-day sustainability challenge demands our full attention. Resource and energy use, food systems, and environmental justice need to be brought to more sustainable states, and this will by no means be easy. We know about states, unsustainable and sustainable, yet how to best approach the transformation required is subject to intense debate. While the scientific evidence underlying the call for a societal transformation is broadly appreciated, this in itself does not spur society to take action. This thesis has argued that citizens find it difficult to imagine a viable, alternative, sustainable future. It fits into the more widespread attention being given to the role of images of the future (e.g. Miller, 2007; Bennett et al., 2016; Hajer & Pelzer, 2018; Garduño-García & Gaziulusoy, 2021)-calls made for good reason, as images, imagination and stories are essential catalysts for man-made transformations. They allow us to see cities as spaces for agriculture, to shift our perspective on bicycles from the poor man's means of transport to a status symbol, or to let us aspire to become energy providers instead of users. But what comes first: the transformation or the image of that transformation? Reflecting on the role of images of the future, one becomes aware of the plurality of circulating images. In the age of social media, we are flooded with images: of the "smart" sustainable cities of Masdar or Songdo, as well as of images of the way in which the inner city of Paris has recently excluded cars to make way for sustainable forms of traffic and create more space for pedestrians and cyclists. It makes us think about the effect of such circulating pictures of allegedly sustainable futures. The following central question was formulated to guide the research:

How can futures practices lead to action on urban sustainability transformations?

The first part of the answer to this question lies in the six conditions for transformative futures practices that were distinguished in section 7.2. Futures perspective, institutional context, participation culture, process design, methodology, and participants are all crucial elements of successful futures practices that can lead to action on the major sustainability issues of our time. Moreover, futures are not only formed by their context but also form this context in turn, occupying space and spreading themselves. This two-way process is the second part of the answer to the main research question. To illustrate this dynamic, let us return to the three case studies mentioned at the start of this thesis.

In **Kyoto (Japan)**, a community of food system innovators, with the support of local food research project FEAST, set out on a journey through various futures **methodologies**. They started with individual, open-ended visioning interviews, the results of which fed into the planning-oriented back-casting focus groups. These were followed by larger simulation gaming workshops, where they practiced with the specifics of organizing and acting as an FPC, an open way of organizing at the local **institutional** level. Together, the **participants** possessed a wealth of local food system knowledge that was brought out by the **process design,** and several key points of interest were outlined: "time poverty" that prevents people from engaging with food, a desire for local heritage food practices, and a tension between a few large, unsustainable but powerful private actors versus local producers. A few key players emerged as "spiders in the web". They persevered at the local government level in establishing and consolidating the FPC, even without a strong

initial **participatory culture** or **institutional support**. The evaluation of the process showed that for some group members the futures workshop series was simply a nice memory of a pleasant afternoon with friends. But other participants put ideas from the workshops into practice, by supporting each other's food system initiatives and changing their own habits. Moreover, they also repeated the futures methodologies in their own circles. Thus, the outcomes of this seemingly simple process started by this community of local change-makers reverberated in multiple levels of the local food system.

In **Gothenburg (Sweden)**, the Gothenburg project community was facing a large but exciting set of tasks. Their project proposal was granted by the European Commission. This in itself meant a vote of confidence at the **institutional** level. Moreover, it loosened up resources to develop and implement an ambitious set of smart-city measures, and it came with a demanding schedule of reporting progress to the funders. This was feasible, given the diverse set of **participants**: they included experienced social housing executives, local political leaders and researchers. Among these people with a multitude of objectives and interests, one group from Utrecht was specifically tasked with ensuring citizen participation. To ensure all cities designed their citizen engagement practices in a standardized, innovative way, the Utrecht team developed a novel **methodology** that allowed project members to restructure their plans and imagine futures with room for meaningful co-creation. The Gothenburg team entered the workshops backed by their strong **participatory culture**. They aimed not just to co-create smart innovations, but also to use this opportunity to deepen their democratic process. They singled out two projects fit for meaningful co-creation and even democratic development: a game and a citizen engagement platform. These two projects set the city on track to become more sustainable, embracing a **futures perspective** of pluriformity and open-endedness in the process.

In **Utrecht (the Netherlands)**, the next generation, or "future generation", is burdened with many expectations: it is they who can finally achieve change though their activism, set their parents or grandparents in motion out of concern for their children's or grandchildren's future, or pay the price for decades of environmental denial. The researchers that developed the game that would be played by an Utrecht group of first-year students acknowledged all these roles and expectations. As a **futures methodology**, the game should not inspire dread or blind optimism. Rather, it was intended to open up a new perspective by allowing players to engage with sustainability challenges and local repercussions up close. The **process** of playing the game was also designed to shape this community of individual **participants** into a collective with agency. After the sessions of playing Utrecht2040 all over the city, the complex environmental problems presented in the game did not magically disappear. But the students learned from each other about sustainable ideas and behaviors, as a collective. They also engaged with business owners and passers-by, staging climate marches and listening to experiences. They were also pleasantly surprised by some of Utrecht municipality's initiatives, such as green roofs and urban gardens, and abhorred some of the "worst practices" they found. When the game was over, the game's developers presented them with the future Utrecht that they had built collectively.

The three cases illustrate that the six conditions are dynamic: they impact one another and optimizing one condition can compensate for another sub-optimal one. An attractive methodology (bottom row), such as used in the Kyoto case, can compensate to some extent for an unconducive institutional context (second column from the left) and open it up. As another example, the IRIS case found that the participation culture (middle row) and futures methodology (bottom row) compensated for a rigid institutional context (second column from the left), which allowed for input from citizens and a more open institutional context. Most examples of futures studies literature sketch ideal starting conditions for a futures practice (e.g., Hebinck et al., 2018). Our case studies found that sometimes futures practices can be built neatly from the start, but there are also many instances where the process cannot be designed perfectly, or the futures practice takes place in an ongoing transformative process. Arguably, bottom-up and top-down are not starkly divided: the cases illustrate that at every level of governance, change is possible and there are points on which actors can intervene. Table 1 contains the six conditions, and their interactions when used as points for intervention.

Table 1. Conditions as points for intervention — with rows impacting columns.

Row impacts column	**Futures perspective**	**Institutional context**	**Participation culture**	**Process design**	**Methodology**	**Participants**
Futures perspective		Can open up	Can instill more inclusivity in	Can allow for uncertainty in	Determines choices in	Determines choices in
Institutional context	Can create more adventurous		Can foster and support	Can provide space and resources for	Can embed and support the output from	Can provide resources and time for
Participation culture	Can open up a more inclusive	Allows for input back into		Can allow for a more inclusive	Can allow for a more participatory	Can involve a more diverse group of
Process design	Can let people encounter a new	Can adapt practice to fit within constraints of	Can foster and stimulate		Can support and increase the effect of	Can facilitate the optimal input from
Methodology	Can let people engage with a new	Can adapt to and shed new light on	Can foster and stimulate	Dictates the needs for		Can challenge, inspire, and develop the views of
Participants	Can introduce and discuss their	Can use their power to move or change	Shared experiences determine	Determine the success of	Determine the success of	

A main argument of this thesis is that the insight that at every level of governance change is possible, and actors can intervene. This insight can elevate a futures practice to become a futures culture. A full grasp of these conditions and their interrelatedness allows for dynamic design and research on different futures. It can also be used in evaluation of futures practices, linking back to the key insight on the need to broaden the scope of evaluations. Table 1 outlines the complete narrative describing how each condition can be a point of intervention with which the other conditions can also be impacted according to the findings of this thesis. For example, in the case of the IRIS project, the institutional context was relatively "closed" because of its many predefined interests and priorities, leaving little room for open-endedness and different, perhaps more sustainable, futures. In other

words, the "institutional context" condition was suboptimal. However, in communities with a strong participatory culture, such as in Gothenburg, this condition could open up the institutional context. Moreover, an attractive methodology also helped shed new light on the institutional context, equipping participants with new ideas and tools to open up the institutional context even more. Ultimately, the conditions and their connections to one another can allow for a powerful, transformative futures practice even if not all conditions are present or optimal at the start of the process.

7.5. A futures culture for urban sustainability transformations

Figure 2. Theoretical framework

This section returns to the bodies of literature that were outlined in chapter 1 and depicted in Figure 2: on the governance of urban transformations, experimental and critical futures, and anticipatory governance. At the start of this thesis, a knowledge gap was identified with regard to the contribution of futures practices to sustainability transformations. Transformations and futures studies are established fields of research, but it is unknown if and how futures practices can spur transformative action. From our set of cases, each with its own characteristics, it can be concluded that the elements of

transformation differ per case and thus so does the definition of success. Below, I discuss how the findings in this thesis contribute to the existing literature on governance of urban transformations, experimental and critical futures, and anticipatory governance.

7.5.1. Governance of urban transformations

About five years ago, there was a wave of new agenda-setting literature at the intersection of governance, transformations, and futures (Lövbrand et al., 2015; Bai et al., 2016; Bennett et al., 2016; McPhearson et al., 2016; Wolfram et al., 2016; Patterson et al., 2017; Fazey et al., 2018). Brought on by the salience of the Anthropocene concept, the 2014 Future Earth research agenda and the then-recent developments around the Paris Climate Agreement (UNFCCC, 2015), these ambitious papers emphasized the need for new kinds of governance of sustainability transformations, and the role that futures-oriented practices from visions to scenarios could play in them. Arguably, this reframed the decade of action in terms such as "Good Anthropocenes", "positive visions of desirable futures", and with more involvement of the social sciences and humanities.

In his 2016 paper, Wolfram builds on the concept of "transformative capacities": developed in the socio-ecological systems literature, such capacities allow communities to transform the system that they live in if the current one has become unsustainable. From this concept, he defines "urban transformative capacity" as *"the collective ability of the stakeholders involved in urban development to conceive of, prepare for, initiate and perform path-deviant change towards sustainability within and across multiple complex systems that constitute the cities they relate to"* (Wolfram, 2016: 126). In other words, this is the ability of urban communities to understand and initiate new patterns of interaction and new outcomes, following the definition of transformations by Patterson et al. (2017) used in chapter 1.

In a follow-up paper published in 2019, Wolfram et al. find that the level of urban transformative capacity is very low, and that developing this capacity should be a priority for researchers and stakeholders. They give a set of requirements for developing this capacity: *"(1) foster inclusion and empowerment as prerequisites, (2) close the intermediation gap and strengthen the role of local academia, (3) challenge and reinvent urban planning as a key arena, and (4) enhance reflexivity through novel self- assessment techniques"* (ibid.: 437). The conditions for futures practices aimed at sustainability transformations found in this thesis answer their call and do so in the urban arena. Moreover, in the complex context of sustainability transformations, they provide a way to dissect, understand, and steer such processes.

7.5.2. Experimental and critical futures

More authors of the original mid-2010s wave of publications have developed their agendas into actionable frameworks. Patterson et al. (2021: 1), for example, characterize transformation processes as *"emergent from an unfolding series of 'fuzzy action moments'"*. Understanding the points of intervention in futures practices for sustainability transformations could make these moments less fuzzy, and accessible to a wider range of stakeholders. Bennett et al. (2016) have triggered a range of experimentation with "seeds"

— existing niche practices that can form the outlines of sustainable futures (e.g., Pereira et al., 2018). The outcomes of this thesis contribute to a reimagining of sustainable futures in various fields — from food, to energy, to the socio-material environment. Moreover, the outcomes can aid in developing the transformative capacity of an urban community to the extent that a "futures culture" emerges.

The conditions outlined in Table 1 can also help governance actors make space for experimentation and creativity with regard to the future in the institutional context. Ultimately, policy and resources are needed to embed the proposed transformations in the systems of cities. The unprecedented environmental challenges of our time ask for new, inclusive, and radical new futures. The lessons from the cases in this thesis are a first step, but using the conditions in Table 1, policymakers and other stakeholders can help foster a futures culture that is supportive to increasingly transformative urban futures. Muiderman et al. (2020) gave a clear outline of four distinct futures perspectives, but chapters 1 and 2 of this thesis confirmed that *"not all futures are created equal"* (Groves, 2010: 107; see also: Inayatullah 1990). The conditions in Table 1 show how researchers and practitioners can select a futures perspective, methodology that is fit for purpose for their intended goal. With knowledge of the conditions of a futures practice that can actually lead to transformative change, everyone can join in futures practices, providing that power and privilege imbalances are taken into account when developing the process design.

7.5.3. Anticipatory governance

Chapter 1 described a problem hampering the decade of action: a gap between ambitious sustainability targets and action "on the ground" that can start urban communities on a path to reach these targets. So far, traditional governance structures have failed to formulate powerful yet specific policies to achieve this start, either due to an institutional void, gridlock, instances of a knowledge or value-action gap, or a combination of multiple obstacles (Blake, 1999; Hajer, 2003; O'Brien, 2013; Jordan & Huitema, 2014). In the governance literature and in the case studies in this thesis, various initiatives and communities emerge to address this gap. The lessons learned in this thesis provide such communities with tools to organize effectively in this space. With a careful process design, an attractive methodology, and a strategic selection of participants, organizers of futures practices can break through an unsupportive institutional context or a participatory culture that is not very developed. This is a hopeful message for groups — whether grassroots or more established — that wish to organize to address inaction on sustainability problems.

The conditions for successful futures practices could be considered "leverage points" for transformations in an urban system, in line with work by Meadows (1999). At the very least, the conditions could contribute to improved understanding of the "system-ness" of sustainable urban futures. As Meadows (2009: 145) describes, *"This idea of leverage points is not unique to systems analysis — it's embedded in legend: the silver bullet; the trimtab; the miracle cure; the secret passage; the magic password; the single hero who turns the tide of history; the nearly effortless way to cut through or leap over huge obstacles. We not only want to believe that there are leverage points, we want to know where they are and*

how to get our hands on them. Leverage points are points of power." But (and Meadows notes this as well) they are often not intuitive. Therefore, the list in Table 2 could provide some guidance to the leverage points of a futures practice.

7.5.4. Contribution of thesis

The set of points at which to intervene on every level, or the possibility of a futures culture, can be considered a hopeful message: each of these conditions is a good starting point. The conditions do not have to be perfect to start a successful futures practice aimed at urban sustainability transformations. This insight is a valuable addition to existing futures literature, which contains a wealth of knowledge on the optimal conditions for a futures practice (e.g., Hebinck et al., 2018). However, such perfect conditions are rare, especially in the current era of rapid transformations in almost every aspect of urban life. The conditions in Table 2 can tailor futures practices to the needs and specifics of an urban system, where *"problem and solution definitions are often diverse, contradictory, and unclear"* (Eelderink et al., 2020: 2). At the start of this thesis, the problem of the environmental crisis was presented. In the middle chapters, different sub-problems of the environmental crisis were presented: urban food systems, smart cities, and the sustainable urban system as a whole. By setting out to find the conditions that make for a successful futures practice, this thesis aimed to move beyond simple, narrow definitions of problems and solutions (Strengers et al., 2019).

In the "solutionist paradigm", problems are shrunk to a size where it is possible to find neatly fitting solutions. Asayama et al. (2019) note that even many recent transdisciplinary sustainability initiatives such as Future Earth have adopted the problem-solving vocabulary out of a sense of urgency to address the global environmental crisis. In a way, the solutionist paradigm is related to the cognitive, quantitative approach to sustainability challenges (Hajer, 2003), or to the predictive perspective (Muiderman et al., 2020) introduced in chapter 1. The experimental and critical approaches to the future that were used in this thesis yield less clean-cut solutions. However, the conditions that were found as a result of the work in this thesis (Table 1) aimed to support urban communities in formulating answers to their own questions, rather than to provide generalized solutions for large, abstract sustainability problems. The conditions and dynamics in Table 1 are also elements to take into account when developing methods for evaluation. Evaluation was identified as one of the four challenges and remains underdeveloped, especially for more innovative future practices with experimental or critical approaches (Wiek et al., 2014; Vervoort et al., 2019).

7.6. Reflections on the research approach

Chapter 2 argues that reflexive futures practices allow *"for a more diverse and holistic range of futures, images of which can guide decisions in the present"*. Inayatullah (1990) describes how "futures consultants" can also be used in undesirable or unintended ways: for example, to legitimize certain decisions or allow decision makers to check the box that says that alternatives were considered (but not ultimately chosen to be pursued). For this thesis as a whole, positionality and reflexivity are also of key importance. Chapter

1 briefly touched upon these concepts and their increasing importance as participatory futures and research methodologies develop. In this thesis project, valuable new insights were gained on our own role and position as researchers, and on the choices made in the design of the research interventions. The field or fields in which the empirical work was conducted varied in terms of their characteristics and power dynamics (Katz, 1994). The Kyoto case was the most culturally different from the western perspective in which this thesis is based, something that my collaborators and I were aware of from the beginning of the fieldwork for that case. However, the local partners and actively involved citizens provided a strong engagement and relatively balanced relationship between the Kyoto niche food community and us as researchers. Multiple lengthy visits to the city and the participants' various initiatives and events also contributed to this. Nevertheless, the participatory methodology was unfamiliar to most participants, and not common in Japanese governance as a whole. The FPC governance frame also helped to guide the workshops and their outcomes.

In the IRIS project cities — Nice, Utrecht, and Gothenburg — the futures process was much more institutionally embedded than it was in Kyoto, and the project members were expecting the futures intervention that they were a part of. However, local participatory cultures were different, and coming from the Netherlands, my collaborators and I had a quite specific understanding of a horizontal, participatory futures process. This approach and vocabulary matched quite well with the Swedish project members, but less so with the French project members. This also led to a less rich outcome for the French futures intervention and raised the question of whether more attention should be paid to a pedagogy of futures and participation if multiple countries or cultures are involved (Cadzen et al., 1996; Inayatullah 1998). And if the answer to the question is "yes", to what extent should the futures practice be adapted to local norms and customs, and to what extent should it bring new customs into this environment?

Finally, in the Utrecht case, the community of students that played the Utrecht2040 game was especially sensitive for us as researchers. I was aware of the dangers of making a futures game to essentially manipulate students into certain attitudes towards the future. Moreover, as Blaze Corcoran et al. (2004: 5) note, *"there are critics of the sustainability trend. Some even claim it represents a false and superficial consensus that masks power struggles and ideological differences, while denying the role of conflict in bringing about fundamental change at the level of culture and values".* The game studio therefore took care to develop an open-ended game that was largely built on the input of players themselves, with much room for critical reflection during and after playing. There was also an opportunity to opt out of the game session and to have all data removed, and since there was a power imbalance between the students and my colleagues and me (their instructors) there was an external complaints officer that the students could address with complaints or concerns.

7.7. Looking ahead

The task of achieving urban transformations to sustainability is large, but this thesis started

from the idea that small cases that experiment with new perspectives, methodologies, institutional contexts, and evaluation can provide valuable insights and starting points for these kinds of transformations. Their outcomes can open up new avenues for action, especially when the outcomes across cases are synthesized. The in-depth insights of such cases can subsequently be translated at scale in multiple ways, as described by Lam et al. (2020): they can be stabilized, accelerated, grown, replicated, transferred, spread, scaled up, and scaled deep – to the point where they impact cultural roots. Distinctly organized futures practices can lead to a sense of hope coupled with a framework for action, by offering diversity of people in a room, engaging them in dialogue and interaction, experimentation, systems thinking, and a reframing of futures that are different from the past (Wilkinson & Flowers, 2018).

Urban areas have increasingly become both an object of study and an arena for testing new futures-oriented methods to conceptualize and initiate sustainability transformations. While these studies have yielded promising results (e.g., Späth & Rohracher, 2010; Moragues-Faus & Morgan, 2015; Kamijo et al., 2017), it is often difficult to scale their key lessons. Scaling is a result of a complex interaction between many different types of actors (Farla et al., 2012). Existing research has largely remained confined to the study of the roles of organizations or networks in scaling processes within local or regional contexts. This is partly understandable, given the cultural specificity and limited resources of research teams. But ignoring the global context also means leaving out the scale and impact of the organizations that operate in this context (Buist, 2019).

The first studies on global networks of cities have produced ambiguous results, concluding that city networks are *"not (yet) the representative, ambitious and transparent player they are thought to be"* (Bansard et al.: 229). Futures practices can allow more actors agency and can fill a void in the current institutional landscape (Van der Heijden et al., 2019). By connecting the methodologies and outcomes of successful urban futures practices horizontally, their transformational potential could be realized: the futures practices can be tailored to the local situation but repeated in other contexts and locations. Experimenting in cities at the local level and finding ways to translate the findings to global city networks then forms the next step of governing towards a future of large-scale sustainability transformations.

The "decade of action" in which we are living demands action toward the multiple ambitious climate goals that have been formulated (UNFCCC, 2015; European Commission, 2019; UN Environment, 2019; IPCC, 2021). This thesis has argued that to finally take meaningful action, more experimental and critical approaches to the future are needed, as well as an altogether more creative view of what sustainable urban futures could and should be. The first and second chapters of this thesis identified four challenges that should be addressed to develop more adventurous transformative urban futures. Subsequently, the empirical chapters delivered different exercises in this kind of adventurous creativity. These results in themselves do not solve the ongoing environmental crisis overnight, but hopefully they can lead to a reframing: a reimagination of existing urban systems, of

the responsibilities of policymakers and citizens, and of what is possible and desirable (Hoffman et al., 2020). The insights of this thesis may also help urban communities find answers to their own questions.

We do not know what the environmental future has in store for us, or whether we will reach any of the environmental targets mentioned at the start of this thesis. These targets are often accompanied by an emergency framing, or a warning that this is the last chance to act before environmental damage becomes irreparable (IPCC, 2021; Patterson, 2021). Perhaps it is time to let go of the targets, and to cease trying to preserve or restore a past state of the planet. Instead, we could adopt an attitude of "active planetary stewardship" (Kim, 2021: 7). This could allow us to more freely shape new, sustainable futures and dream about "that which is not-yet but still open" (ibid.; Haraway, 2019). In this endeavor, I hope that the findings from this thesis can serve as a helpful guide.

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Appendix A: Chapter 3

APPENDIX A - BACK-CASTING SURVEY

• Backcasting survey (English version)

Your network

1a. Were there people in this workshop that you had already met before?
o No
oYes, I knew the following people:

Name Our connection

---

2. Did any new ideas come up in the workshop?

o No
o Yes, the following ideas came up in the workshop:

---

3. Did any concrete new plans come out of this workshop?

o No
o Yes, the following plans have come out of this workshop:

---

3. How would you describe your personal experience of this workshop?

---

4. Was this method new to you and do you think you might use it in your own work?

APPENDIX 2

Game surveys

• Let's Kyoto survey (English version)

1. The game improved my insight in how the food system works:

O	O	O	O	O
Not at all	Barely	A little	A lot	Completely

2. The role play in the game improved my insight in the roles in the foodsystem:

O	O	O	O	O
Not at all	Barely	A little	A lot	Completely

3. The game gave me insights in different possible interventions in the local food system and their effects:

O	O	O	O	O
Not at all	Barely	A little	A lot	Completely

4. If I could add another intervention to the game, it would be the following:

_____
_____

• The FPC Simulator survey (English version)

1. The game gave me a good idea of what it is like to be in a Food Policy Council:

O	O	O	O	O
Not at all	Barely	A little	Mostly	Completely

2. After playing the game, I am interested in taking part in a Food Policy Council:

O	O	O	O	O
Not at all	Probably not	A little	Probably	Absolutely

3. If I would be in a Food Policy Council for Kyoto prefecture, I would want it to do the following things:

_____
_____

4. I heard new ideas in this workshop:

O No
O Yes, the following:

_____
_____

5. The role playing in the game gave me a greater insight into other people's perspective:

O	O	O	O	O
Not at all	Barely	A little	A lot	Completely

APPENDIX 3

Gameplay & rules for FPC Simulator (English version)

You and your group are the new Food Policy Council (FPC) of Kyoto prefecture. The mission of your FPC is to make Kyoto's prefecture's more environmentally sustainable and socially just, and stimulate local economic development. Let's play!

- **STEP 1 - INTRODUCTION AND ROLES**
  The game starts with the players filling out the role cards from their own role. In round 1, the players play their own roles. In round 2, the players introduce themselves with their own name, but otherwise assume the role of someone else at the table by using each other's role cards.
- **STEP 2 - SET FPC AGENDA**
  Every player has 3 main issues on their role card that they think the FPC should address. During the introduction round, the facilitator writes down each player's top issues on the FPC agenda sheet. Afterwards, the main themes on the agenda are shortly discussed together. After determining the agenda, a chairperson should be appointed who oversees the budget, does the writing and leads the FPC's discussion.
- **STEP 3 - DRAWING A SET OF INTITATIVES**
  Now that the FPC is in business, a timer starts counting down 45 minutes. It's time to support food initiatives in Kyoto prefecture that do good work. The FPC also looks outside of the prefectural borders and outside of Japan for inspiration. The FPC draws one card from each deck of initiatives: green = Kyoto, red = Japan and yellow = world. First, shortly discuss the potential of the three initiatives.
- **STEP 4 - SUPPORTING THE INITIATIVES**
  Each round represents a period of one year, for which the FPC gets 1000.000 yen from the bank. This money does not all have to be spent in one round. To support its initiative(s), the FPC should make a plan, drawing possible inspiration from the intervention list and involving as many roles as possible. Write the intervention down on an activity card, and allocate a budget to it. The facilitator gives the FPC a feasibility rating, based on 1) feasibility of plan 2) budgetting, 3) inclusion of all different roles and 4) ambition. The FPC can shortly plea to raise this rating. Once it's set, roll the 10-sided dice. A score within the feasibility rating means success, one above it means failure. Move on to the next round and draw 3 new initiatives. In case of failure, first take some time and spend some budget to make the failure right. Then roll the dice again and try to get to success. A final step at the end of each round is rolling for disaster: roll the dice once more. If you get 1, roll again to find out which disaster off the disaster list has hit you. You have to deal with this disaster in the next round.
- **STEP 5 - TIME'S UP**
  After 45 minutes of playtime, the different FPCs in the game shortly present their agenda and set of interventions to one another. The team with the highest number of successful initiatives wins a prize!

APPENDIX 4

Seed initiatives included in the FPC Simulator card-based table top live role-playing game

World

- Center for ecoliteracy - a center that aims to stimulate education for sustainable living.
  Source: https://goodanthropocenes.net/2016/04/20/center-for-ecoliteracy/
- Santropol roulant - a Montreal-based community food initiative.
  Source: https://goodanthropocenes.net/2016/04/14/santropol-roulant/
- Retuna Altebruksgalleria - a mall and cafe dedicated entirely to repaired and "upcycled" goods.Source: https://makewealthhistory.org/2017/03/22/the-worlds-first-mall-for-recycled-goods/
- Philippi horticultural area - 3000m2 area of land that supplies half of Cape Town's fresh produce.
  Source: https://goodanthropocenes.net/2016/07/23/philippi-horticultural-area-food-farming-campaign/
- Re:farm - project in the US dedicated to growing food in, by and for the community.
  Source: http://www.revision.coop/programs/
- Sustain ability challenge - 6-month challenge stimulating people in the UK to live more sustainably.
  Source: https://goodanthropocenes.net/2015/04/08/sustain-ability-challenge-and-live-better-challenge/
- Union kitchen - culinary startup incubator.
  Source: http://www.unionkitchendc.com
- Farm hack - an open source software tool for small-scale resilient agriculture.
  Source: https://goodanthropocenes.net/2016/08/02/farm-hack-open-source-tools-for-small-scale-resilient-agriculture/
- De Ceuvel - a circular business park in Amsterdam
  Source: http://www.circle-economy.com/grand-opening-new-office-de-ceuvel/
- Instock restaurants - Dutch restaurant concept that only serves food that would otherwise be wasted.
  Source: https://www.instock.nl/en/question/

Japan

- Mother's radiation lab - radiation measuring lab set up by mothers in Fukushima.
  Source: http://www.iwakisokuteishitu.com/english/aboutus.html
- Satoyama initiative - initiative seeking new ways to preserve traditional Satoyama landscapes.
  Source: https://goodanthropocenes.net/2015/02/06/tribal-parks-2/
- Pasona HQ urban farm - urban farm integrated in Pasona's HQ in Tokyo
  Source: https://goodanthropocenes.net/2016/05/16/urban-office-urban-farm/
- Fujisawa smart town - high tech sustainable smart town concept in Fujisawa, initiated by Panasonic.

Source: https://panasonic.net/es/solution-works/fujisawa/
- Edible schoolyard - program that promotes educational vegetable gardens for schools.
  Source: http://www.edibleschoolyard-japan.org
- Chiba ecofeed eggs - range of eggs produced in a food recycling loop process in Chiba prefecture.
  Source: http://lawson.jp/en/csr/waste/in_store/
- Food bank Kagoshima - Food bank based in Kagoshima.
  Source: https://www.facebook.com/pg/foodbank.k/about/?ref=page_internal
- Oyako shokudo - a parents and children's cafeteria in Minamisoma city.
  Source: http://www.japanfs.org/en/news/archives/news_id035771.html
- Takahata kyosei project - project in Takahata town promoting local consumption and self-sufficiency.
  Source: http://www.japanfs.org/en/news/archives/news_id035645.html
- Bio coke - solid fuel produced by Kobe city government in collaboration with Starbucks and Kindai university.
  Source: http://www.japanfs.org/en/news/archives/news_id035802.html

Kyoto
- Mothernet food education - foundation for "neo food education".
  Source: https://www.food-edu.com/- -- - -neo-food-education/
- Kyoto farmer's market - bi-weekly farmer's market in Kyoto city.
  Source: https://www.facebook.com/kyotofarmersmarket/
- Kyoto's kodomo shokudo - organizations where children can eat and learn.
  Source: http://www.asahi.com/ajw/articles/AJ201607200014.html
- Kyoto eco money - a special currency that can be earned by sustainable behavior.
  Source: http://www.japanfs.org/en/news/archives/news_id031037.html
- Green consumer guide - network and online platform of green businesses in Kyoto prefecture set up by an NPO.
  Source: http://www.japanfs.org/en/news/archives/news_id025820.html
- Food miles label - a label that displays food miles and CO2 emissions.
  Source: http://www.japanfs.org/en/news/archives/news_id028907.html
- Amita circular museum - a museum displaying various projects of AMITA corporation.
  Source: http://fudenkan.jp
- Saka no tochu - a Kyoto based distributor of vegetables grown without synthetic pesticides or chemical fertilizers.
  Source: http://www.on-the-slope.com/english
- Spread - vertical lettuce and leafy greens farm in Kameoka.
  Source: http://www.spread.co.jp/en/sustainable-farming/
- Nantan farmer's cooperative - an organic and partly self-sufficient farmer's cooperative.
  Source: http://www.tukaisutejidai.com

APPENDIX 5

Visioning narratives

Social and technological innovation
"Technological innovation by larger companies is being put to use to support social innovation. From a social perspective, people take pride in their produce, their recycling activities, cooking and other activities related to the food system. Traditional cooking methods are preserved and passed on to the next generation, but in addition to this people have the "food literacy" to make their own decisions and cook the food they feel like. In schools, the school lunches are safe and high quality. All food is safe to eat, especially food that is served to children. Food education is part of the school curriculum, and even university students and adults have opportunities for continued learning about food. Online tools enable people to organize easier into consumer collectives, sales platforms or educational communities. Furthermore, the food system has become less wasteful as a result of a combination of better social systems and technological innovation that succeeds in closing material and energy loops."

Urban and rural areas
"The system has found a balance between the trends of urbanization and the exodus of people from the countryside. Young people that are interested in becoming farmers feel motivated and supported -with tools and knowledge- to move (back) to the countryside. They are able to stay connected to the city by way of new technologies. New ways of economically successful food activities, like "beyond organic" techno-farming, directs sales on farmers markets and profitable re-use of waste have become standard practice. They make the production chain more transparent and connect consumers more directly to the food they buy and eat. Because of this newfound sustainable balance, both the natural resources and the natural landscape of Japan are protected and preserved. A steady market share for local food, produced within Japan or even closer to people's own home, makes food supply more secure, generates an income within Japan and connects people to the food they eat."

Small and large actors
"New, ambitious and innovative farming technologies and organic local farming methods co-exist. Their combined efforts together create a more environmentally sustainable situation. It also enables a preservation of traditions and local food heritage, like Kyo-yasai heirloom vegetables, while also fuelling innovation that discovers new ways to further improve Kyoto's food system. Larger and smaller companies co-exist as well, and in all cases their production chain is transparent to all actors involved. The government actively addresses sustainability issues and listens to the needs of inhabitants with regards to food. This leads to people trusting the government to support both them and their citizen initiatives. The coordinated efforts of these actors together, as well as an increased knowledge of food among a new generation of consumers, changes food demands. Private companies embrace concepts like clear labelling and certification, as well as local produce, to meet this new demand."

APPENDIX 6

Example FPC plan

"Kodomall kingdom" (workshop 2)

Round 1		
Seed cards	World: Recycle mall (ReTuna) in Sweden.	
	Japan: Takahata co-existence project.	
	Kyoto: Children's cafeteria (Kodomo Shokudo).	
Brainstorm ideas	Make the neighbourhood eatery fashionable as "children's cafeteria".	
	If you go help out in the field, you will receive a meal ticket.	
	Food tickets are for children only.	
	Parent-child participation is possible in the field.	
	Activate shopping district at school curriculum and connect to children's cafeteria.	
	Use shops in local shopping areas.	
	Learn with the help of the town.	
	Connect production and consumption with digital signage in a public place.	
	Buy empty shopping mall and make a place for children's food education that also revitalizes the neighbourhood.	
Plan + budget (no limit)	Shopping centre infrastructure development: restaurant; greengrocer; tofu shop; fish; miscellaneous goods.	9 million
	Mutual communication system (connect production and consumption, digital signage).	3 million
	Operating cost.	7.2 million
	Farm (10a) in shopping area.	10 million
	Transportation expenses, conference fee.	2 million

	Personnel expenses (3 staff members).	12 million
	Expert farming consultant.	2.4 million
	Total expenses (no limit).	45.6 million
	Success rate	85% → success
	Disaster	None
Round 2		
Seed cards	World: Union Kitchen.	
	Japan: Chiba ecofeed eggs.	
	Kyoto: Eco Money.	
Brainstorm ideas	Make the mall into a place for children's vocational experience.	
	Make a playground (free space, with activities such as movie screenings, workshops, bouldering).	
	Make children's currency which can only be spent in Kodomall.	
	Parents should be barred from taking and spending the currency.	
	Encourage and support children's start-up shops in the mall.	
	Develop systems, mail order and information dissemination.	
	Thinking about 'turning' the economy.	
Plan + budget (no limit)	Expand KodoMall with restaurant + multipurpose room (food and movie theater, pool, exercise).	100 million
	Development of KodoMall currency.	8 million
	Development of distribution system for produce from the mall.	10 million
	Total expenses.	118 million
	Time up - game ends	

Appendix B: Chapter 5

APPENDIX A. Survey and interview questions Nice and Gothenburg

Pre-workshop survey questions

1. Please briefly describe your experience with citizen engagement tools.
2. Which citizen engagement practices do you currently participate in?
3. What are your expectations of:
   - the workshop?
   - the interaction with other participants?
4. Regarding the usefulness of the results of this workshop, are you feeling:
   Openly optimistic; cautiously optimistic; pragmatic; unsure; pessimistic

Post-workshop survey questions

1. What is your opinion of the Ladder model?
2. What is your opinion on the Scope model
3. Do you have any suggestions for improvement of the tool(s)?
4. How did this workshop compare with your expectation?
5. What actions are you going to take from this point forward with regards to citizen engagement?

Interview questions

1. What are the different forms that you believe citizen engagement can assume?
2. When do you think these various forms are relevant in transition processes, and in which processes?
3. How much of these standpoints have you been able to incorporate into your practice?
4. How do you view current attempts in your area at citizen engagement?
5. Do any other cities or countries use methods which you would like to either avoid or adopt in your own community?
6. What do you think is the primary barrier to citizen engagement, from the citizen perspective? From the project planner perspective?
7. From your own personal experience, what measures in this city have been demonstrated to be the most effective in fostering a level of citizen engagement deemed sufficient by both sides?

Appendix C: Chapter 6

Appendix 1

Table 1A. Mean and median scores per variable pre- and post-intervention

Variable	Study program	N	Mean before	Mean after	Median before	Median after
1a. Knowledge (SDGs)	GSS	54	3.20	3.78	3.00	4.00
	HGPL	122	2.70	3.43	3.00	4.00
	PPE	22	2.64	3.73	2.50	4.00
	GM	86	2.37	3.51	2.00	4.00
	All	**284**	**2.69**	**3.55**	**3.00**	**4.00**
1b. Solutions for a better future	GSS	54	2.85	3.26	3.00	3.00
	HGPL	122	2.45	2.98	2.00	3.00
	PPE	22	2.77	3.18	3.00	3.00
	GM	86	2.44	3.35	2.00	3.00
	All	**284**	**2.55**	**3.16**	**2.00**	**3.00**
2a. Attitude (to the future)	GSS	54	2.56	2.91	2.50	3.00
	HGPL	122	2.66	2.99	3.00	3.00
	PPE	22	2.82	3.05	3.00	3.00
	GM	86	2.49	2.81	3.00	3.00
	All	**284**	**2.60**	**2.93**	**3.00**	**3.00**
3a. Individual outcome efficacy	GSS	54	3.81	4.04	4.00	4.00
	HGPL	122	3.14	3.34	3.00	3.00
	PPE	22	3.68	3.73	4.00	4.00
	GM	86	3.60	3.76	4.00	4.00
	All	**284**	**3.45**	**3.60**	**4.00**	**4.00**
3b. Collective outcome efficacy	GSS	54	4.78	4.67	5.00	5.00
	HGPL	122	4.44	4.37	5.00	4.00
	PPE	22	4.64	4.77	5.00	5.00
	GM	86	4.44	4.48	5.00	5.00
	All	**284**	**4.52**	**4.49**	**5.00**	**5.00**

Table 1B. Difference between pre- and post-intervention

Variable	p-value	Z-value
1a. Knowledge (SDGs)	.000*	-11.433
1b. Solutions for a better future	.000*	-8.951
2a. Attitude (to the future)	.000*	-6.454
3a. Individual outcome efficacy	.000*	-3.650
3b. Collective outcome efficacy	.429	-0.791

**significant at p<0.05*

Table 1C. Differences within groups between pre- and post-intervention

Variable	Study program	p-value	Z-value
1a. Knowledge (SDGs)	GSS	0.000*	-4.589
	HGPL	0.000*	-7.531
	PPE	0.000*	-3.739
	GM	0.000*	-6.477
1b. Solutions for a better future	GSS	0.006*	-2.773
	HGPL	0.000*	-5.477
	PPE	0.080	-1.748
	GM	0.000*	-6.424
2a. Attitude (to the future)	GSS	0.001*	-3.189
	HGPL	0.000*	-4.436
	PPE	0.096	-1.667
	GM	0.002*	-3.149
3a. Individual outcome efficacy	GSS	0.083	-1.733
	HGPL	0.004*	-2.864
	PPE	0.822	-0.225
	GM	0.070	-1.812
3b. Collective outcome efficacy	GSS	0.109	-1.604
	HGPL	0.246	-1.159
	PPE	0.180	-1.342
	GM	0.575	-0.560

** significant at p<0.05*

*** (-) or (+): program a (left of table) has a higher (+) or lower (-) median response than program b (top of table)*

Appendix 2

*2A Differences** between groups (pre-intervention)*

Variable	Program	GSS	HGPL	PPE	GM
1a. Knowledge (SDGs)	GSS				
	HGPL	0.003* (-)			
	PPE	0.048* (-)	0.538 (-)		
	GM	0.000* (-)	0.004* (-)	0.350 (-)	
1b. Solutions for a better future	GSS				
	HGPL	0.010* (-)			
	PPE	0.878 (-)	0.077 (+)		
	GM	0.019* (-)	0.887 (+)	0.097 (-)	
2a. Attitude (to the future)	GSS				
	HGPL	0.296 (+)			
	PPE	0.159 (+)	0.420 (+)		
	GM	0.868 (-)	0.195 (-)	0.141 (-)	
3a. Individual outcome efficacy	GSS				
	HGPL	0.000* (-)			
	PPE	0.392 (-)	0.020* (+)		
	GM	0.156 (-)	0.001* (+)	0.838 (-)	
3b. Collective outcome efficacy	GSS				
	HGPL	0.001* (+)			
	PPE	0.191 (+)	0.233 (+)		
	GM	0.011* (-)	0.455 (+)	0.515 (-)	

** significant at p<0.05*

*** (-) or (+): program a (left of table) has a higher (+) or lower (-) median response than program b (top of table)*

*2B Differences** between groups (post-intervention)*

Variable	Study program	GSS	HGPL	PPE	GM
1a. Knowledge (SDGs)	GSS				
	HGPL	0.021* (-)			
	PPE	0.865 (-)	0.169 (+)		
	GM	0.174 (-)	0.439 (+)	0.428 (-)	
1b. Solutions for a better future	GSS				
	HGPL	0.063 (-)			
	PPE	0.702 (-)	0.285 (+)		
	GM	0.336 (+)	0.002* (+)	0.252 (+)	
2a. Attitude (to the future)	GSS				
	HGPL	0.440 (+)			
	PPE	0.419 (+)	0.108 (+)		
	GM	0.518 (-)	0.149 (-)	0.257 (-)	
3a. Individual outcome efficacy	GSS				
	HGPL	0.000* (-)			
	PPE	0.091 (-)	0.020* (+)		
	GM	0.050 (-)	0.003* (+)	0.781 (+)	
3b. Collective outcome efficacy	GSS				
	HGPL	0.002* (-)			
	PPE	0.527 (+)	0.005* (+)		
	GM	0.216 (-)	0.061 (+)	0.136 (-)	

** significant at p<0.05*

*** (-) or (+): program a (left of table) has a higher (+) or lower (-) median response than program b (top of table)*

Summary

In the current "decade of action", many cities, countries, and international organizations throughout the world have committed themselves to achieving ambitious sustainability goals. A wide base of support and action is needed to realize the transformative change that allows these targets to be met. This thesis aims to improve understanding of the ways in which shared images of the future can be generated or moved, and how steering this process can contribute to action towards urban sustainability transformations. The urgency of the environmental crisis has led to the emergence of new communities of actors that come together to act for more sustainable futures. The work in this thesis can support these communities organize themselves by outlining how to imagine new forms of governance, how they work, and how they can be achieved.

From a review of the transformations, governance, and futures literature, I identify four challenges to the organization of futures practices for sustainability transformations: 1) including different perspectives and assumptions in futures, 2) the need for novel approaches and methodologies, 3) making space for participation, and 4) broadening the scope of evaluations.

The following main research question guided the research:
How can futures practices lead to action in urban sustainability transformations?

To build a theoretical base for the thesis, chapter 2 elaborates on the different intellectual traditions and futures practices that each make epistemologically distinct claims about the future and its manifestations in the present. Through their different outlooks on analyzing, understanding, and influencing the future, these diverse approaches represent fundamentally different attitudes to what it means to meaningfully engage with the future. Because of this diversity of attitudes toward the future, and the different possible modes of engagement with the future, futures literacy is more complex than it appears at first sight. Being futures literate depends on reflexivity of these different engagements with the future, and on what these different approaches can offer future-oriented action. Such reflexivity entails being reflexive about how different approaches to the problem of the future arise, as well as about the underlying power structures. This chapter also investigates possibilities to cultivate this futures reflexivity.It concludes with a set of questions to guide future research in deepening reflexivity as a key element of futures literacy.

To formulate and answer to the questions at the end of chapter 2, chapters 3-6 of the thesis report on three case studies, which in this thesis are all examples of futures practices set up and conducted in the context of larger transformation processes. The context of the transformation process determines the extent to which the community can easily adopt the resulting plans and what kind of support is available to them. Experimenting with futures practices in these three relatively small case studies can provide insights into the first developmental steps toward larger transformational change. I argue that the imaginative,

the creative, and the experiential can open up transformative futures perspectives in governance processes.

Chapter 3 investigates how existing examples of good practices, or "seeds," can be used to open up novel, desirable, bottom-up futures in the case study of Kyoto (Japan). Innovative combinations of methodologies (visioning, back-casting, simulation games) were developed in order to create multiple ways of experimenting and engaging with local food system futures. The result was a pluriform pathway to a sustainable Kyoto food system. Each method brings in its unique pathway elements: visioning to formulate a desired end goal, back-casting to create a step-by-step action plan, and gaming to practice with the future. The combination of Kyoto-based "seeds" with initiatives from elsewhere and with a new food system governance model (a food policy council) resulted in participants learning about new food system practices, extending their networks, and obtaining support for actualizing a food policy council. The chapter concludes that multimethod futures processes that combine existing practices and new modes of governance are a promising new way to outline various pathways for sustainability transformations.

Chapter 4 builds on the empirical work of chapter 3 and returns to the Kyoto case to evaluate the enduring effects of the futures workshops. Deeper insight is needed on how futures practices may guide concrete transformations to more sustainable systems. The chapter draws up a framework for the evaluation of futures practices for food systems transformation. The results show that using "seeds" as inputs for imagining futures had an immediate effect by connecting participants. I also conclude that the use of a new concept of governance (the food policy council) was a key organizing element for the futures practice. Institutional change was observed at the local level, particularly due to the efforts of key "project champions". These enthusiastic and highly motivated participants carried the futures workshops results forward. Finally, an important outcome was the spreading of the futures practice itself. The chapter concludes with two sets of lessons: on evaluating experimental futures and on transformative food systems change.

Chapter 5 turns to futures practices that take place in situations where the contextual factors are less than ideal, at the crossroads of many predetermined agendas and priorities. Four factors can be distinguished that shape the effects of futures practices: 1) how the institutional landscape constrains or enables a project aimed at urban sustainability transformations; 2) the participatory culture surrounding the project; 3) the project design; and 4) the futures methods applied. These factors are assessed in three cities within the European H2020 IRIS Smart Cities project. In each city, project members participated in sessions where they designed citizen engagement using a futures methodology: the novel Scope and Ladder models. Each city reflects a different combination of the four contextual factors. The results indicate that space for exploration and reimagining can be found and optimized under imperfect conditions. Drawing on the results from the three cities, the chapter concludes with a set of recommendations for the funders, project members, and futures organizers of urban sustainability transformation projects.

Chapter 6 explores a futures practice that engages with the daily lives of city dwellers that will be significantly impacted by the transformations aimed at the "decade of action". As ways to imagine and co-design sustainable urban futures, experiments within the present-day urban environment are growing in popularity. This chapter investigates how such an experimental approach can serve as the basis for an applied urban futures game that enables its players to reflect on and imagine ways to address complex sustainability problems. At the center of the chapter is a large-scale mobile urban futures game, Utrecht2040, that provides its players with sustainability content, reflection, and motivation for action. The digital infrastructure of the game and large number of players provided unique opportunities for measuring outcomes. The results indicate that this type of experimental gaming offers a new way for players to collect existing sustainable practices or "seeds" and to use them to collectively create glimpses into relevant sustainable urban futures. At the individual player level, participants reported an increased understanding of sustainability and motivation to act.

The task of achieving urban transformations to sustainability is large, but this thesis started from the idea that small cases that experiment with new perspectives, methodologies, institutional contexts, and evaluation can provide valuable insights and starting points for these kinds of transformations. The insights from these casescan open up new avenues for action, especially when the outcomes across cases are synthesized. To synthesize the findings from the case studies, their outcomes are linked to the four challenges identified at the start of the thesis, thereby generating a set of key insights, from which six conditions for futures practices that inspire action are deduced: 1) futures perspective, 2) institutional context, 3) participation culture, 4) process design, 5) methodology and 6) participants. Futures studies literature often seeks to optimize conditions such as these. However, from the analysis of the three cases in this thesis, it becomes apparent that these conditions are in fact dynamic. Each of them is a point for intervention in a sustainability transformation: the conditions influence and shape one another, and if one condition is not optimal, other conditions can be emphasized to compensate for this and maximize the impact of the practice. I argue that this knowledge can help researchers and practitioners to go beyond futures practices and build a futures culture. In the "decade of action", this futures culture can bring about new, much-needed images of sustainable futures and what they could and should be like, and can inspire action to attain these futures.

Samenvatting

In het huidige 'decennium van actie" hebben steden, landen en internationale organisaties over de hele wereld zich gecommitteerd aan ambitieuze duurzaamheidsdoelen. Er is breed gedragen steun en actie nodig om de transformatie te realiseren die het behalen van deze doelen mogelijk maakt. Dit proefschrift heeft als doel het begrip te vergroten van de manieren waarop gedeelde beelden van de toekomst tot stand worden gebracht en worden veranderd, en hoe het sturen van dit proces een bijdrage kan leveren aan het realiseren van duurzaamheidstransformaties. De urgentie van de huidige milieucrisis heeft geleid tot de opkomst van nieuwe gemeenschappen van actoren die samenkomen om stappen te nemen naar een duurzamere toekomst. Het werk in dit proefschrift kan deze opkomende gemeenschappen helpen zichzelf te organiseren, door te schetsen hoe ze nieuwe vormen van bestuur voor kunnen stellen, hoe deze vormen werken en hoe ze kunnen worden gerealiseerd.

Uit een review van de academische literatuur over transformaties, bestuurskunde en toekomstdenken onderscheid ik vier uitdagingen voor de organisatie van toekomstgerichte werkvormen: 1) het betrekken van verschillende perspectieven op en aannames over de toekomst, 2) de noodzaak van nieuwe benaderingen en methodieken, 3) ruimte maken voor participatie, en 4) het verbreden van de reikwijdte van evaluaties.

De volgende onderzoeksvraag staat centraal in het onderzoek:
Hoe kunnen toekomstgerichte werkvormen leiden tot actie in stedelijke duurzaamheidstransformaties?

Om een theoretische basis te leggen voor het proefschrift gaat hoofdstuk 2 dieper in op de verschillende intellectuele tradities en toekomstgerichte praktijken die epistemologisch verschillende claims maken over de toekomst en hoe deze zich in het heden manifesteert. Door hun verschillende kijk op het analyseren, begrijpen en beïnvloeden van de toekomst vertegenwoordigen deze verschillende benaderingen fundamenteel verschillende houdingen ten opzichte van wat het betekent om de toekomst op een betekenisvolle manier te benaderen. Door deze diversiteit aan benaderingen van de toekomst, en de verschillende methodes om de toekomst te benaderen, is het moeilijker dan het lijkt om "geletterd" te zijn in de toekomst. Geletterd zijn in de toekomst hangt af van reflexiviteit ten opzichte van de verschillende interacties met de toekomst, en wat deze verschillende benaderingen betekenen voor toekomstgerichte actie. Een dergelijke reflexiviteit betekent reflexief zijn over de manier waarop benaderingen van het probleem van de toekomst tot stand komen, en ook over de onderliggende machtsstructuren. Dit hoofdstuk verkent tevens de mogelijkheden voor het verder ontwikkelen van deze reflexiviteit ten opzichte van de toekomst. Het sluit af met een set vragen die centraal kunnen staan in vervolgonderzoek dat reflexiviteit als een sleutelelement van toekomstgeletterdheid verder verkent.

Om een antwoord te formuleren op de vragen aan het eind van hoofdstuk 2 gaan hoofdstuk 3-6 dieper in op drie casussen, die in dit proefschrift zijn opgenomen als voorbeelden

van toekomstgerichte werkvormen die worden ingebracht en uitgevoerd in de context van grotere duurzaamheidstransformaties. De context van dit transformatieproces bepaalt de mate waarin een gemeenschap de resulterende plannen kan oppakken, en welke steun er daarbij voor handen is. Het experimenteren met toekomstgerichte werkvormen is deze drie relatief kleine casussen kan inzichten opleveren in de eerste ontwikkelstappen richting grotere transformaties. Ik betoog dat het verbeeldende, het creatieve en het ervaringsgerichte transformatieve perspectieven op de toekomst kunnen openen in bestuursprocessen.

Hoofdstuk 3 onderzoekt hoe bestaande succesvolle niche-praktijken, of "seeds", gebruikt kunnen worden om nieuwe, aantrekkelijke, bottom-up toekomsten te verbeelden in de casus van Kyoto (Japan). Innovatieve combinaties van methodologieën (visies, back-casts en simulatie-games) werden ontwikkeld om meerdere manieren te creëren om te experimenteren en de interactie aan te gaan met toekomsten van het lokale voedselsysteem. Het resultaat was een pluriforme routekaart naar een duurzaam voedselsysteem in Kyoto. Iedere methode bracht deed een eigen bijdrage aan deze routekaart: visies om een gewenst einddoel te formuleren, back-casting om een stapsgewijs actieplan te maken en gamen om te oefenen met de toekomst. De combinatie van bestaande "seeds" uit Kyoto met initiatieven van elders en met een nieuw bestuursmodel voor voedselsystemen (een voedselbeleidsraad) leidde ertoe dat deelnemers leerden over nieuwe voedselsysteempraktijken, hun netwerken uitbreidden en steun kregen voor het realiseren van een voedselbeleidsraad. Het hoofdstuk concludeert dat multi-method toekomstprocessen die bestaande praktijken en nieuwe vormen van bestuur combineren, een veelbelovende nieuwe manier zijn om verschillende paden naar duurzaamheidstransformaties te schetsen.

Hoofdstuk 4 bouwt voort op het empirische werk van hoofdstuk 3 en keert terug naar de Kyoto-casus om de blijvende effecten van de toekomstworkshops te evalueren. Er is meer inzicht nodig in hoe toekomstgerichte werkvormen concrete transformaties naar duurzamere systemen kunnen leiden. Het hoofdstuk stelt een raamwerk op voor de evaluatie van toekomstgerichte werkvormen voor de transformatie van voedselsystemen. De resultaten laten zien dat het gebruik van "seeds" als input voor het verbeelden van toekomsten een onmiddellijk effect had door deelnemers met elkaar in contact te brengen. Ik concludeer ook dat het gebruik van een nieuwe vorm van bestuur (de voedselbeleidsraad) een belangrijk organiserend element was voor de toekomstgerichte werkvorm. Op lokaal niveau werden institutionele veranderingen waargenomen, met name dankzij de inspanningen van de belangrijkste "project champions". Deze enthousiaste en zeer gemotiveerde deelnemers bleven de resultaten van de toekomstworkshops uitdragen. Een belangrijk resultaat tenslotte was de verspreiding van de toekomstgerichte werkvorm zelf. Het hoofdstuk wordt afgesloten met twee soorten lessen: over het evalueren van experimentele toekomsten en over de transformatie van voedselsystemen.

Hoofdstuk 5 gaat in op toekomstpraktijken die plaatsvinden in situaties waar de contextuele factoren niet ideaal zijn, op het kruispunt van vele vooraf bepaalde strategieën

en prioriteiten. Er kunnen vier factoren worden onderscheiden die de effecten van toekomstgerichte werkvormen vormgeven: 1) hoe het institutionele landschap een project dat gericht is op stedelijke duurzaamheidstransformaties beperkt of mogelijk maakt; 2) de participatiecultuur rond het project; 3) het projectontwerp; en 4) de toegepaste futures-methoden. Deze factoren worden beoordeeld in drie steden binnen het Europese H2020 IRIS Smart Cities-project. In elke stad namen projectleden deel aan sessies waarin ze burgerbetrokkenheid ontwierpen met behulp van een toekomstmethodologie: de nieuwe Scope- en Ladder-modellen. Elke stad weerspiegelt een andere combinatie van de vier contextuele factoren. De resultaten geven aan dat ook onder onvolmaakte omstandigheden ruimte voor verkenning en nieuwe verbeelding kan worden gevonden en geoptimaliseerd. Op basis van de resultaten van de drie steden wordt het hoofdstuk afgesloten met een reeks aanbevelingen voor de financiers, projectleden en organisatoren van toekomstgerichte werkvormen binnen projecten voor stedelijke duurzaamheidstransformaties.

Hoofdstuk 6 onderzoekt een toekomstgerichte werkvorm die zich bezighoudt met het dagelijks leven van stedelingen, dat aanzienlijk zal worden beïnvloed door de veranderingen die onderdeel zijn van het "decennium van actie". Als manieren om duurzame stedelijke toekomsten voor te stellen en mee te ontwerpen, worden experimenten binnen de huidige stedelijke omgeving steeds populairder. Dit hoofdstuk onderzoekt hoe een dergelijke experimentele benadering als basis kan dienen voor een toegepast spel over stedelijke toekomsten dat spelers in staat stelt na te denken over complexe duurzaamheidsproblemen en manieren om deze aan te pakken. Centraal in het hoofdstuk staat een grootschalig mobiel spel over stedelijke toekomsten, Utrecht2040, dat zijn spelers voorziet van inhoud, reflectie en een handelingsperspectief op het gebied van duurzaamheid. De digitale infrastructuur van het spel en het grote aantal spelers boden unieke mogelijkheden om resultaten te meten. De resultaten geven aan dat dit soort experimenteel gamen spelers een nieuwe manier biedt om bestaande duurzame praktijken of "seeds" te verzamelen, en om deze te gebruiken om gezamenlijk een glimp op te vangen van relevante duurzame stedelijke toekomsten. Op het niveau van de individuele speler rapporteerden de deelnemers een toegenomen begrip van duurzaamheid en een vergroot handelingsperspectief.

De opdracht om stedelijke transformaties naar duurzaamheid te realiseren is groot en complex, maar dit proefschrift ging uit van het idee dat kleine casussen die experimenteren met nieuwe perspectieven, methodologieën, institutionele contexten en evaluatie waardevolle inzichten en uitgangspunten kunnen bieden voor dit soort transformaties. De inzichten uit de drie casussen kunnen nieuwe routes voor actie openen, vooral wanneer de uitkomsten worden samengebracht. Voor een synthese van de bevindingen van de casussen worden hun resultaten gekoppeld aan de vier uitdagingen die aan het begin van dit proefschrift zijn geïdentificeerd, wat leidt tot vier sleutelinzichten. Uit deze sleutelinzichten kunnen zes voorwaarden voor toekomstgerichte werkvormen die tot actie inspireren worden afgeleid: 1) toekomstperspectief, 2) institutionele context, 3) participatiecultuur, 4) procesontwerp, 5) methodiek en 6) deelnemers. In de literatuur over toekomstonderzoek wordt vaak getracht om dergelijke omstandigheden te optimaliseren. Echter, uit de analyse van de drie casussen in dit proefschrift blijkt dat deze omstandigheden in feite

dynamisch zijn. Elke voorwaarde is een punt voor interventie in een transformatieproces: de omstandigheden beïnvloeden en vormen elkaar, en als één voorwaarde niet optimaal is, kunnen andere voorwaarden worden benadrukt om dit te compenseren en de impact van de toekomstgerichte werkvorm te maximaliseren. Ik betoog dat deze kennis onderzoekers en actoren in de praktijk kan helpen om verder te gaan dan toekomstgerichte werkvormen, en ze in staat stelt om een toekomstgerichte cultuur op te bouwen. In het "decennium van actie" kan deze toekomstgerichte cultuur nieuwe, broodnodige beelden van duurzame toekomsten ontwikkelen, onderzoeken hoe deze zouden kunnen en moeten zijn, en inspireren tot actie om deze toekomsten te bereiken.

SAMENVATTING

Curriculum Vitae

Astrid Mangnus holds an MSc in Sustainability Science from Utrecht University, where she graduated from the Environmental Governance track. Prior to that she graduated from the BSc program in Economics and Business as well as the BA program in Art History at the University of Amsterdam. After a brief stint in the museum world, she decided that her seemingly divergent interests came together in the field of sustainability in its modern form, where the social, environmental and economic are all taken into account.

Ultimately, this led to a PhD project in which she explored the use of experimental ways to think about and act on sustainable futures. She presented her work at various conferences such as Earth System Governance (2019) in Utrecht, the World Social Science Forum (2018) in Fukuoka and the Anticipation conference (2017) in London. She also taught in multiple courses at the BSc and MSc level, such as The Sustainability Game (in collaboration with HKU University of the Arts) and Techniques of Futuring: A Mixed Classroom with policymakers, for which the teaching team was awarded a Hogeronderwijspremie by the Ministry of OCW in 2021. She is a member of the Copernicus PhD book club and was a member of the social committee that organized the monthly Copernicus Drinks.

Astrid has recently taken up the position of research fellow in the CreaTures project, a European project that explores the role of creative practices in transformational futures.

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