


Playing games to transform the urban

Identifying enabling and hindering factors of urban neighbourhood transformations through participatory place-making games

Master Thesis**Author(s):**

Schuur, Johann 

Publication date:

2022-08-03

Permanent link:

<https://doi.org/10.3929/ethz-b-000665350>

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Playing games to transform the urban

Identifying enabling and hindering factors of urban neighbourhood transformations through participatory place-making games



Johann Sebastiaan Schuur

Master's thesis

Master's degree in Science, Technology and Policy

August 3th 2022

Playing games to transform the urban – identifying enabling and hindering factors of urban neighbourhood transformations through participatory place-making games

Author

Johann Sebastiaan Schuur

Institute of Science, Technology and Policy

S19-951-318

jschuur@ethz.ch

Supervision

Prof. Dr. Adrienne Grêt-Regamey

Institute for Spatial and Landscape Development

Chair Planning of Landscape and Urban Systems

gret@ethz.ch

Co-supervision

Prof. Dr. David Kaufmann

Institute for Spatial and Landscape Development

Chair Spatial Development and Urban Policy

kadavid@ethz.ch

August 3th 2022

Image front-page: Hochdorf participatory place-making game, workshop 2. Graphic game design and picture taken by Ralph Sonderegger.

Voor Silene Troelstra-Ponstein, mijn grootmoeder

Als eerbetoon aan jouw motiverende wijsheid,
en liefdevolle ondersteuning voor al dat leeft.

Ik draag dit als gift in mijn leven mee,
ook wanneer we beiden ergens anders zijn.

Acknowledgements

This research greatly benefitted from being embedded in a wonderful group of people and possibilities. I have enjoyed the privilege of outstanding supervision from my supervisors. Prof. Dr. Adrienne Grêt-Regamey, giving me trust and support in developing my own approach to the research and whose generosity supported the quality of the work, and the continuous feedback helped me to understand the need to scale down. Prof. Dr. David Kaufmann, from whose critical and detailed feedback the argument in this research greatly improved. The ‘step-‘supervision from Michal Switalski in particular for helping me to transcend the importance and bring perspective in the level of detail from my work, helping me find the trust to “just do it” and learn in the process, and the valuable time spend in exciting discussions. Joyfully enriched by a never-ending source of anecdotes and analogies, they were much needed to sometimes transcend a thinking spiral looping in on itself. Dr. Nicolas Salliou for having a functioning game on which I could built the games for Hochdorf and Sompassaari, his rich support during this development process and being a flexible and enthusiastic sounding board to help entangle anything I was struggling with. His expertise and enthusiasm fast-tracked me into the world of serious gaming, from which I had never even heard of before September 2021.

The colleagues from PLUS, who were always a source of entertainment in every good meaning of the word. Post-corona rendered it difficult not to come to the office, because every day would come with the promise of interesting conversations and laughter over coffee, lunch, or on encounters in the hallway. And, of course for taking their valuable time to partake in the many iterations of the game, as well as being available for helping me to vent and critically reflect on my ideas. I also thank the IRL-support-team for without their technical and chatter support this research could not have been carried out.

In particular I’d like to thank Heidi Baumann for giving me a first entry into the world of qualitative data analysis, and discussions on coding strategies. Mahsa Bazrafshan for providing me with info into the reviewer process leading me to alter my initial coding strategy and sample data that I could use to develop the code-book. My brother Irian Schuur, whose second nature in graphic design helped to create a more intuitive code-book, as well as offering the idea of coding category by category. Heidi Annala and Lucien Schriber were a joyful and energetic bunch to work with during the iterations of the coding protocol and resulting coding process. Their critical and advancing thoughts as independent coders helped me greatly to reflect on the work, and of course I thank them for the laborious work of being my bias-reductionists in coding all the data. Bianca Venuti took her valuable time to reflect on the coding protocol and her methodological suggestions helped me to better link the coding to a particular method.

The other colleagues involved in the EU ERC Globescape project include Laura Schalbetter, Ralph Sonderegger, and Jens Fisscher. Laura’s flexibility and reflection helped me to take decisions at difficult moments. Ralph’s humour and eye for detail made both games beautiful pieces to work with for both me and the participants. Jens’ pleasant atmosphere emanated throughout both game sessions in Hochdorf. Together with the support from Adrienne, Laura, Michal, Nicolas, and Ralph made hosting these workshops into an exciting experience.

Further, I am very grateful for the rich and enthusiastic support from Prof. Dr. Christopher Raymond, who's joyous spirit made the Human-Nature Transformation group feel like re-visiting old friends during my time in Helsinki. Me and this research also greatly benefitted from Dr. Janina Käyhkö's trust to let me host a seminar on serious-gaming, her motivating support throughout the adaptation process, and coffee and lunch-breaks in the Environmental Policy Group. These connections made the winter in Helsinki a truly warm experience.

Clarity and language in writing up this thesis is greatly improved by feedback from many. I am beyond grateful for the critical reflection and suggestions from Mengina Gilli, Silvia Burgdorf, Kayleigh McKavanagh, Bauke van der Veldt, Nicolas, Adrienne and David, where I sometimes fail to see clearly.

Last, I feel spoiled to have you, Mengina, by my side and my parents supporting me no matter what. Silene, my grandmother, I thank you for your financial support, lending me your car to drop my application in time at the ETH office, and your valuable lessons both spoken and unspoken. I will continue to live by them and hope to drink one last cup of coffee with you before you go.

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Summary

Societal change is imminent and fueled by wicked problems including climate change, biodiversity loss, poverty, pollution, extraction of mineral resources, and decreasing water availability. Where each in its own right poses severe challenges to a sustained and balanced life on earth, they seem to amplify each other in urban landscapes, putting these landscapes under immense pressure. However, this also signals the potential for transformative change within urban landscapes as focal point of these multi-faceted problems. This potential requires appropriate interventions to address these problems whilst accommodating for increasing population growth.

This research aims at the development of a participatory tool that assists intentional transformations of urban landscapes by investigating enabling and hindering factors, i.e. the 'what' of the transformation, at the neighbourhood level. It helps identify important themes and factors for the transformation of neighbourhoods in both Hochdorf and Helsinki through a serious game (participatory place-making game) involving relevant urban stakeholders, the 'participants'. Through a number of coding cycles, participant statements – resulting from the in-plenum semi-structured interviews after the game session – are coded by a qualitative analysis employing a structural coding method and thematic analysis. The emerging themes and corresponding factors are *planning* consisting of the enabling factors 'early participation and cooperation', 'adaptation and agility', and 'bridging visions'; the hindering factors 'resources and competing interests' and 'changing needs'. Within *mobility* both enabling and hindering factors are 'aboveground parking' and 'alternative infrastructure'. For *spatial*, both enabling and hindering factors are 'meeting places' and 'open structures'. For the theme *liveliness* the factor 'trilogy of services' can both hinder and enable the neighbourhood transformation. Within *policy*, enabling and hindering is 'resources'. In *identity* the enabling factors 'place-attachment' and 'characteristics' arise. Lastly, for *people* the simultaneous enabling and hindering factor is 'inclusion'.

While the serious-gaming method is not a strictly controlled experimental environment and the qualitative data analysis is a highly interpretative act, the factors arising from this endeavor, with the exception of the theme *mobility*, are well reflected in the urban transformation literature. Future research could therefore focus on the role of *mobility* as enabling or hindering factor and address the effectiveness of factors by linking them with transformation- and policy frameworks. This would allow to start pave the way for addressing the 'how' of urban transformation.

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Introduction

Societal change is imminent and fueled by wicked problems such as climate change, biodiversity loss, poverty, pollution, decreasing water availability and extraction of mineral resources. Where each in its own right poses severe challenges to a sustained and balanced life on earth, they seem to amplify each other in urban landscapes. Forgoing the debate on direction of causality between societal change and urban landscapes, their relation simultaneously puts these landscapes under immense pressure, yet also presents potential for transformative societal change.

A medium-variant projection estimates these landscapes to grow with 0.5 billion people already by 2030, as virtually all future population growth is expected to be absorbed in urban areas (UN, 2019b). Currently, already 50% of the global population – 74% in the European Union alone – lives in cities (Binder, Wyss, et al., 2020). Then, by 2050, 70% of the global population – totaling 7.9 billion¹ at the moment of writing – is projected to live in urban areas (Birch et al., 2012; Dodman et al., 2013). This expansion is worrying if the population growth is not sustained by addressing increasingly difficult multi-faceted challenges through appropriate interventions.

General examples of these interrelated challenges are the rapid outbreak of COVID-19, pollution, poverty and inequality, ageing infrastructure and climate change (Hölscher & Frantzeskaki, 2021; Kareem, 2020; Newman, 2020; UN-Habitat, 2016). Specific examples can be found in green spaces that are under threat at the expense of increasing urban populations (Haaland & van den Bosch, 2015; Lin et al., 2015). The aftermath of which is found in reduced functioning of ecosystem services, varying from cooling, air-purification, storm water mediation and biodiversity provisioning; to diminishing their contribution to the mental health and well-being of residents and a lessening sense of place and community connection (Bush & Doyon, 2017). Other issues relate to poverty, over-population, unhealthy housing conditions, poor water and hygienic conditions, inadequate infrastructure, and uncontrolled pollution mainly in the global south. For the global north, segregation, increased social tensions, traffic problems, disproportionate and inefficient use of energy and materials, and the production of solid waste are among the biggest (Ernst et al., 2016; McCormick et al., 2013). Moreover, cities are growing at a faster rate than their populations putting pressure on different land-use requirements (UN, 2019a) and resources. While cities cover only 3% of the earth's surface, they are responsible for the majority share of global emissions (75% of CO₂), consumption of resources (75%), and waste production (50%) (Acuto & Parnell, 2016; Wigginton et al., 2016).

The urban landscape as a focal point of these challenges could also highlight the potential to address these interconnected problems. This is in large because urban landscapes can be seen as both the origin of unsustainable consumption, but also as the operational units where concrete action can be envisaged, designed, (politically) facilitated and effectively rolled out (Nevens et al., 2013). Nevens et al. further stress that whenever urban landscapes engage in innovative, ambitious and responsible tasks of transformative change, there is major potential for learning. In addition, creating sound

¹ Current world population, available at: <https://www.worldometers.info/world-population/>. Accessed July 6th 2022

knowledge on how to advance these change processes could form a solid foundation to help local actors pursue effective and efficient action.

The potential learning effects should however avoid the pitfall of rendering these urban landscapes increasingly homogenous, being the result of increased urbanization subject to rapid globalization processes. This understanding forms the basis for the EU ERC GLOBESCAPE², the umbrella project of which this thesis is an integral part. Increased globalization kick-starts a negative feedback cycle that 1) threatens the diversity of these landscapes leading to 2), a losing sense of place-attachment which in turn 3), disincentives people to be involved in place-making, a theoretical urban transformation construct consisting of the elements place, person, and procedure (see section Place-making)³.

The urban landscape thus seems to play a pivotal role in addressing multi-faceted problems. Consequently, they are reflected by the United Nations as one of the sustainable development goals: 'Sustainable Cities and Communities' (UN, 2019a). Likewise, the need to radically change cities towards sustainability is echoed by UN-Habitat (UN-Habitat, 2016, 2022). These urban transformation narratives are driven by both the need and opportunity for radical change towards cities that are sustainable and resilient. Yet, contemporary urban change processes are unparalleled despite cities allocating the conditions and resources for the realization of fundamental changes to address multi-faceted problems (Elmqvist et al., 2019; Hölscher & Frantzeskaki, 2021)

The name of the game might well be to intervene in urban transformation processes in support of radical change towards creating urban landscapes that are capable of addressing these multi-faceted issues. To intervene, however, actionable knowledge first needs to be generated (Hölscher & Frantzeskaki, 2021; Nevens et al., 2013) and better public understanding of transformation processes should be achieved (Lorig et al., 2016).

The last decades, however, have rendered urban transformation processes more complex and challenging due to both increased urbanization and urban population (Ataman & Tuncer, 2022). The dilemma is strikingly exemplified by urban transformation interventions that led to issues of gentrification, degradation of heritage, social tensions, mass tourism and even exclusion (Seve et al., 2021). Not an easy feat, as the transformational systemic change is "catalysing change for sustainability where the challenge is complex, the goals are ambitious, and the way we cultivate change is systemic" (Birney, 2021).

With pressures intensifying, the rate of challenges evolving more rapidly, and the time to achieve global goals creeping out, understanding the factors that underlie urban transformation can be seen as an important part of the puzzle. So, if we ought to steer these transformations, what would they look like? What is known about how to steer these processes, i.e. what are the required factors to intervene? Which parts ought to be transformed and what is the most important place to intervene

² More information on the project website:

<https://plus.ethz.ch/research/forschungsprojekte/GLOBESCAPE.html>. Latest access Juli 22nd, 2022.

³ A theoretical construct to operationalize the elements of urban transformation, after Switalski et al. (forthcoming).

in order to ensure desired results? What actors are most influential in shaping these transitions, and how to get them involved? And last, how can the required knowledge be generated?

These questions support the motivation for this research and are covered in more depth in the next chapter. The motivation is to support the transformative potential from urban landscapes. And, as integral part of the EU ERC GLOBESCAPE project specifically, to support a positive feedback cycle that 1) maintains the diversity of these landscapes (place) leading to 2), an increased sense of place-attachment (person), and 3) a renewed incentive for people to be involved in place-making (process). Ultimately, this research could inform the development of a participatory tool that assists intentional transformations of these landscapes.

To advance our current understanding of urban transformation at the core of multi-faceted challenges, this research will therefore aim at the use of a participatory method to identify enabling and hindering factors of urban neighbourhood transformations. The urban neighbourhood is chosen as a unit of analysis, because it is perceived to capture the complexity of an urban landscape, yet is still familiar enough to bring the identification of these factors onto a level of common understanding. As of today these factors are not yet clearly laid out to be readily adopted in practice, or tested for in a participatory context simulating real-world interactions. Consequently, the research' intent to support urban transformation at the neighbourhood level is captured by the research question:

“In what way can a serious place-making game be used to identify enabling and hindering factors of participatory urban neighbourhood transformations?”

In the subsequent chapters, I will first embed the work in existing theory, conceptual frameworks and methods that can be used in urban transformation context. I will then present the case studies of Hochdorf (Luzern, Switzerland) and Sompasaari (Helsinki, Finland) where two versions of a participatory serious game (the data collection method) are played with multi-stakeholders. The qualitative data analysis subsequently presents the analysis of interactions during these workshops, by adopting an iterative qualitative coding process with two native- (Swiss and Finnish) and project-independent coders. The participatory serious game and qualitative data analysis result in the identification of enabling and hindering factors of urban neighbourhood transformation. These are then discussed with respect to the current literature and the methods, and hints at possible future research vectors.

Urban transformation – state-of-the-art

A call for urban transformation would require us to look at what it is, how it can be triggered, and who should be involved in doing so. This chapter first covers general understanding of ‘the urban’ and ‘transformations’. It then continues with a description of the emerging field of urban transformation studies and factors that arise from it. It then relates the understanding to the general transformation literature, and concludes with the use of serious games as a participatory method to study urban transformation.

The following discussion is a reflection of a literature review using the search-term “urban transformation”, for English review articles from 2020 until present, exclusively focused on contexts in Europe or the United States, within the databases of *Google Scholar*, *Scopus*, *Web of Science*, and *Science Direct*. The search was performed in February 2022, and the practice of “snowballing” extended these works until July 2022.

Urban transformation brings two concepts together. The first, ‘the urban’, is difficult to capture, because there is no uniform definition to distinguish it from other types of urban settlements, because the administrative borders vary across different contexts (Binder, Massaro, et al., 2020a). A definition of these landscapes emerges from a set of characteristics – the recurring elements across differing urban landscapes - that include 1) *population size, density, and hierarchy*, 2) *social, cultural, and economic heterogeneity and disparities*, 3) *artificial and heterotrophic open system*, 4) *functional complexity*, 5) *access to services and facilities*, 6) *economic growth, wealth creation*. Further, they define four metaphors, describing the variety of scientific approaches to ‘the urban’: the city as *machine*, as *organism*, as *network*, and as *melting pot*. The latter two reflect the angle taken in this research best, where the lens of this work is seen to reflect the disciplines of complex systems science, and critical social science. For reading purposes, I will continue to refer to ‘urban landscapes’ as an “agglomeration of social, economic, and infrastructural connections that link places into networks that span both local and global scales” (city as network), and as “places of intermingling and sometimes conflicting cultures and social groups” (city as melting pot) (Binder, Massaro, et al., 2020a).

Second, for a ‘transformation’ of the urban, two closely related concepts are important to distinguish. The first – transformation – can be understood as the ‘what’ of change and the outcomes at a systemic level. The second – transition – describes the ‘how’ of a shift from one state to the other, focusing especially on how this process is supported or hindered (Hölscher et al., 2018). Urban transformation could thus be seen as one possible instantiation of an urban transition (Ernst et al., 2016; Hölscher et al., 2018). Gearing towards the meaning for the urban, McCormick et al. (2013) describe (sustainable) urban transformation as placing a stronger emphasis on structural transformation processes, where change is both radical and multi-dimensional, which can essentially direct urban development towards sustainability. Therefore, (sustainable) urban transformation is exclusively about the change of an urban area. Within this research, I will refer to ‘transformation’ as any form of radical change in both structural and organizational context.

Present research on urban transformation can be classified according to first, frameworks for evaluation, for example on the basis of sustainability dimension(s) (Binder, Massaro, et al., 2020b; Boschetto et al., 2022; Morano et al., 2021; Salomaa & Juhola, 2020). Second, specific outcomes towards e.g. mobility and energy efficiency (García-Fuentes et al., 2021; Link et al., 2021). Third, a specific focus on approaches in support of urban transformation (Pera, 2020; Zhou et al., 2021). Or fourth, take perspectives such as adaptation and mitigation strategies towards climate change (Mendizabal et al., 2018), or health (Crane et al., 2021).

Placing these manifold efforts into a frame of reference, Hölscher & Frantzeskaki (2021) give three perspectives to explain, structure, and integrate the emerging urban transformation field. The authors focus on transformation *in* cities – unravelling factors, processes, and dynamics underlying place-based transformation explain the “why” of transformation. Transformation *of* cities – outcomes of transformative changes serve to understand and evaluate new urban functions, interactions and implications. Transformation *by* cities – changes on global and regional levels take place as a result of urbanization and urban development approaches emphasizing the agency of cities.

This research falls in the first perspective. However, what is missing at present is the ‘what’ – eccentric factors that can readily be adopted by practitioners. And the ‘how’ of idiosyncratic urban transformations – a particular instantiation of the transition. To understand general urban transformation processes, we first ought to understand its particular constituents – the specific factors that govern urban transformation, to subsequently be able to generalize these factors. The direction of the transformation is then determined by knowing which of these factors enable or hinder such transformation.

Triggering urban transformation

A first understanding of these factors comes from the dissertation of Yang (2010), who proposes a set of six key driving forces relevant to an urban transformation. These are population, governance, policy, wealth (economic growth), technology, and lifestyle. Corresponding to these driving forces, he proposes a set of three indicators that define the trajectory of sustainable urban transformation. The first, human well-being, covers personal disposable income, life expectancy at birth and the student-teacher ratio. Then, the built environment can be measured by residential floor area per capita, public green area per capita, and car ownership per 100 persons. The last is the natural environment, gauging electricity consumption per capita, water consumption per capita and air pollutants.

Radywyl & Biggs (2013) define the participatory process as simultaneously the largest driver and barrier of city-wide sustainable urban transformation. The authors state that a value-based, mutual understanding between stakeholders should be cultivated and retained (Radywyl & Biggs, 2013).

McCormick et al. (2013) suggest that in order to advance sustainable urban transformations three main drivers of change are key: *governance and planning, innovation and competitiveness, and lifestyle and consumption*. These drivers can be considered the processes that evoke change in urban contexts, with *governance and planning* being the key leverage point for transformative change. These drivers of so called ‘radical’ change form together with ‘multi-dimensional’ sustainable urban

structures’ a framework for sustainable urban transformation. The urban structures encompass *resource management and climate mitigation and adaptation, transport and accessibility, buildings, and the spatial environment and public space.*

Sustainable urban landscapes require changes in the culture, structure and practices of the urban development regime. Doing so, Ernst et al. (2016) synthesize literature on the normative goals that ought to govern these changes: *“a culture of open participation, co-creation, communication and collaboration by regime and niche actors, local communities and future owners and users, with an attitude of experimentation, innovation and learning. Facilitated and enabled by connecting and empowering local authorities and based upon transition-oriented planning schemes, new contractual forms and property rights, its actors use simultaneous bottom-up and top-down approaches and build upon the potential of existing land use and temporary uses, thereby producing new business models and flexible, sustainability oriented visions, plans and designs”.*

Mendizabal et al. (2018) further identify eight triggers of change that can overcome planning and implementation barriers moving the urban landscape towards resilience. These include *authority and political leadership, learning from disasters, co-responsibility, increased public-private interface, social participation, and lastly the living lab approach to innovation.*

Kroh (2021), focuses on drivers and barriers in the implementation of urban innovation – key for achieving sustainable urban transformation. These drivers and barriers are classified according to the type of stakeholders – *individual, organizational, or ecosystem* – and the locus of driver or barrier in either the *urban district, the near urban environment, or distant urban environment.* Drivers (Figure 1) are mainly found within the urban district, here *“the empowerment of individual stakeholders, like residents, is important. Apart from repeated stakeholder contact, individual incentives, such as financial grants and public funding, and non-financial incentives, like an award for the most climate-friendly building, can interest the stakeholders”.*

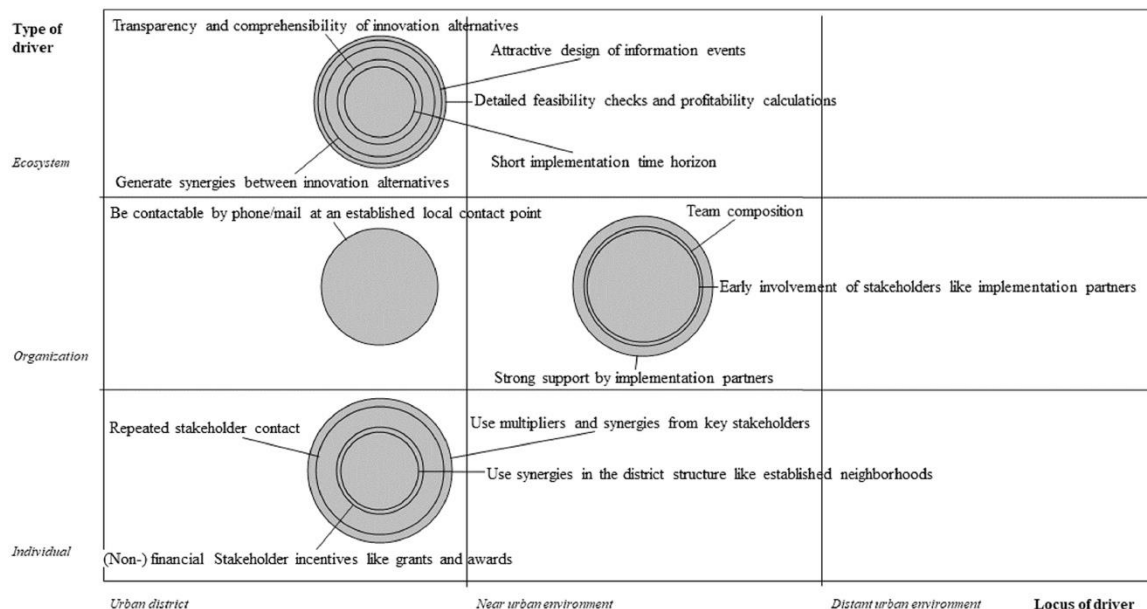


Figure 1. Summary of drivers of urban innovation implementation. With the size of circles representing the frequency of being addressed in the interviews, ‘type’ representing the type of stakeholder(s), and the ‘locus’ describing the locality of implementation. Reprinted from Kroh (2021).

Similarly, barriers (Figure 2) are mainly found in the urban district: “the importance of barriers increases when closer to the ecosystem core. This is understandable as urban innovation implementation relies on the acceptance and willingness of key stakeholders in the urban district. Consequently, the stakeholders’ structure, their attitude toward the transformation, and their responsiveness present barriers”.

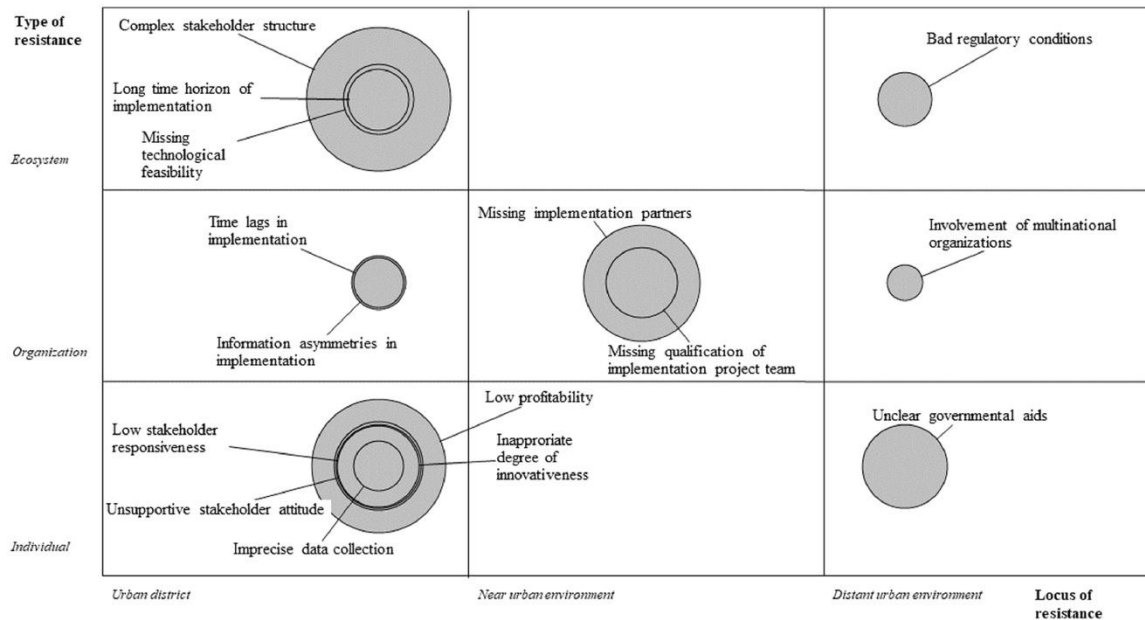


Figure 2 Summary of barriers of urban innovation implementation. With the size of circles representing the frequency of being addressed in the interviews, ‘type’ representing the type of stakeholder(s), and the ‘locus’ describing the locality of implementation. Reprinted from Kroh (2021).

An initial understanding of enabling and hindering factors can be distilled from the literature on urban transformation. It is then important to cast these into concrete frameworks to know where to intervene in the urban landscape, and what the potential effectiveness of such interventions might be. Kroh (2021) already gives perspective by finding both the drivers and barriers to be most present in the urban district, and mainly originating at an individual or urban ecosystem level. Within the general transformation literature, similar three-level structures of change are found, but allow for assessing the effectiveness of these changes.

Triggering urban transformation effectively

O’Brien & Sygna distill a transformation framework after Sharma (2007), where the outcome for sustainable transformations increase towards the outermost circle of a three-level interaction between the *practical*, *political* and *personal* sphere of transformation (O’Brien & Sygna, 2013).

O'Brien continues the exploration of these spheres, by noting that in order to achieve transformation one has to understand "how do deliberate (social) transformations happen". She overlays the three spheres of transformation with the pioneering work from Donella Meadows (Figure 4), recognizing the need to define leverage points for transformation to address changes in any (complex) system (O'Brien, 2018). The appealing presentation of these leverage points on a lever – levying work on a system – is also adopted in more recent work (Chan et al., 2020; Koskimäki, 2021). From an intuitive point of view, a lever can be seen as the "what", the size of the lever as the "how", and the placement of the lever – the leverage point – as the "where" to intervene in a system.



Figure 3 Three spheres of transformation, showing the transformative outcome to be largest for changes in the personal sphere. Reprinted from O'Brien & Sygna (2013).

Meadows explicitly defines leverage points as "places in a complex system where a small shift in one thing can produce big changes in everything" (Meadows, 1999). Her work remains instrumental because both the definitions and framework are still echoed today. For example, Koskimäki describes leverage points as "key system properties where focused interventions can give rise to large changes in the behaviour of a system". Here, the "key system properties" refer to the leverage points from Meadows (Koskimäki, 2021). Linnér and Wibeck define leverage points as "the part of the system that can be influenced for a proportionally greater effect on the whole system" (Linnér & Wibeck, 2021). The understanding of a lever seems more fluid, yet an exemplary description would be "actions and interventions promoting transformative change" (Chan et al., 2020).

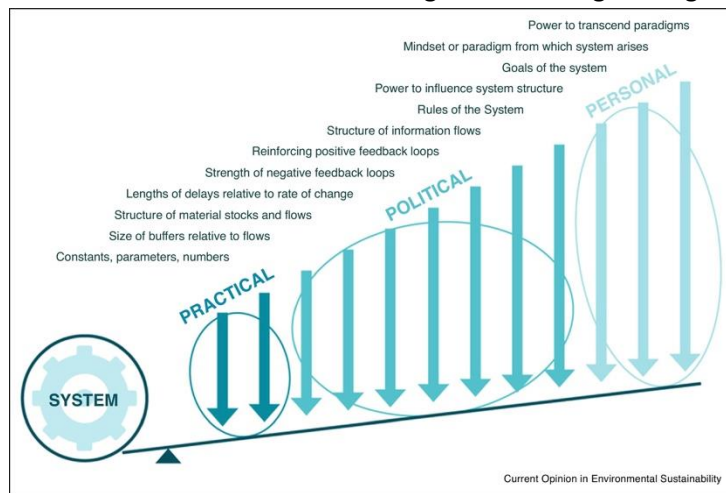


Figure 4. Identifying leverage points for transformation, by mapping the three spheres of transformation onto the leverage point framework after Meadows (1999). Reprinted from O'Brien (2018)

Table 1 presents the current state of knowledge on leverage points, both directly and indirectly mapped onto the initial framework coined by Meadows. The table is a result of a literature search including the terms *leverage*, *point*, *places*, *intervene*, *system* separated by the Boolean operators AND, OR, performed in March 2022. Snowballing led to the incorporation of additional works. Table 1 hints at the possibility to map the enabling and hindering factors. If a mapping onto any of the frameworks seems possible, it can be used as a heuristic device to indicate the potential effectiveness of said factors. Note that this completely disregards the potential effectiveness of many, different, small, and repeating interventions (after Prof. Dr. David Kaufmann, personal communication, July 2022).

Table 1. Framework of leverage points – places to intervene in a system, after Meadows (1999), coupled literature (one-to-one mapping), and related literature (no direct mapping).

		(Meadows, 1999)	(Abson et al., 2017)	(O'Brien, 2018)	(Nobles et al., 2021)	(Birney, 2021)		(Koskimäki, 2021)
Leverage points	Lowest resistance, least effective	Constants, parameters, numbers	Parameters	Practical sphere	Events	Configuration of system structures and flows	No direct mapping onto Meadows leverage points	Flows, constants, and other parameters
		Size of buffers and stocks						
		Structure of material stocks & flows		Feedbacks				Political sphere
		Length of delays						
		Negative feedback loops						
	Positive feedback loops							
	Structure of information flows	Design	Structures	Patterning of relationships and organization	Information flows and feedback loops			
	Rules of the system							
	Power to change system structure		Goals		Whole system goals	Key parameters		
	Goals of the system							
Highest resistance, most effective	Mind-set or paradigm	Intent	Personal sphere	Beliefs	Paradigms	Structural goals		
	Power to transcend paradigms						Societal goals	

O'Brien acknowledges that the recognition and engagement of people as agents of change can drastically speed up transformation processes. Activating this under critical reflection of individual and shared assumptions, beliefs, and paradigms is a powerful path to shift norms and institutions (O'Brien, 2018). Nevens et al. (2013) specifically suggest addressing this engagement through planning tools to enable and steer urban transitions, to monitor and evaluate urban transition processes, and to explore the role of agency dynamics in (sustainability) transitions in terms of politics, power and seizing or seeking opportunities. This forms the motivation for the following section, which covers place-making as theoretical construct, and serious games as participatory method in pursuit of the aforementioned conditions.

Serious games - simulating urban transformation

The need for participation in the urban is not new. Arnstein coined the concept in 1969, defining participation as “the redistribution of power that enables the have-not citizens [...] to be deliberately included in the future” (Arnstein, 1969). The interest in the subject is growing ever since this influential work, yet the actual practice of participation, bottom-up processes and community planning are only recent. Only if perspectives of groups with different interests can readily be integrated, will the vision of a city be complete (Seve et al., 2021).

It is thus without a doubt that participation is necessary to achieve effective urban transformation. Efforts increasingly focus on participatory processes by engaging citizens and stakeholders at different stages of the planning process (Seve et al., 2021). The breadth of methods to do so is broad (Voinov et al., 2018). Serious games are one of these methods, and have a long track-record in participatory processes in the fields of urban planning, as well as in transitions and the transformation of systems (Lorig et al., 2016; Müller & et al., 2017; Poplin, 2012; Stanitsas et al., 2019), or evaluation of newly built or refurbished spaces (Prilenska, 2020). In comparison to other participatory methods, Bhardwaj et al. (2020) argue that games are capable of engagement at the community level as opposed to activities that for example focus on individual participation.

Would you like to play a game?

Serious games are tools where viewpoints can be expressed concerning challenging transition processes. These viewpoints need to be understood in order to guide those processes. Additionally, serious games seem to be an appropriate way for preserving the complexity of a system whilst simulating real-world processes. Both aid in the understanding of these complex systems and their mechanisms, and help to explore collective solutions (Lorig et al., 2016; Müller & et al., 2017; Voinov et al., 2018). Moreover, addressing common or conflicting interests helps to build a supportive coalition and increases the effectiveness of implementation (Voinov et al., 2018). Kim et al. (2020) showcase that engaging people into the participatory process of spatial planning is clearly encouraged by gaming methods. Other case studies suggest that, regardless of the motivation to participate, gamification increases the participant yield and contributions per participant (Prilenska, 2020), whilst bringing together stakeholders with very different background and interests (Koens et al., 2020). In addition, games present an opportunity to openly discuss and challenge ideas and processes in a way that they would otherwise not have access to in their daily activities (Fleming et al., 2020). More importantly, research from Hakkarainen et al. (2021) suggests that serious games – understood by the

writer as collaborative and transdisciplinary research tool – could contribute to enabling deliberate transformation.

Poplin (2012) uses games to entice people to participate in urban planning processes. She states that collaboration, competition, satisfaction, reward and fun are all game-play elements that add motivational factors, next to conventional factors such as gifts, self-interest, and altruism. In collaboration with other authors, she advances the use of serious games in urban planning for civic engagement, and uses it repeatedly as a method to co-create the future of cities (Poplin et al., 2017, 2020).

Who ought to participate?

Particularly stakeholders from the urban neighbourhood level – the unit of analysis – are fundamental in the development and implementation of urban innovations. Innovations that are impossible without involving and the empowerment of urban stakeholders. This stresses the need for a bottom-up approach to enable the recombination of existing urban structures, and building of a new – or renewed – urban landscape (Kroh, 2021). These stakeholders would typically consist of community representatives, social organizations, and government agencies (Almansi et al., 2020). Because the planning process is far removed from the commoner, however, their concerns and aspirations are possibly overlooked. Creating an understanding of this collective knowledge of participants is therefore important (Bhardwaj et al., 2020). However, as Ataman and Tuncer (2022) point out, the representation of data, obtained from participation tools and interactions between stakeholder is missing in the literature at present and they call for more studies to comprehend participation in urban transformation projects. They state that new opportunities ought to be adopted to be able to capture the emergence, development, and continual transformation of cities, and using the collected information in iterative urban design processes. This could be done by more interdisciplinary and context-based studies, for example by comparing cities in different countries, benefitting the domains of urban interventions and participation tools.

What should be played for?

Almansi et al. (2020) observe that when citizen participation addresses complex urban problems, it improves to the urban governance, provides comprehensive responses, and could ensure long-lasting effects of introduced changes. They continue by saying that the decision-making process is structured by participation and transparency, making it into a ‘dialogue of knowledge’. This dialogue is needed to generate structural changes at different levels and could be seen as co-production between stakeholders (Almansi et al., 2020). The fun aspect of games is fundamental in freeing up conversations (Voinov et al., 2018), and could thus help to foster these needed dialogues. The participatory process further encourages residents to take ownership of the process and transformation (Almansi et al., 2020). An interesting example comes from Opromolla et al. (2020), who noticed that games interrupt systemic continuity, because it leads participants to stop, and interact with each other and specific elements of the urban environment – aimed at transforming this specific environment. Participatory games as such, commonly create a framework to co-design a collective vision for the future development of a neighbourhood (Prilenska, 2020). The importance of envisioning the urban transformation is also echoed by Fistola & Rastelli (2021). Adopting new technologies allows one to

“see” and verify the transformation of the urban landscape ex-ante, and to take socially shared decisions. Seeing where the transformation will be, inhabitants can play an active role in urban decisions overcoming the need for technical know-how, and allow them to evaluate opportunities and the effectiveness of a transformation (Fistola & Rastelli, 2021).

Operationalizing urban transformation – theoretical background

In studying the enabling and hindering factors of urban transformation, Switalski et al. (forthcoming) propose place-making as operationalization construct to guide knowledge extraction in such transformations. Serious gaming taps into the engagement of people and provides a (planning) tool to study, enable, and steer urban transformation.

Place-making

Switalski & Grêt-Regamey (2021) define place-making as “the totality of processes and outcomes responsible for how places emerge from interactions between people and their environment”. It is about the change happening to the environment – in this case the urban neighbourhood – and a common set of approaches considers place-making as targeted intervention to guide these changes towards more livable and pleasant places (Switalski, Marcelo, et al., forthcoming).

Place-making is built up from three interacting elements: one’s personal attitudes to place-making (*person*), the influence of existing administrative or collectively organized procedures on place-making (*procedures*), and the existing outcomes of place-making (*place*) (Switalski et al., forthcoming). Place itself can be conceptualized as the meeting point between the *form*, *function*, and *image* produced and perceived of a place (Switalski & Grêt-Regamey, 2021). Here, form is understood as “a collection of physical elements and their configurations”, function as “the activities that can be pursued in a place”, and image as “the cognitive and affective relationships which result in our perception of a place” (Switalski, Marcelo, et al., forthcoming). Because place-making is deemed instrumental to understand dynamics beyond merely direct and deliberate interventions, the “three P’s of place-making” could therefore serve as a first entry into operationalizing place-making in applied research, while building on the understanding and engaging of leverage points for sustainable transformations (Switalski, Marcelo, et al., forthcoming).

The framework of place-making seems promising because it is adaptable to different places (warranting its use in different case studies), it helps identify a set of universal elements, while responding to the rich variety found in place-making processes (cross comparison between different case studies), and it can be elicited from people in a structured way (Switalski, Marcelo, et al., forthcoming). Moreover, it can be operationalized from the perspective of the individual within their neighbourhoods to better understand both its potential and implications for urban transformation (Switalski & Grêt-Regamey, 2021). Last, similarities with the work from O’Brien (2018), allows for bridging the extracted knowledge with transformation frameworks, and as a consequence the potential indication of promising “places to intervene in the urban neighbourhood system” (Table 1).

Framing the research

This thesis is part of the EU ERC GLOBESCAPE project umbrella⁴. As part of this project, the aim is to eventually overlay a number of closely related concepts to build the understanding of the ‘what’, ‘how’ and ‘where’ in addressing urban transformations. This combines the identification of enabling and hindering factors of transformation using a serious place-making game (this thesis), with their perceived effectiveness within an transformation frameworks (O’Brien, 2018; O’Brien & Sygna, 2013), and the operationalization in the form of place-making (Switalski, Marcelo, et al., forthcoming). It is deemed additionally important to understand the temporal, as well as spatial scale of transformation and relationships between all concepts, whilst also being open to “the story arising from the data”.

The main aim of the analysis is to understand enabling and hindering factors of urban transformations, while operationalizing place-making, and secondary to pave the way to explore the similarities between different conceptual frameworks. Consequently, the methodology and analysis will focus on the following concepts:

- 1) **Enabling and hindering factors of urban transformation** (Ernst et al., 2016; Kroh, 2021; McCormick et al., 2013; Mendizabal et al., 2018; Radywyl & Biggs, 2013; Yang, 2010)
- 2) **Leverage points for transformation** (Abson et al., 2017; Birney, 2021; Koskimäki, 2021; Meadows, 1999; Nobles et al., 2021; O’Brien, 2018)
- 3) **The three spheres of transformation** (O’Brien, 2018; O’Brien & Sygna, 2013)
- 4) **Place-making** (Switalski, Marcelo, et al., forthcoming; Switalski & Grêt-Regamey, 2021)
- 5) **Temporal scale of transformation**
- 6) **Spatial scale of transformation**
- 7) **Additional: relation and other**

Yet because the whole is beyond the scope of this thesis, the outcome will only cover the enabling and hindering factors, i.e. the ‘what’ of urban transformation, and makes a preliminary bridge to the remaining concepts (see Future research vectors).

⁴ See the project-website under: <https://plus.ethz.ch/research/forschungsprojekte/GLOBESCAPE.html>

Methods

We develop a participatory place-making game to identify enabling and hindering factors of urban neighbourhood transformation. The game is applied to two case studies (Hochdorf and Sompasaari), and results are analyzed in quantitative and qualitative manner (mixed-method analysis). Figure 5 and Figure 6 show respectively a graphical overview of both the conceptual game model and the game-mechanics.

Serious game set-up

The primary objective of the participatory serious place-making game ('the game' for the remainder of this thesis) is to use it for our research purposes. Specifically, to 1) identify enabling and hindering factors of urban neighbourhood transformation and 2) investigate the lens of place-making in a participatory transformation simulation. A secondary objective is to provide the participants with a stimulating environment to foster constructive discussions. And, to provide them with a potential method to unlock urban transformation processes.

To explore these dimensions in a participatory setting, the participatory serious place-making game simulates the Braui Areal in Hochdorf (Switzerland), and Sompasaari in Helsinki (Finland).

Setting the scene

The game is originally designed for the Braui Areal in Hochdorf. Through interviews with partners from Espace Suisse, the area seemed suitable because a motivated municipality and the persisting problems with the development. Despite several studies made by the municipality, the urban development of this place remained hindered by unknown factors, and as such was chosen by the Globescape project-team as case study to investigate these factors through the lens of place-making. A specific problematic of the area was how to bring life back into the place by making it more attractive. (after Nora Bögli, personal communication, July 24th 2022).

Conceptual game model

Based on Switalski & Grêt-Regamey (2021), we operationalize dynamic interactions between a neighbourhood (place), its place-specific elements (form and function), evoking a particular perception (image). Based on Switalski et al. (forthcoming), place-making is introduced by incorporating players with a particular objective (person), introducing discussion opportunities to transform the neighbourhood (procedure), to arrive at a particular outcome (place).

The conceptual model is ideally a co-construction in accordance with an overarching, and negotiated question, to define the Actors, Resources, Dynamics, and Interactions (ARDI-method) after Etienne et al. (2011). Due to limitations in resources, we forgo co-constructing the model for the initial model, and identify the ARDI-elements based on interviews with key-partners from Espace Suisse, our modeling expertise, a visit to the neighbourhood, and talking to locals. We define the actors to be the

case-specific relevant stakeholders (municipality, housing cooperative, landowner, and cultural center), the resources to be their means to transform the neighbourhood (time, assets, and income), and the dynamics and interactions the place-specific elements and game-dynamics (see Game elements and dynamics).

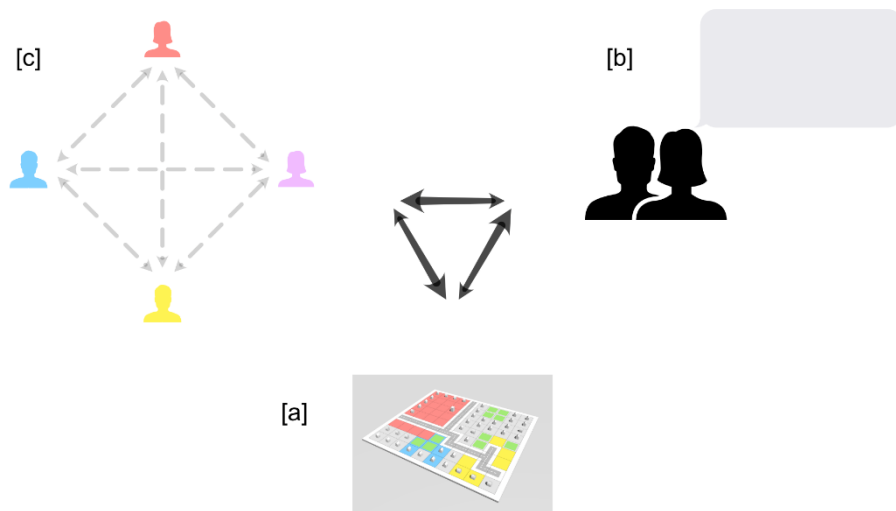


Figure 5. Conceptual game-model. A multi-directional interaction between the individual and the neighbourhood (a-b), the individual and the collective (b-c), and the resulting transformation (c-a & b-a). With a) a 2D representation of the neighbourhood ('place'); b) the individuals' perception of that neighbourhood, its personal and professional objectives, and available resources including ownership, time, and money ('person'); c) the interaction between these individuals having an effect on both the individual and the physical changes within the neighbourhood ('procedures').

The serious game aims to create a playful experience where players – representatives for the relevant stakeholders – implement their visions to transform their urban neighbourhood, whilst getting direct feedback on the effect of their choices without real-life consequences. In this simulation, local stakeholders discuss and negotiate on the neighbourhood transformation, whilst navigating tradeoffs between different objectives, assets, space, and perspectives.

Game elements and dynamics

The game is an interplay between game-elements and game-dynamics. The game elements are the parts 'giving structure' to the game. Dynamics arise from an interaction between the content of these elements and the players. Specific details for the elements and dynamics in relation to place-making can be found in *B.1 Elements and dynamics* in the Supplementary Information. Figure 6 shows a graphical representation, below follows a general description.

Each game-round follows four phases: 1) neighbourhood appeal, 2) income, 3) projects and actions, and 4) events (specific differences for the case studies can be found in the game-rules, Supplementary Information *B.2 Game-rules Sompasaari* and *B.3 Game-rules Hochdorf*).

Neighbourhood appeal dictates the overall appeal of the area and consequently adds or reduces income from businesses. Income is generated from assets that include these businesses, but also parking, and buildings. The projects and actions dictate the transformation of the neighbourhood and

can be small- to large scale, being easier and harder to implement respectively. Implementation requires space on the board, compliance with project- and action specific conditions, and financing, within a ten minute time restriction. This fosters the interaction between the participants, needing to agree on which direction the transformation takes. Events are costs or benefits that incur as a result of external effects such as heavy rain, winning a price for ‘most beautiful neighbourhood’, or needing to adhere to governmental mandates. The event only has an effect when particular conditions are met, e.g. having enough green spaces would absorb the heavy rain. These events ‘respond’ to the transformation and simultaneously tests responses from the participants to particular input.

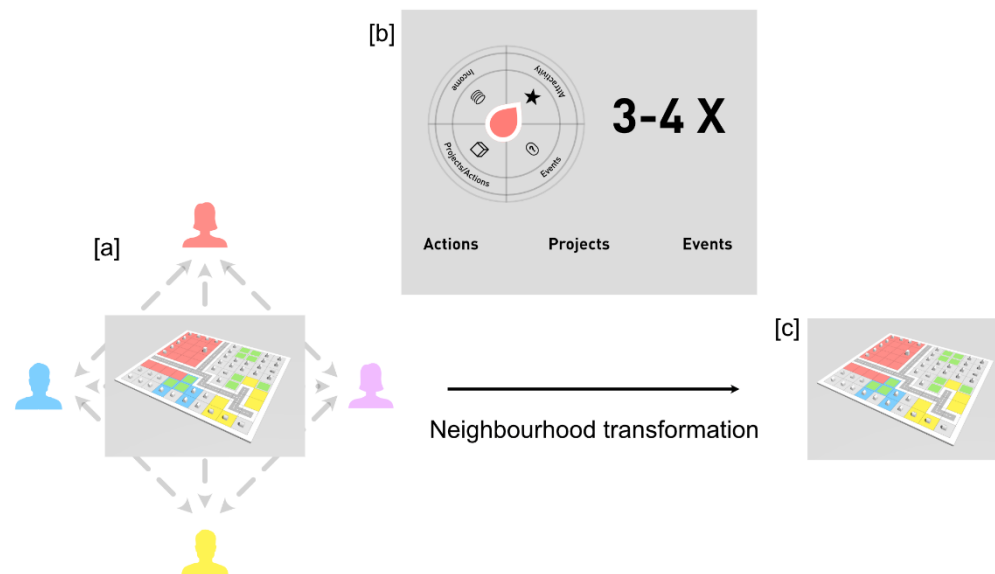


Figure 6. Game-elements and game-dynamics. With a) the participants given a professional objective, resources (time, money, and ownership); and the game-board consisting of place-specific landmarks, private and public space (ownership indicated by colour), green space, roads, and buildings. b) in 3 to 4 game-rounds, the neighbourhood is transformed by the participants. Each round consists of four phases (guided by the turn-of-the-game disc), starting with the neighbourhood appeal, followed by income, projects and actions, and events. With their income, the participants can implement projects and actions. Events are external effects that respond to particular transformations. c) the outcome of the game, being the transformation after 3 to 4 game-rounds.

We choose a table-top game-board as the basis for the neighbourhood transformation simulation (Figure 7). It consists of tokens and tiles, where tokens are movable objects such as buildings, businesses, and case-specific landmarks. Tiles are movable grid-cells that represent public and private spaces (roads, parking, green & blue space). The ownership situation is pre-defined, yet can change during the transformation. Based on ownership, the players receive income that can be used to finance projects and actions. Each player has a pre-defined objective that dictates the transformation. This can be operationalized by implementing project-blocks, that determine the transformation through specific requirements (costs, benefits, spatial imprint) and affect the score of neighbourhood appeal and political approval. Similarly, individual actions and external events influence the transformation and in turn the neighbourhood appeal and political approval. A turn-of-the-game disc is used to guide the players through the game-rounds, and an hour-glass restricts the time for implementation of project and actions.

We calibrate the dynamics by determining a ratio, R , of points gained over points lost in each round. A higher ratio increases the fun-factor, and makes it easier to implement projects or actions. We

motivate the participants (and resulting transformation) by tuning the ratio such that collaboration is rewarded – the points gained then outweigh the points deducted through external events – and individual actions generally lead to lower scoring.

$$R = \frac{P_{\max_gained}}{\bar{P}_{deducted}}$$

Where $\bar{P}_{deducted}$, being the average amount of points deducted,

And
$$P_{\max_gained} = \frac{\sum budget^{-turn}}{\bar{P}_{value}}$$

where \bar{P}_{value} , the average monetary value of points.

Excel-files containing calibrations, and descriptions of specific elements for both Hochdorf and Sompasaari are available upon request with the author.

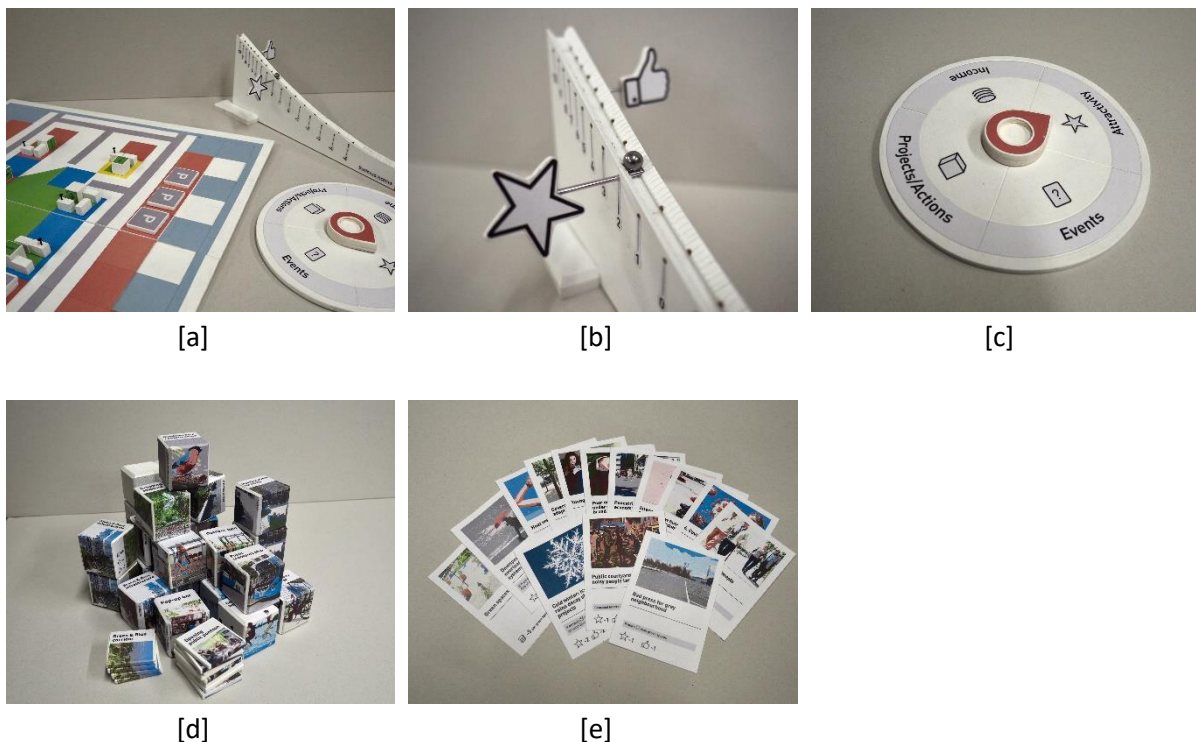


Figure 7. Game-elements for the Sompasaari place-making game. Graphic design and photography by Ralph Sonderegger. With a) the Sompasaari game-board including housing, businesses, parking, green space, blue space, and ownership indicated by colour (e.g. red for the city of Helsinki); b) the neighbourhood appeal and public approval scale; c) the turn-of-the-game disc which guides players through the different phases of the game-round; d) the project blocks; and e) the event-cards.

Testing the game

The game evolves out of a number of iterations with project, or project-independent researchers and students. The game is tested on game-dynamics, functionality of game-components, emerging interactions, and on the methods of data-collection (see section

Data collection and preparation). These test-players give their critical reflections during an in-plenum discussion after the game. Throughout each iteration, we maintain the KIDS (Keep It Descriptive Stupid) principle after Edmonds & Moss (2005).

The definition of actors, resources, dynamics, and interactions, theory from place-making, modeling expertise, and external input from interviews with key partners from Espace Suisse, lead to a first game model. Subsequent iterations and testing resulted in the Hochdorf participatory place-making game that was used in the Hochdorf gaming sessions (see section Application in Hochdorf (Luzern, Switzerland)).

Adapting the game

The Sompassaari game is an adaptation from the game in Hochdorf. The initial conceptual model from Hochdorf is re-assessed following the ARDI-method by Etienne et al. (2011) more closely. We do so co-constructing an adapted version in accordance with an overarching and negotiated question (Etienne et al., 2011). In line with Etienne et al., we first collectively define an appropriate neighbourhood (initial boundary of model), and formulate case-specific questions that need to be addressed. Second, we select the principal researcher of this thesis to moderate the process. Third, the composition of the core-group includes managers, representatives, experts, scientists and local policy makers.

For the core-group we chose to involve 1) academics from the chair Planning of Landscapes and Urban Systems (project-lead, part of EU ERC GLOBESCAPE, ETH Zurich), and the Human-Nature Transformation Research group, Helsinki Institute for Sustainability Sciences, and Urban Environmental Policy (University of Helsinki), 2) the innovation company Forum Virium Helsinki, 3) planning department officials from the City of Helsinki, 4) urban sustainability experts from the Finnish Environment Institute, and 5) resident from the Sompassaari neighbourhood. The latter were involved as a sanity-check of modeling efforts during the adaptation process.

The adaptation commences with a kick-off workshop with the core-group, continues with game-design iterations within a sub-group, and concludes with the core-group in a confirmation workshop.

The kick-off workshop starts with a short introduction into the objectives of the EU ERC GLOBESCAPE project, a characterization of both case studies, and playing the Hochdorf participatory place-making game. Based on this input, the core-team then continued to define the extent of the neighbourhood (boundary of model), relevant actors in the area including their professional objectives (Actors), the game-elements and ownership (Resources), place-specific game-dynamics (Dynamics), and potential interactions (Interactions), feeding into the ARDI-method. Post-workshop surveys (idea after Heidi Tuhkanen) were used as confirmation of the discussion, and to allow for any remaining input.

The game-design iterations draw from discussions with two researchers from the Globescape team (ETH Zürich), who focus on land system modeling (Postdoc) and people-place relationships (PhD). And, a university lecturer from the Urban Environmental Policy Group (University of Helsinki), experienced

in serious games for urban environmental policy. The Helsinki OmaStadi project⁵, was used to integrate citizen wishes concerning specific elements of the transformation.

The confirmation workshop is used to assess the final conceptual model for Sompasaari, and post-workshop surveys were used to extract any latent issues.

All workshop material, including survey-responses can be found in the project-internal folder, see Supplementary Information A.1 *Additional game-development information*.

Serious gaming

Four players are situated around a square table. To recreate power-dynamics, the public-body representative is seated opposing the three other players. Project-blocks are placed closer to the public-body representative, the board closer to the three other players (Figure 8). The goal of the game is to collectively transform the simulated neighbourhood.



Figure 8. The game setup for the workshops in Hochdorf and Helsinki. With a) and b) the first workshops for Hochdorf and Sompasaari respectively. Players are seated around a square table, the public-body representative behind the project blocks, distanced from the game-board. Each player has a personal booklet to track their income, have an overview of the actions that can be implemented, and keep their money. Likert-scale voting cards (visible in a)) are filled out after every game-round. Turn-of-the-game disc and 'neighbourhood attractiveness' and 'public approval' scale are placed clearly visible to all players, the events-cards are placed face-down.

The game starts with a short introduction to the neighbourhood, where the facilitator explains all game-elements, game-rules, ownership situation and the phases within each game-round. Slight differences exist between the games for Hochdorf and Sompasaari, specifics for each can be found in Supplementary Information B.2 *Game-rules Sompasaari* and B.3 *Game-rules Hochdorf*. Each player has a personal player-sheet where they track their income in each round, have an overview of the actions that they can implement (equal for all players), and the possibility to take notes and keep their money hidden from other players. Next to the player-sheet they have a leaflet with voting-sheets

⁵ The Helsinki OmaStadi project allocated 8.8 million euros to realising citizen wishes. See more at <https://omastadi.hel.fi/?locale=en>. Latest access Juli 21st 2022.

(see Data collection) that are filled out after each round. The neighbourhood attractiveness and public approval scale are placed on the table so that they are clearly visible to all players. The event-cards are placed face-down and drawn by all players except the public-body representative in each game-round.

Application in Hochdorf (Luzern, Switzerland)

The neighbourhood is situated around the Braui Areal – a former brewery – and stakeholders characterize it as not attractive, “dead”, grey and a place where you want to “pass through”. The neighbourhood consists of businesses, private and cooperative housing, a hotel, the former brewery, the cultural centre, and a handful of private green spaces. Motorized access is warranted only from the main road, and is the sole result of available private and public parking places. A number of alleys allow cyclists and pedestrians to use the area as a short-cut between the main-road and other parts of the city. Buildings are typically three story-high, with the Braui Tower twice as high.

The workshop took place in the Braui Tower, run by the KulturZentrum Braui (cultural center), and owned by Gemeinde Hochdorf (municipality). The location is a central landmark within the simulated game-area, and players could oversee the game-area through the windows. Participants were invited by a representative from the municipality, who also took part in the game-session. The participants consisted of representatives for the municipality, a housing cooperative, a landowner, and the cultural center.

Application in Sompasaari (Helsinki, Finland)

The Sompasaari neighbourhood is situated in Kalasatama and reflects state-of-the-art planning practice, being in the final stages of its development. Sompasaari is flanked by water on two sides and looks out on the island Mustikkamaa – a popular recreation destination. The neighbourhood consists of a number of building-blocks all situated around public courtyards. They host businesses, private and cooperative housing, a hotel, and private/public green spaces on rooftops. The area is open to motorized traffic to reach public and private parking, yet the centre of the neighbourhood is a public park. Buildings are typically four story-high, with in each block a tower twice as high.

The workshops for Sompasaari took place in the Urban Lab, REDI Shopping Center, run by Forum Virium, and owned by the City of Helsinki. The lab is located a ten-minute walk from the game-area, yet the area was visible from the playing table. Participants were invited based on discussions with, and existing networks of the core-team. They include representatives for the City of Helsinki, a housing cooperative, the resident association, and a sustainability expert.

Data collection and preparation

The data was collected in both Switzerland and Finland, through a mix of qualitative and quantitative methods, as integral part of the serious gaming workshop. Because of the qualitative and quantitative origin, I follow a mixed-method approach for the analysis.

Data collection

Quantitative data is collected through Likert-scale voting sheets, tracking of indicators, and from the frequencies of mentioned categories (see section Coding the data). Qualitative data is collected through 1) observations (during the game and discussions), semi-structured focus group discussions ('warm debriefing'), 3) structured individual interviews ('cold debriefing'), and open questionnaires. A protocol (Supplementary Information C.1 *Workshop protocol*), including a description and template for the methods is used to ensure reproducibility between the workshops in both Hochdorf and Helsinki. Note that all collected data is beyond the scope of this thesis. Despite preparing the data, I will focus in the final analysis only on the data from the warm debriefing.

The aforementioned methods are used to collect data on place-making, the transformation, the transformation process and on the underlying explanation or justification through professional or personal attitudes. Below follows a description of each

Questionnaires measure any change as a result of the gaming workshop, by asking the participants to fill-out the same questionnaire before and after the session. Comparing the ex-ante and ex-post assessment measures 1) changes in the vision on the transformation from the professional perspective of each player, 2) changes in the elements of place-making, and 3) changes in enabling and hindering factors of the transformation process – the transition. Moreover, the answers serve as basis for the cold debriefing.

Observations are used to identify an initial set of enabling and hindering factors of the transformation, and elicit how place-making is operationalized by the participants. The observations are based on verbal and non-verbal interactions (verbal to get content, non-verbal to understand dynamics), and on indicators (to track the physical changes in the transformation). Doing so, we have three observers that take notes of interactions that belong to either of the place-making elements (place, person, procedure), or can be classified as enabling or hindering factor for the transformation. The observations are therefore guided by the concept of place-making, an initial differentiation of enabling and hindering factors in the transformation, and the changes in the game-elements. Taking note of key-moments in the game is used to mobilize particular game-events during the warm debriefing.

Likert-scale voting is used to measure the attitude of each player in response to the transformation, and transformation process during the game. Participants rated their satisfaction on a graphic-based 5-point Likert scale (-2 = very unsatisfied, 2 = very satisfied). They indicate their level of satisfaction concerning each game-round (general), projects and actions implemented (projects, actions), and the events (events). Results are used to follow-up during the cold debriefing with the participants.

The warm debriefing is used to elicit how place-making is operationalized by the participants, and uses questions based on the place-making concept as guiding framework to elaborate on enabling and hindering factors of the transformation. The warm debriefing takes place after a short break separating the game-play from reality. Goal is to first give the players the opportunity to let of steam, i.e. release of potential emotions and first thoughts. To then transition from a game-based discussion to a reality-based discussion, using the game only to enhance the argumentation.

The cold debriefing is used to follow-up on collected data and to validate the concepts used. These one-to-one interviews are thought to tap into any latent attitudes that might be hidden in the group-dynamics during the workshop. They take place two to four weeks after the workshop. Within this time-frame the researcher can do some preliminary analysis, and simultaneously gives the participant some time to reflect on the workshop, yet not so much that could result in the experience to fade. The interview questions are used to follow-up on the transformation, the questionnaires, and the Likert-scale voting. And to validate an initial framework of enabling and hindering factors, the realistic professional objectives, the serious gaming method, as well as an understanding of the theory of place-making.

Data preparation

The collected data is a mix of qualitative and quantitative data. To cast the diversity of data into a structured approach, I will follow a data preparation method, being part of the qualitative content analysis (QCA) method, after Mayring (2014). The reason for choosing this method is due to its rigid structure, and capability of treating both qualitative and quantitative data (see further Data analysis). Following Mayring, the data preparation starts by first, defining the material (the mix of qualitative and quantitative data), second, present an analysis of the circumstances of origin, and third, to formally characterize the data. As an additional step, we transcribe and translate the recordings from the warm debriefing that serve as input for the analysis for this thesis.

Data determination

Sources and type of data include data collected during questionnaires (qualitative, open ended), game-time (qualitative and quantitative), warm debriefing (qualitative and quantitative), and cold debriefing (qualitative and quantitative). Supplementary Information D.1 *Source, type and amount of collected data* presents an overview of source, type, and amount of data gathered for both case-studies. We use this overview to plan the analysis accordingly.

Circumstances of origin

Data is collected over the span of four hours from participants that participated voluntarily. The first three hours are devoted to the gaming workshop, the last hour is reserved for the cold debriefing.

The workshops are hosted in native Swiss-German or Finnish language to aid the interactions between participants. This approach is deemed to enhance the data quality, because participants can express themselves naturally, without having to morph their visions and argumentation into a less familiar language. In view of reproducibility, the workshops follow a specific protocol (Supplementary

Information C.1 *Workshop protocol*), and time-plan (see Supplementary Information A.1 *Additional game-development information*). The location for the workshop is chosen within, or in close-proximity to the neighbourhood, and started with a short introduction of the motivation and expected outcomes of the research behind the EU ERC GLOBESCAPE project. Participants were then asked to fill out the ex-ante questionnaire during 5-10 minutes, before taking part in approximately one-hour collective game-time. A short break with refreshments separates gameplay (the transformation simulation) from the one-hour warm debriefing, where the semi-structured interview guides the discussion. The workshop concludes by the participants filling-out the ex-post questionnaire.

The cold debriefing takes place through an online video-meeting solution, e.g. Zoom or Microsoft Teams. This interview is done from home or workplace of both interviewee and interviewer, in the native language of the interviewee (Swiss-german for Hochdorf, Finnish for Sompassaari). Specific characteristics of the parties and locations involved in both data- collection and production can be found in D.2 *Characteristics of origin* in the Supplementary Information.

Converting raw material

The raw data is a mix of (Swiss) German, Finnish, and English, consisting of both handwritten and voice-recorded material. A common language (English) is chosen to perform the analysis. This allows the cross-comparison between the two case-studies whilst having coders from both countries involved in the analysis.

For the purposes of this thesis we will focus on the recorded material from the warm debriefing. Before translating, we transcribe the recording using a transcription system to be able to capture all essential details. “A transcription system is a set of exact rules how spoken language is transformed into written text” (Mayring, 2014). The system adopted for this research is a mix of *smooth* -, *and pure verbatim transcript*, *protocol with special characters*, and *protocol with comment column*. The last two are used in manual data collection during the workshops (verbal and non-verbal observations). The smooth and pure verbatim approach is taken for the transcriptions of the recorded data, instructions for the transcriptions can be found in the project-internal folder, see Supplementary Information A.1 *Additional game-development information*.

In sum, we transcribe the recording using MAXQDA, Microsoft Teams, and Otranscribo. The transcriptions are translated using Deepl, and checked on correctness by a native speaker. Having the raw data ready for processing, the next section dives into the theoretical foundations of, and subsequent approach to the qualitative data analysis.

Data analysis

The analysis is focused on the discussions with participants during the warm debriefing. In order to identify the perceived enabling and hindering factors of urban neighbourhood transformation, we first structure the content of qualitative data by applying qualitative codes (labels) that align with the

research objective and existing literature. The structured content is then analyzed by looking for recurring themes to further detail the perceived factors based on quotations from the participants.

The analytical process is based on the qualitative content analysis method after Mayring (2014). The specific application of codes adopts a coding method after Saldaña (2021) and is expanded by a self-built methodology. The power of Mayring's method is that it starts from the basis of a quantitative content analysis, yet it conceptualizes the assignment of codes (structuring the data) to text-segments as a qualitative-interpretive act, which then allows for the incorporation of content-analytical coding methods (e.g. from Saldaña (2021)). This mixed-method thus combines the assignment of codes to text (qualitative) with the analysis of frequencies in codes (quantitative) (Mayring, 2014).

The advantage of choosing a specific coding method after Saldaña (2021), is that apart from developing merely deductive codes (based on literature and/or research objectives) or inductive codes (arising from the data-corpus), it also specifies for which data type, scientific inquiries, and circumstances a particular method is most suited.

Analytical process

The analytical process for this thesis involves the development of codes and a coding-protocol, several iterations with two project-independent coders, reproducibility tests, and finally a set of three coding cycles (see Coding the data). Below, I present the analytical steps, based predominantly on Mayring (2014), Curry (2015), and Saldaña (2013, 2021).

Step 1. Reading the material. Coder 1 (principal investigator) reads the raw material freely to get a first impression of the material (Curry, 2015; Mayring, 2014; Saldaña, 2021). I read the raw material before developing any codes to assess whether the research inquiry speaks from the data, and to assess what other understanding arises from the data without being framed by a coding system.

Step 2. Initial coding system. A code-book is a set of codes that reflect the research inquiry (deductive codes) and/or the story arising from the data (inductive codes) (Curry, 2015; Mayring, 2014; Saldaña, 2021). I develop an initial coding system that includes the categories reflecting the research inquiry, theoretical foundations and first impressions from step 1. Within these categories I specify the codes, a definition, and examples of quotations to which these codes can be applied. Face validity of scientific concepts and general language and code comprehension was checked by the Globescape project-team (ETH Zürich), and colleagues from the core-team in Helsinki.

Step 3. Coding protocol. A coding protocol is a specific set of analytical rules for when and how to apply the codes (Curry, 2015; Mayring, 2014). I create a protocol that includes the coding approach, a timeline, research question, coding rules, and the coding system. Face validity and comprehension were checked by the Globescape project-team.

Step 4. Applying the protocol. Coder 1 applies the protocol to a sample dataset with statements on a related concept (place-attachment). This is done to prevent getting too familiar with the actual data already. The potential of creating a deeper level of understanding already could interfere with the reproducibility tests at a later stage. The face validity, language, and general comprehension is verified

by first, a third-person applying the protocol to the same dataset, and second, an independent expert with good command in qualitative data analysis from the Transdisciplinary Lab (ETH Zürich).

Step 5. Iterative coding process. Two project-independent coders (idea after Mahsa Bazrafshan) are involved in further developing the coding protocol and coding the material during the first coding cycle.

We deem it important to involve these coders for a number of reasons. First, it reduces biases that could arise from coding with a project-internal member. Second, it aids in creating a common understanding. Moreover, consensus with three coders is deemed to reduce the potential of the principal researcher to dominate the outcome (based on Friese (2020)). Third, having a native Swiss and native Finnish coder aids the interpretation of the translated material. Fourth, a minimum of two independent coders is required to perform intercoder reliability (ICR) tests (Friese, 2020; O'Connor & Joffe, 2020). These tests measure the coding performance between coders and yield a number of benefits, such as ensuring systematicity, communicability, and transparency of the process; promoting reflexivity and dialogue; and aiding the trustworthiness of the analysis (Mayring, 2014; O'Connor & Joffe, 2020).

The coding protocol is iterated until a point of diminishing marginal returns is reached. O'Connor and Joffe suggest to take 10-25% subsets from the data corpus to perform the ICR tests. I choose to take roughly 25% from each transcript, to ensure that the data-segments cover multiple discussion thematics. I define the point of diminishing marginal returns based on the progression of the ICR-scoring, measured by Krippendorff's cu-Alpha and Cu-Alpha^6 , for each of these tests. I use both Alpha measures because these reflect the research inquiry. Krippendorff's cu-Alpha measures how well coders distinguish between codes within one semantic domain (a coding category). This helps to test the validity of codes and to label each data-segment according to one of the codes only (structuring the data). The Cu-Alpha is a summary coefficient from all cu-Alpha s and takes into account that multiple semantic domains can be applied to the same segments of text. This allows us to check potential overlap between different concepts (e.g. place-making and the three spheres of transformation, more in Future research vectors).

In a first coding cycle (see Step 6 below, and section Coding the data), each coder applies the final coding protocol to the full data-corpus. This includes all four transcripts from the warm debriefings in Hochdorf and Sompasaari.

Step 6. Coding cycles. Three coding cycles transform the data-corpus into an initial categorization (first coding cycle), to then formulate themes and classify the data accordingly ("second" coding cycle), and last to scrutinize these themes to developing meaning out of the participant quotations ("third" coding cycle). I use quotation marks for the subsequent coding cycles, because I do not interpret these cycles as intended by Saldaña (2021) to reduce codes to categories to themes and concepts. The approach taken here is to apply codes, expand into different categories, and then to extract themes and concepts. More detail in the following section.

⁶ For other measures of the ICR test, see for example (Friese, 2020).

Coding the data

In the first coding cycle we structure the data, using the structural coding method after Guest et al. (2012), MacQueen et al. (2008), and Namey et al. (2008) in Saldaña (2021). Guided by the coding protocol we use Atlas.ti to structure the data according to the categories mechanisms, three spheres of transformation, place-making, and additional, reflecting the research inquiry (details in the coding protocol, Supplementary Information E.2 *Coding protocol – first coding cycle*). In addition to the structural method, I pre-select participant quotations from the data that are in line with the research objective. A participant code is added to each quotation in a separate coding cycle to link the participants to their respective quotations. All three coders then apply the coding protocol to these quotations independently. Importantly, we give reasons for the coding choices to assist later analysis. Further, I keep analytical memos to extract an initial set of themes and meaning from the data. This follows Saldaña (2013), who states that the essence of writing memos during the process is essential to reflect and expound on the data – a practice echoed by virtually every qualitative research methodologist.

The second coding round is based on the initial set of themes that I develop based on the memos. This set is used to further classify the participant quotations, adopting an automated approach using Rstudio. First, I extract all quotes from the mechanisms category for which a 100% agreement is found between the coders. This ensures that the remaining material is understood by all coders to belong to one of the coding categories. The resulting data is pooled into a data-set comprised of the participant quotations, applied codes, and reasons for the coding decision for all coding categories (data-set available upon request with the author, see Supplementary Information A.1 *Additional game-development information*). Second, I use the initial set of themes to create lists of words arising within these themes. Specifically, I use stemming to shorten words to their stem, i.e. participation, participatory becomes ‘part’⁷. These lists are applied to the data-set to categorize all participant quotes in these themes. Quotations that do not fit any of the themes are assigned to an ‘other’ category. Third, I assess the frequency of themes as mentioned by the participants and look for patterns that might arise based on the themes, professional background or case study (the R markdown script used for this analysis can be found in Supplementary Information E.3 *R-markdown script – subsequent coding rounds*).

In the third coding round, I assess the participant quotations within each theme, re-assign quotations to different themes where needed, and identify enabling and hindering factors by interpreting the quotations. In the latter, I look for patterns arising from the quotations. I do this by first clustering similar statements, giving these clusters a preliminary description, and assessing the meaning for the urban neighbourhood transformation. The last step involves manually extracting similarities arising from the quotations to develop final descriptions, accompanied by exemplary quotations. An example of the final step can be found in Supplementary Information E.5 *Example manual qualitative coding*. Note that due to time limitations, the last step was done for one of the themes only, the remaining themes are summarized pooling the participant statements at face value.

⁷ This approach is drawn from the field of natural language processing

Results

The participatory place-making games resulted in distinct transformations of the neighbourhoods in Hochdorf and Helsinki. The qualitative analysis of the warm debriefing (in-plenum discussions) thereafter resulted in the identification of enabling and hindering factors for the urban neighbourhood transformation. These factors arose within a number of themes connected to the urban transformation and are identified on the basis of three coding cycles.

Preliminary themes

The first coding cycle resulted in the clustering of data into a number of preliminary themes influencing urban neighbourhood transformation. A 100% coding-match between all coders resulted in 301 quotations (out of the initial 829) and the analytical memos devised four preliminary themes including *planning*, *mobility*, *identity*, and *spatial*. They form the foundation for the second coding round, and are characterized based on the analytical memos.

For *planning*, the participants perceived that planning processes are too inflexible to absorb, and do not consider the current needs of individuals, changing climate conditions, and biodiversity considerations. Moreover, they perceive that too many details are already fixed in advance by planning departments which does not allow for learning and adaptation during the process. Participants express the wish that the realization of steps in the development should be made more incremental, easy, and rapid.

Under *mobility*, on the one hand participants noted that aboveground parking spaces take too much valuable space, are costly, unattractive, and create unsafe situations. For example, parents do not like to have their children play outside close to motorized traffic. On the other hand, residents and (local) businesses require parking spaces (as not to lose business) or improved bike- and walking infrastructure.

Participants believed that *Identity* helps to build community feeling and place-attachment. Hence, 'activating' cultural events such as festivals and the organisation of place-specific activities can help achieve this.

Under *spatial*, players valued un-defined spaces so that residents are able to develop these spaces themselves. Moreover, they value the uniqueness of a place through historical or natural characteristics and a proper balance between- and interaction of local shopping, work, gastronomy, and living. Further, participants stated that the physical structure of a neighbourhood should be adaptive to the contemporary needs and changing climate conditions. Yet, spaces that are too clinical and pre-defined (e.g., uniform positioned benches, or concreted buckets with greenery) influence the interaction between people negatively.

The intercoder reliability tests were performed for the different categories 'Mechanisms' (Krippendorff's $\text{cu-Alpha} = 0.850$), 'Three Spheres of Transformation' ($\text{cu-Alpha} = 0.426$), and 'Place-making' ($\text{cu-Alpha} = 0.487$).

A final set of themes

The preliminary themes from the first coding cycle feed into the second round resulting in the identification of four additional themes that are perceived to influence urban neighbourhood transformation. Based on an automated assignment of themes for the 301 participant quotations, a final set of themes emerge including *planning*, *mobility*, *spatial*, *liveliness*, *policy*, *identity*, *people*, and *other* (Figure 9). *Other* includes all quotations that cannot be categorized in any of the themes. The number of quotations of each theme indicates their potential salience with respect to the urban neighbourhood transformation. For example, *planning* seems to be the most salient theme, followed by *mobility*, *spatial*, *policy* and *liveliness*, *identity*, and *people*.

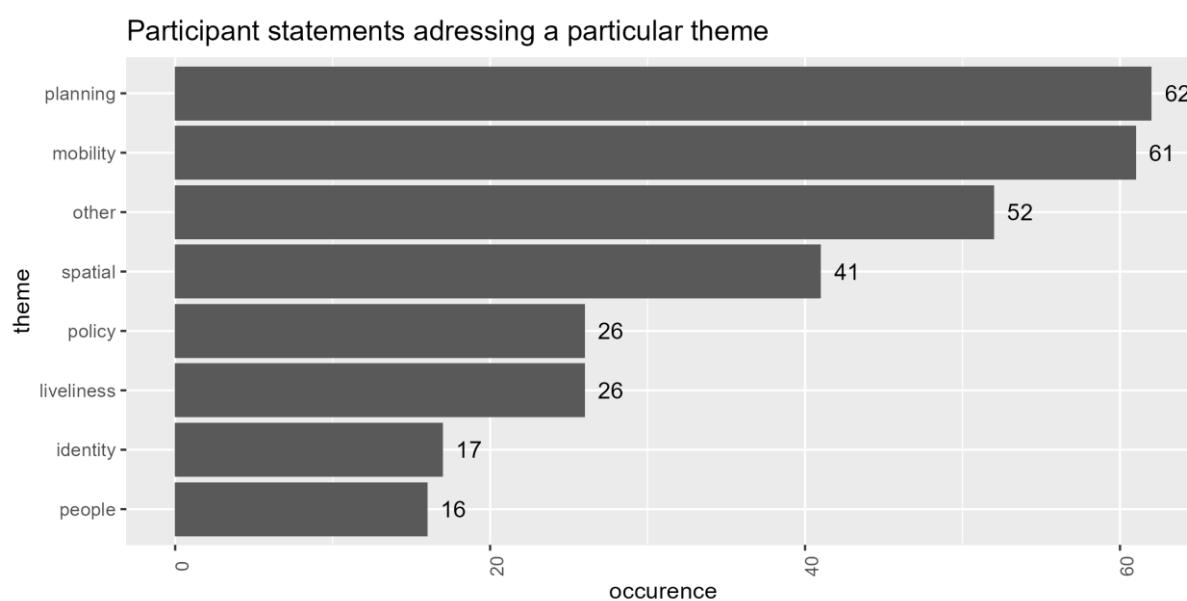


Figure 9. Number of participant statements addressing a particular theme in the warm debriefing. 'Planning' is the theme addressed most, 'people' the least. This could indicate that the participants perceive 'planning' to be the most important theme in the urban neighbourhood transformation.

A closer look at the perceived enabling or hindering issues within these themes shows that the enablers are more often addressed than those that hinder urban transformation (Figure 10). This suggests that the participants have ideas on what could work, yet seem less clear about what at present hinders the transformation of the urban neighbourhood.

Looking in more detail at the occurrences of quotations across themes and participants allows for a two-fold interpretation (Table 2). A first pattern emerges in the salience of themes, being altered when differentiating the quotations by hindering and enabling issues. For example, *planning* seems to be the most prominent issue in the transformation. However, when differentiated by hindering and enabling issues, it becomes less pronounced. In that case, the hindering issues within *mobility* are addressed more by a factor of two (*planning*: enabling = 52, hindering = 10; *mobility*: enabling = 37, hindering = 24). In general, the quotations related to enabling issues are mainly found within the themes *planning*, *mobility*, and *spatial*. For the hindering issues, the players more often addressed the themes *mobility*, *planning*, and *policy*.

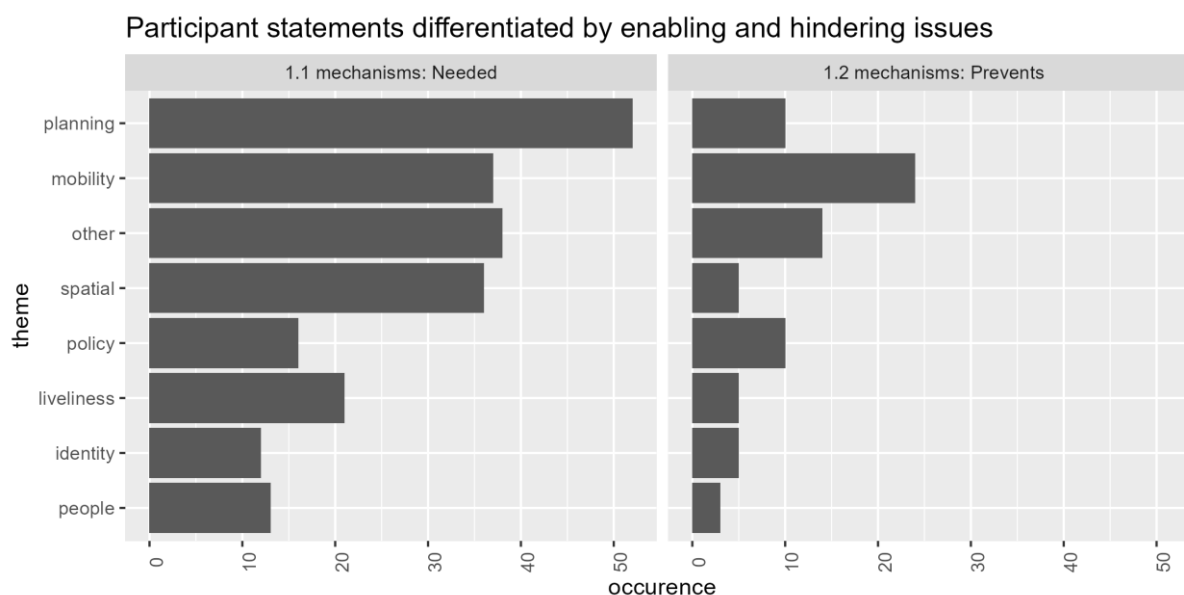


Figure 10. Number of participant statements, differentiated by enabling (coded by 1.1 mechanisms: Needed) and hindering factors (code 1.2 mechanisms: Prevents). In general, enablers are addressed more often than hindering factors. The differentiation between potential enabling and hindering factors, however, changes the order of themes. 'Mobility', for example, is addressed more than 'planning' for the hindering factors.

The second pattern relates to differences in the occurrence of quotations within each theme per participant. A first observation shows that the resident association (Sompassaari) and cultural center (Hochdorf) address the planning theme more often than the public actors, being represented by the city of Helsinki (Sompassaari) and municipality (Hochdorf). This seems contradicting from an intuitive point of view, because the latter two roles ought to represent governing planning processes. It could therefore highlight a potential contemporary mismatch between the commoners' expectations from planning processes and its perceived functioning from the public sector' perspective. However, the importance of this pattern can be relaxed because both the resident association and cultural center have a quadruple (40% vs 11%), respective triple (43% vs 17%) amount of input during the discussions.

A second observation relates to the spread of enabling and hindering issues across the themes and cases. For both cases, players address enabling issues more than they address hindering issues. Moreover, the case of Hochdorf shows a relatively balanced spread of themes being addressed by each participant, with the exception of the landowner not addressing *people*. This reflects a similar contradiction as in the first observation, because it seems odd that a landowner does not address '*people*', whereas he/she ought to care for its residents, the people. However, only an in-depth analysis of the quotations within *people* can give meaning to this observation (see third coding round). In the case of Sompassaari, on the contrary, the addressing of themes seems to be less prevalent, not only by the general coverage of themes, but also in the number of quotations within each theme. For example, the themes *people* and *identity* are addressed solely by the resident association, and *liveliness* only by the resident association and the sustainability expert. This could show that the quotations are a reflection of the (professional) background from the players. This is further exemplified by the city of Helsinki, who discusses mainly topics related to governance (*planning*, *mobility*, and *policy*), whereas it does not address the themes *people*, *identity*, *liveliness*, and *spatial*.

In sum, the first round of coding helps to identify eight themes in which enabling and hindering issues are addressed, where *planning* seems to be the most salient theme in the urban neighbourhood transformation. A different picture occurs when differentiating the quotations by enabling and hindering issues, participants, and cases. Nonetheless, the lack of distinctive patterns make the interpretation of Table 2 difficult. More importantly, without interpreting the quotations, conclusive results cannot be drawn. In the following section, therefore, I will present the identified enabling and hindering factors within these eight themes, arising from the participant quotations.

Enabling and hindering factors of urban transformation

The clustering of participant statements resulted in distinct factors within each of the seven themes. Manually extracting similar statements within *planning* and assessing the topics addressed within these statements results in the enabling factors ‘early participation and cooperation’, ‘anticipation and agility’, and ‘bridging visions’. The hindering factors are ‘resources and competing interests’ and ‘changing needs’. The enabling and hindering factors, a description, and exemplary quotations for the theme *planning* are given in Table 3.

Disregarding the assessment of the ‘*other*’ category and taking the participant statement from the remaining six themes at face value results in *mobility* to be comprised of both enabling and hindering factors ‘aboveground parking’ and ‘alternative infrastructure’. In ‘aboveground parking’, enabling an urban transformation would be to avoid parking spaces from the get-go and only integrate these when required, as exemplified by one of the participants: “the starting point should be [...] zero parking spaces at the beginning, but then they are adapted to what is needed”. Hindering is the public money spent on parking spaces, the cost (and possibility) of underground parking, businesses that require parking, and legalities: “as long as there are subsidized parking spaces or the city plan requires [...] that they are built [...] means that the home buyer or tenant who does not have a car, subsidizes those who have”.

In ‘alternative infrastructure’, enabling is appropriate walking and biking infrastructure: “If we are to move something in this direction now, then pedestrians must have space, cyclists must have space”. Hindering is that cities are designed for cars: “[...] when planning the city, the inhabitants were not really previously thought about at all, but rather where to fit the cars.”

Within *spatial* both enabling and hindering factors ‘meeting places’ and ‘open structures’ emerge. For ‘meeting places’, enabling is the presence of places that are recognized by young and old as comfortable hangouts, having a rich mix of nearby services, and (historical) landmarks. A striking example is found in the statement: “if you wanted to meet someone [...] you went down to the post office with a gravel garden, with big trees, where there was shade -- and that's what I wish for, that you can go to a place and know that you'll see someone there”.

In ‘open structure’, enabling is to have accessibility from all directions through small, interconnected piazzas and parks through alleys within the larger neighbourhood matrix, and the possibility to organize the structure according to contemporary needs, importantly “You mustn't fix anything in place”. Hindering goes hand in hand with the latter, because the pre-defined nature of a neighbourhood cannot be changed by the residents themselves: “if you think about this park so this is really quite clinical”, and “it is not possible, the actual waterfront structure, to influence it in any way”.

Table 2. Participant quotation statistics. Differentiating by enabling and hindering issues (coded by 'Needed' and 'Prevents' respectively), themes, participants, and case study allows for a two-fold interpretation. First, salience of themes changes when differentiated by enabling and hindering concerns. Second, participants' professional background does not always seem to correlate with the themes being addressed, further, the spread of themes addressed is smaller in Sompasaari than in Hochdorf.

Code	Topic	Occurrence	Hochdorf, Luzern, Switzerland				Sompasaari, Helsinki, Finland			
			Role [# quotes / participant]				Role [# quotes / participant]			
			Municipality	Landowner	Housing Cooperative	Cultural Centre	City of Helsinki	Resident Association	Housing Cooperative	Sustainability Expert
Needed	Planning	52	6	3	4	17	1	12	5	4
	Other	38	4	6	12	11	1	2	-	2
	Mobility	37	4	4	5	15	1	6	1	1
	Spatial	36	7	2	6	10	-	5	1	5
	Liveliness	21	4	4	5	5	-	1	-	2
	Policy	16	-	2	2	6	1	2	2	1
	People	13	3	-	2	6	-	2	-	-
	Identity	12	1	3	3	3	-	2	-	-
Prevents	Mobility	24	3	5	4	5	-	6	-	2
	Other	14	2	2	-	4	-	4	1	1
	Planning	10	1	-	-	2	1	5	1	-
	Policy	10	2	3	-	4	-	1	-	-
	Spatial	5	-	-	-	3	-	-	2	-
	Liveliness	5	-	1	2	2	-	-	-	-
	Identity	5	-	-	5	-	-	-	-	-
	People	3	-	-	1	2	-	-	-	-
Share of discussion input			[~17%]	[~20%]	[~21%]	[~43%]	[~11%]	[~40%]	[~33%]	[~17%]

For *liveliness* the factor 'trilogy of services' seems to emerge from the participant quotations, meaning an appropriate balance between diversity and interaction of (local and niche) shopping, gastronomy, and quality of stay. Enabling is when liveliness is brought about by gastronomy and shops that attract people to the neighbourhood, in combination with quality of stay which is being fostered through a pleasant and inviting environment that allows these services to intermingle. They are seen as the essential pillars to bring liveliness into a place: "I'm still of the opinion that with gastronomy and shops - that these are essential pillars for life to come". Hindering, however, is the current focus on bringing life into places through the orchestration of physical elements without paying attention to the interaction with and between these elements: "if there are nice benches, nice shading, but nothing is going on - there are no elements where people say we want to go into the village". These elements fail to serve the needs of the individuals: "you put things in the center, not the needs of individuals anymore".

Policy includes the factor 'resources'. Participants perceived time and money as the main culprits when it comes to urban transformation. Enabling effective policies would be to pool resources and ensure that changes can be carried out over generations: "You have to make a generational contract". Simultaneously, resources also prevent appropriate policies and are perceived to inhibit the transformation "unfortunately, it's always a question of money".

In *identity* the most prevalent enabling factors seem to be 'place-attachment' and 'characteristics'. For 'place-attachment', enabling a transformation would be to ensure the organization of place-specific activities that trigger the connection of people with their surroundings "children liked it terribly when it was self-made and they had ownership to it". Under 'characteristics', enabling is to maintain the existing image of places whether by natural or historical characteristics: "this village character has to be - not exactly the same, but it has to be looked at really well so that [the transformation] gives a good unity" and "the church image from the street up - that gives it this village character".

Last, from the theme *people* the simultaneous enabling and hindering factor 'inclusion' arises. Enabling a transformation refers to residents coming into action themselves and having an administration that is there for the citizens by being accessible, actively listens, and focusses on solutions that are tailored to the individual: "it has to pull people out of the rooms, take them out of the neighbourhoods". Hindering is the lack of motivation, people being too comfortable, and not knowing "what they can get" from their local administration: "somehow the (...) motivation is missing for the young people who say come down here"

Table 3. Enabling and hindering factors in the theme ‘planning’. Three factors are perceived to enable the urban transformation, two are seen to hinder urban transformation. A short description for each factor is given, as well as exemplary quotations from the participants.

	Factor	Exemplary quotations	Player
Enabling	Early Participation & Cooperation Strive for common ground by discussing with a random sample of different stakeholder parties and individuals, from an early stage, on an equal level.	<i>“to start discussing with different parties early enough and looking for the common ground [...]”</i> <i>“we should take everyone with us, that everyone should discuss with each other on the same level, at the same eye level, and seek solutions with them.”</i>	Resident Association Landowner
	Anticipation & Agility Ensure that urban development is agile, and able to anticipate on the unknown by gradual learning – initiate development, take small steps, and ensure intermediate reflective stages.	<i>“preparing for things that can not be seen in advance [...]”</i> <i>“there should be some intermediate stage, where you could like check the contents without having to remake everything from the beginning again.”</i>	Resident Association City of Helsinki
	Bridging visions Develop overarching, conceptual plans that integrate different visions (on e.g. urban green, local climate, technology, housing, health, identity, ...), yet do not define everything until the last detail.	<i>“they should be conceptual, structured plans, and not just individual topics, patchwork in the end”</i>	Hochdorf Housing Cooperative
Hindering	Resources & Competing Interests Time, money, human resources, legalities, and competing interests fail to achieve an effective participatory planning process.	<i>“there are different actors who have different time horizons, resources” ; “they are so long processes”</i> <i>“I have [the perception] that the involvement of residents is quite zero.”</i>	Resident Association Sompassaari Housing Cooperative
	Changing Needs Requirements for a neighbourhood keep changing. For example due to Covid-19, changing climate conditions and demographics.	<i>“the requirements are now for the environment are different than they were even 5 years ago.”</i>	Resident Association

Discussion

The serious gaming method enabled the identification of themes and corresponding hindering and enabling factors within urban neighbourhood transformations that are, in general, reflected in the literature. This chapter first reflects on these factors by relating them to (urban) transformation literature. It then continues with a discussion on the methods and research process and ends by addressing potential future research vectors.

It is important to remember throughout this discussion that the identified enabling and hindering factors of urban transformation are *perceived* factors, emerging from the participant statements, addressing the transformation of their neighbourhood. A more extended reflection on the data origin can be found in the section Methods and the research process.

Enabling or hindering factors of urban neighbourhood transformation

First, I present an overview of enabling and hindering factors that occur within the different themes in relation to urban transformation literature (Table 4). The subsequent sections then discuss each theme and corresponding factors in more detail by 1) reflecting on the naming convention chosen to name the themes and 2) placing the results in perspective through a detailed discussion on compatibility with urban transformation literature.

The naming of the themes – *planning, mobility, spatial, liveliness, policy, identity, and people* – and enabling and hindering factors within these themes is a highly interpretative act resulting from the qualitative data analysis (see *Data analysis*). Forgoing any scholarly debate or practitioner understanding, I consider Merriam-Webster definitions⁸ of the aforementioned themes. While there may be flaws in the linguistics, the discussion below demonstrates that the content of the themes and enabling and hindering factors nonetheless resonates with understanding from the urban transformation literature.

Planning

Planning can be defined as “the establishment of goals, policies, and procedures.” and in the context of city-planning as “the drawing up of an organized arrangement of a city.” This resonates well with the intended meaning of the word.

Within *planning*, there are three enabling factors 1) ‘early participation and cooperation’, 2) ‘anticipation and agility’, and 3) ‘bridging visions’. These enabling factors could arise as a result of the game-dynamics. The first (‘early participation and cooperation’) resulted from the participants needing to discuss where, how, and when to implement projects. However, participants also performed individual actions, forgoing the need to cooperate. Nevertheless, it seemed that they realized that cooperation (“when everyone understands the benefits, then we want to do it in cooperation.”) and

⁸ All definitions accessed on July 16th, 2022. Available at: <https://www.merriam-webster.com/>

participation from an early stage (“[...] start discussing with different parties early enough and looking for the common ground [...]”) would bring out the largest benefits for the transformation.

The second (‘anticipation and agility’) is influenced by external events whose outcome would depend on the state of the transformation, potentially making the participants realize that it is important to think ahead. However, this factor was also addressed as problematic in existing planning processes. Participants mentioned that development plans are typically 20 years old at the time of implementation, making it difficult to respond to contemporary issues. Therefore, it would be much more desirable to incorporate “the idea of agile urban development,” because “there should be some intermediate stage, where you could like check the contents without having to remake everything from the beginning again.” Moreover, participants noted that “preparing for things that cannot be seen in advance [...] would also require pre-negotiation [...].”

The third (‘bridging visions’) can be seen solely as reflection from the participants views on planning processes, as it is difficult to see a direct link with any of the game-elements that could have evoked this particular factor. This is exemplified by the need of an overarching vision, “[...] we have to have a plan of where we want to go,” specifically “[...] conceptual, structured plans, and not just individual topics, patchwork in the end.”

All three enabling factors, and *planning* in general, seem to echo the existing urban transformation literature addressing factors of transformation. For example, Yang (2010) lists ‘governance’ and ‘policy’ as general driving forces for urban transformation, reflecting the overarching category *planning*. Moreover, results from Radywyl & Biggs (2013) indicate that the ‘participatory process’ is simultaneously the largest enabling and hindering factor in urban transformation, while McCormick et al. (2013) list ‘governance and planning’ as key enabler to advance urban transformation. Ernst et al. (2016) address similar topics, but specifically mention the need for ‘open participation’, ‘empowering local authorities’, ‘transition oriented planning schemes’, and ‘flexible visions, plans and designs’. The enabling factors from *planning* are also found to trigger change by Mendizabal et al. (2018), who address ‘learning from disasters’, ‘increased public-private interface’, and ‘social participation’. Last, Kroh (2021) lists ‘attractive design of information events’, ‘short implementation time horizons’, and ‘generation of synergies between innovation alternatives’ as enablers, which is seen reflected in the enabling factors from *planning*.

The hindering factors within *planning* are ‘resources and competing interest’, and ‘changing needs’. These are not addressed as particular factors of urban transformation in the literature, yet are recognized as important in urban transformation literature. From an intuitive point of view, the former is almost a trivial factor inherent to the complication of any type of process. Landry (2006, p.10) in Sepe (2014), reiterates this complication as “these mixed targets, goals and audiences each demand something different.” Landry stresses the importance of aligning and unifying this diversity to ensure that the resulting city can operate consistently and feels coherent. The hindering factor ‘changing needs’ is acknowledged by Rauws & De Roo (2016) and Rauws (2017) in the form of adaptive urban planning. They state that planners should focus on two sets of conditions to cope with the uncertainty of preparing for future, unknown issues; the first involves the conditions for spatio-functional configurations and the second the conditions for capacity building of local actor coalitions.

Table 4. The results from this thesis reflect existing literature on enabling and hindering factors of urban transformation. Where results from this thesis are not backed by the specific literature on factors of urban transformation, they are discussed based on more general urban transformation literature.

This thesis		Literature	
Theme	Factor	Urban transformation factors	Urban transformation general
Planning		✓ (McCormick et al., 2013; Yang, 2010)	NA
	Early Participation & Cooperation	✓ (Ernst et al., 2016; Kroh, 2021; Mendizabal et al., 2018; Radywyl & Biggs, 2013)	NA
	Anticipation & Agility	✓ (Ernst et al., 2016; Kroh, 2021; Mendizabal et al., 2018)	NA
	Bridging Visions	✓ (Ernst et al., 2016; Kroh, 2021)	NA
	Resources & Competing Interests	✗	✓ Landry (2006) in (Sepe, 2014)
	Changing Needs	~ (Ernst et al., 2016)	✓ (Rauws, 2017; Rauws & De Roo, 2016)
Mobility	Aboveground Parking	✗	~ e.g. (Campisi et al., 2022; Cilliers & Timmermans, 2016; Gogishvili, 2021; Nederveen et al., 1999)
	Alternative Infrastructure	✗	~ e.g. (Covelli, 2022; Glazener & Khreis, 2019; Golub et al., 2016; Piras et al., 2022; Seto et al., 2016; Wemmenhove & Steinberg, 2020)
Spatial	Meeting places	✓ (Radywyl & Biggs, 2013)	NA
	Open Structures	✗	✓ (Filion, 2010; Sacco & Tavano Blessi, 2009)
Liveliness	Trilogy of Services	✓ (Mendizabal et al., 2018)	✓ (Cilliers & Timmermans, 2016; Nissen, 2008)
Policy	Resources	✗	NA
Identity			✓ (Al Naim, 2013; Beyhan & Gürkan, 2015)
	Place-attachment	✗	✓ (Reese et al., 2019; von Wirth et al., 2016)
	Characteristics	✗	✓ (de Broekert, 2022; Kalaycı Önaç & Gönüllü Sütçüoğlu, 2021; Kirschstein, 2022; Sepe, 2014)
People	Inclusion	✓ (Ernst et al., 2016; Kroh, 2021)	NA

In sum, the enabling factors within planning are well presented in the literature. For the hindering factors, ‘changing needs’ could probably be merged with ‘anticipation and agility’. Although ‘changing needs’ remains a hindering factor, the perceived synergies with agile planning might be an answer to this problematic.

Mobility

Mobility refers to “the quality or state of being mobile or movable,” or “the ability to change one’s social or socioeconomic position in a community and especially to improve it.” These definitions do not reflect the intended meaning of *mobility* when choosing the category. Rather, I meant the totality of physical transport and consequences thereof, i.e., the required infrastructure within the urban settings. This category could thus better be named *urban infrastructure intended for physical human movement*.

Both enabling and hindering factors are ‘aboveground parking’, and ‘alternative infrastructure’. The fact that the former is addressed in both case studies could be incentivized by the modelling of the parking spaces in the game; because for both games, parking spaces generated income and, when removed, created more space for the implementation of projects and actions. Specifically, large-scale transformations involving, for example, the implementation of a pedestrian zone, urban green or green infrastructure. Thus, likewise to the factor from *planning* this particular factor could suffer from a bias, fuelled by the possibilities presented in the game. Having the participants thinking about parking spaces could as a consequence also incentivize the discussions on ‘alternative infrastructure’.

Despite these considerations, the statements from the participants seem to reflect general dissatisfaction with above ground parking. Examples include general statements, such as “the parking space problem is quite big,” to specific comments in relation to urban transformations, e.g., “car parking is now one example of the fact that, well if you remove parking spaces you then get all kinds of other things.” Interestingly, the literature is not clear about these factors, neither explicitly as enabling nor as hindering the urban transformation. More generally, however, aboveground parking is seen to impose an ever-increasing pressure on public space (Gogishvili, 2021). Strategies that reclaim the use of this public space for purposes other than vehicles go from the extreme in car-free cities (e.g. Nederveen et al., 1999), to low-key alternatives for the conversion of parking spaces by transforming them into lively public open spaces (Cilliers & Timmermans, 2016) or, on the smaller scale, into parklets (Campisi et al., 2022).

The desire for alternative modes of transport, on the contrary, can be seen solely as a reflection of the participant attitudes, as possibilities for alternative modes of transport are not explicitly modelled into the game. For example, visions of car-less cities were raised: “it’s like a big overall vision for this area, that [...] it is no longer necessary to have a car.” More specifically, participants believed that alternative infrastructure should take the form of improved walking and cycling infrastructure: “if we are to move something in this direction now, then pedestrians must have space, cyclists must have space.” These considerations are well reflected in the literature on, for example, transit-oriented development (e.g. Covelli, 2022), increased efforts towards improved walking and cycling infrastructure (Golub et al., 2016; Piras et al., 2022; Wemmenhove & Steinberg, 2020), and also with regard to health benefits because of reduced pollution and increased physical activity (Glazener & Khreis, 2019). In general, the

notion of carbon lock-in due to existing carbon-based infrastructure (Seto et al., 2016) can be seen as hindering the urban transformation at large.

Summarizing, 'aboveground parking' and 'alternative infrastructure', parking spaces, cars, or streets as hindering factor for urban transformations is in the present literature not discussed. This could warrant the need for more research on this topic.

Spatial

Spatial can be defined as “relating to, occupying, or having the character of space” or “relating to, or involved in the perception of relationships (as of objects) in space.” With *spatial*, I intended to describe the perception of the physical characteristics of a place within an urban setting. Here, it would have been more descriptive to rename the theme as *urban spatial structure and its physical components*.

Within *spatial*, 'meeting places', and 'open structures' are simultaneously enabling and hindering factors. Neither of these are modelled into the game – because the initial structure is modelled after the existing situation – and thus can be viewed as factors arising exclusively from the participants attitudes on the neighbourhood transformations.

Participants wished for places that are recognized as comfortable hangouts, incorporating a mix of functionalities and interaction possibilities. This is strikingly exemplified in the participant statement: “in the past you had the old post office down there, if you wanted to meet someone [...] you went down to the post office with a gravel garden, with big trees, where there was shade -- and that's what I wish for, that you can go to a place and know that you'll see someone there.” Importantly, “the quality” of these places seems to be the largest motivator: “if the quality of the local environment is good, people will like to be there.” This might be supported by “the diversity of what's on offer [...], but also the diversity of people, young and old, who maybe come out of the houses and stay in a place where it smells nice, or where there's a coffee or a beer, and you know [that you will encounter these people].”

'Open structure' could foster these conditions by giving people the possibility to structure, develop, and use the space to their own likings. Moreover, spaces that are accessible from multiple directions are believed to enhance varied interactions with the place and among people. Most important is that “you mustn't fix anything in place” and that the structure consists of “[...] some space or some park [...] like pockets within the larger area” that are interconnected “[...] a big parameter of this open space concept is of course that the main street is connected with the centre [...]”.

The aforementioned conditions for public space are echoed in Radywyl & Biggs (2013), who investigated how public space can leverage disruptive changes in urban environments by prototyping different alternatives, e.g., temporary street closures. By exploring these alternatives, they find that rigid urban structures can be relaxed and “stakeholders can cultivate and consolidate shared resources and custodial commons practice”(Radywyl & Biggs, 2013). Fillion (2010), in addition, hints at the propagation of fixed urban structures as hindering factor for urban transformation when designing spaces. Participants mention that care must be taken however, that these places should not be designed from a top-down planning perspective, because then residents themselves cannot give shape

to the neighbourhood: “if you think about this park so this is really quite clinical”, and “it is not possible to influence it [the local shore-line] in any way.” If done so regardless, both ‘meeting places’ and ‘open structure’ are likely to result in a sub-optimal neighbourhood transformation, because a merely cosmetic fix is likely to exacerbate the critical aspects of urban transformation, instead of tempering them (Sacco & Tavano Blessi, 2009). As Lefebvre stated: “the most beautiful cities were those where festivals were not planned in advance, but there was a space where they could unfold”.

Liveliness

Liveliness can be defined as “briskly alert and energetic” and “full of life, movement, or incident.” Both reflect, yet the latter comes closest to the intended meaning, where *liveliness* within this research is understood as the vibrancy of the urban neighbourhood. In this sense, *liveliness* covers the enabling and hindering factors well.

In *liveliness* the enabling factor ‘trilogy of services’ is thought to bring life into a place by striking a balance between shopping, gastronomy, and quality of stay. As the addition of businesses generated income that could be used for transformation possibilities, the game may have influenced discussions on this topic. However, the content and specific services of these businesses (shopping, restaurant, bar, local vs franchise, etc.) was not modelled into the game, besides the “buvette” (project option) in Hochdorf. Therefore, the fact that especially the trilogy of services brings life into a place is a clear reflection of the participant visions for the neighbourhood transformation.

Participants deemed *liveliness* to be the outcome of particular services: “[...] gastronomy and shops - that these are essential pillars for life to come.” The quality of stay could be part of the factors ‘meeting places’ and ‘open structures’ (spatial), yet the focus here is explicitly on creating quality of stay by bringing in services and functionalities that require a transformation of public-private space.

This transformation of public-private space potentially privatizes bringing life into a place, in close harmony with the quality of stay. Examples of such transformations can be found in the work from Cilliers & Timmermans (2016), who showcase a number of transformations that resulted in increased liveliness, based on privatization of former un-used spaces. Nissen (2008), however, sheds light on potential dangers of this trend, addressing both exclusion, and the transfer of state or local rights and control to private or commercial actors. ‘Trilogy of services’, as an enabler should therefore be considered in equal parts with the enablers ‘meeting places’ and ‘open structures’ (*spatial*), to avoid a potential transfer of ownership of these public and self-built places to private and commercial activities.

Policy

Policy can be defined as “a definite course or method of action selected from among alternatives and in light of given conditions to guide and determine present and future decisions” and as “a high-level overall plan embracing the general goals and acceptable procedures especially of a governmental body.” Policy could therefore be seen as umbrella theme targetting any of the identified enabling and hindering factors. In this case, however, it is closely related to the *planning* theme, and focuses in particular on the policies that govern urban transformation. This is exemplified by the definition of

planning being “the establishment of goals, policies, and procedures.” This indicates that *policy* is part of planning and therefore would not warrant its own theme. Yet, the theme of *policy* is chosen to reflect specific courses of actions towards urban neighbourhood transformation within a *planning* context. It was made into a stand-alone category because it reflected deliberate interventions. However, this seemingly close overlap could thus mean that it is necessary to re-assess the exact differences with *planning*, especially in view of the large body of research addressing urban (transformation) policy (Botticini et al., 2022; Figueiredo et al., 2022; Medved et al., 2020; Narandžić & Ljubojević, 2022; Seto et al., 2016; Shahani et al., 2021).

The fact that this theme arises from the discussions is not influenced by the game, yet could be a reflection of the professional background from especially the representatives of the public-sector. Interestingly however, this theme is built up mainly from statements by other representatives. Examples of these would be: “you have to make a generational contract”, indicating that policies should be independent of current regimes. The fact that ‘resources’ is both seen as enabling as well as hindering factor revolves mainly around the time required for implementation and the finances needed to do so. This is exemplified by for example: “that's a culture -- that doesn't come overnight. It also takes time” and “unfortunately, it's always a question of money.”

Despite having ‘resources’ as main enabling and hindering factor for the implementation of targeted transformation policies, it might actually overlook the social and political dynamics involved in their determination (Grandin et al., 2018). The authors highlight both opportunities and constraints to urban transformation based on the ‘politics of governance’, ‘politics of infrastructure’, and ‘politics of everyday life’. This could indicate that, although participants address resources as main culprit, interventions are mainly subject to social and political dynamics. In addition, Lozano-Gracia et al. suggest that policies targeted at urban transformation are most effective when they not focus on time and money, yet on fluid land markets where institutions should “1) assign and protect property rights, 2) enable independent valuation and public dissemination of land value across uses, and 3) enable the judicial system to handle disputes that may arise in the process” (Lozano-Gracia et al., 2013). This is however countered in a specific example raised in one of the workshops where participants discuss the issues with the Swiss ‘Heimatschutz’ – protection of cultural heritage and local identity. Although this involves an independent “expert advisory board”, property rights, and independent valuation which enables a judicial system to handle disputes actually severely hamper the transformation process.

Identity

Identity is defined as “the relation established by psychological identification”. Identification is defined as the “psychological orientation of the self in regard to something [...] with a resulting feeling of close emotional association” or “a largely unconscious process whereby an individual models thoughts, feelings, and actions after those attributed to an object that has been incorporated as a mental image.” Because participants refer to the perceived identity of a place itself (and their psychological orientation in regard to that identity), a more tailored description could have been *place identity*.

Identity harbours the enabling factors ‘place-attachment’ and ‘characteristics’. Both factors could be addressed by the factors ‘meeting places’ and ‘open structures’ (*spatial*) and ‘trilogy of services’

(*liveliness*) because these themes could contribute to the development of place-attachment and place-specific characteristics. What is meant here, however, is the preservation of the characteristic identity of a place, exemplified by the participant statement, “the church image from the street up - that gives it this village character” and “the image has to stay”. The place-attachment could result from particular events, e.g., “things happen that make people feel that they are like attached to the environment,” practices “but children liked it terribly when it was self-made and they had ownership to it,” and cultural values “that [a festival] is identity-forming.” *Identity* as such is thus not only connected to the physical urban transformation, but can also be related to particular practices, social, or cultural values.

The literature does not address these factors as specific enabling or hindering urban transformations, but merely as outcome thereof. Examples include work from Beyhan & Gürkan (2015), who relate the loss of urban identity to increasing globalization processes of which the resulting monotony depresses local features. Work from Al Naim (2013) addresses the fracturing of urban identity as a result of fast urban changes, and the potential need for the ‘New Traditional City’ to maintain a coherent urban identity. He continues by saying that the urban identity in itself is an unstable entity facing a continuous transformation process, which troubles the definition of the identity of a city in the first place.

Looking at ‘place-attachment’, Reese et al. (2019) find that the loss of social and physical place characteristics reduces place attachment, yet Von Wirth et al. (2016) find that place-attachment can actually increase despite significant transformations. This increase is however dependent on the perception that changes are attractive and environments remain familiar. This thus signals the need to pinpoint, and preserve, aspects of the built environment that represent local familiarity. Sepe (2014) also observes that a balanced mix of historical memory and technological innovation is attractive for many residents, where the creation of identity of the neighbourhood should be based on the place and its history. Importantly, Sepe states, urban transformations that are merely based on physical and material aspects – disregarding intangible culture – make the production of homogenous places easily prone to globalization. The latter refers to the negative feedback cycle addressed in the introduction.

De Broekert (2022) highlights the potential of preserving characteristics of a place in the form of industrial heritage. Seeing it as a catalyst effect ensuring urban revitalization as a result of its historical, architectural, and technological importance. Sepe (2014) states that local identities and distinctiveness can be fostered by arts and culture, and the more value is given to any local peculiarities (cultural heritage and place identity), the more the urban transformation can be embedded in the local fabric, rendering it more attractive for both residents and visitors. A recent case from the Netherlands taps into this understanding through localized material reuse which maintains the existing physical characteristics (Kirschstein, 2022). Kalaycı Önaç & Gönüllü Sütçüoğlu (2021) expand by noting that people who can still experience the historical and natural landscapes are more likely to build strong bonds with their neighbourhoods.

People

‘People’ has a very broad understanding and a definition can therefore not be given in the context of urban transformations. Yet, putting the individual central in the transformation process seems to be the common understanding from participants in both case studies. This especially relates to the possibilities for inclusion, but also to the personal motivation to be part of an urban neighbourhood

transformation. *People* in this context reflects the conditions met by any individual within an urban transformation process. People is therefore chosen to cover the common individual, and is loosely based on the work from Switalski et al. (forthcoming), where they define person as “one’s personal attitudes to place-making”. A potential better description could have been *urban commoners*.

Within *people* both enabling and hindering is the factor ‘inclusion’, which could be understood as integral part of ‘early participation and cooperation’ (*planning*). However, inclusion focuses specifically on what it means to include the commoner, not the fact that it is important to participate. Enabling would be to “[...] have an administration that is there to serve the citizens” and to “show people that something is being done.” The hindering part is exemplified by the participant statement: “somehow the (...) motivation is missing for the young people [...]” and participants believed that “people are too comfortable” to be involved, let alone know what they can get out of any involvement in the transformation process.

Kroh (2021) observes similar aspects, specifically in the enablers ‘attractive design of information events’, ‘being contactable by phone/mail at an established local contact point’, and hindering factors ‘low stakeholder responsiveness’, and ‘unsupportive stakeholder attitude’. Other examples of enablers are the ‘co-responsibility’ and ‘social participation’ after Mendizabal et al. (2018); ‘co-creation’, ‘communication and collaboration by local communities and future owners and users’ after Ernst et al. (2016); ‘lifestyle and consumption’ after McCormick et al. (2013); or ‘wealth’ and ‘lifestyle’ (Yang, 2010). The enabling and hindering factors of inclusion are therefore really two sides of the same coin. The hindrances found in lack of motivation, being too comfortable or not knowing “what one can get”, counter the enablers, which creates a difficult interdependency.

The discussion from the previous sections show that most of the enabling and hindering factors are reflected in the urban transformation literature. An exception is, however, the theme *mobility* comprised of the factors ‘aboveground parking’ and ‘alternative infrastructure’. This is an interesting outcome in itself, not only because transformative possibilities are currently hampered due to the spatial requirement of car-based infrastructure, but also because these factors are explicitly addressed as hindering the urban neighbourhood transformation by the participants themselves.

In answering the research question – “In what way can serious gaming be used to identify enabling and hindering factors of participatory urban neighbourhood transformations?” – the participatory place-making game has shown that, regardless of a small sample size, it is possible to identify enabling and hindering factors of urban neighbourhood transformation. This could warrant the potential use of the method in other case studies, especially because the results also comprise of case-specific factors that are left out of the analysis for the purposes of identifying general factors for this research.

Methods and the research process

The results should, however, not only be interpreted with respect to the literature, because they are a product of the methods used and the corresponding research process. In the following sections I will 1) reflect on the choice of methods and 2) on the research process.

Serious gaming

The goal of this thesis is to identify enabling and hindering factors of urban neighbourhood transformation processes within a participatory setting operationalized using serious gaming. These transformation processes are in general complex, first because they likely involve changes on the personal, political, and practical level (O'Brien & Sygna, 2013), and second because they most likely require systemic change, adding to the complexity even more (Meadows, 1999). In addition, urban neighbourhoods typically result out of complex interactions between multi-level stakeholders. These have to navigate trade-offs concerning space, time and money, next to internal and external pressures, views and competing interests. We believe this complexity can best be preserved in a participatory serious game.

The origin, however, starts with the idea of participatory co-constructing a serious game with stakeholders from Hochdorf, as part of the EU ERC GLOBESCAPE project (after Dr. Nicolas Salliou, personal communication, September 2021). This would ensure the modellers efforts to indeed preserve complexity as perceived by the stakeholders themselves, and would help a bottom-up problem definition (Salliou et al., 2021). Difficulties of involving stakeholders in this endeavour, however, led to the creation of a pure scientific place-making game as governing transformation concept. External input from key partners from Espace Suisse and development studies launched by the municipality were used to detail the content of the game. The game was aimed at giving rise to the procedures involved within urban neighbourhood transformations to allow their investigation. Having almost no direct input from stakeholders, designing the game around the, then preliminary, concept of place-making, and time-limitations of the project could therefore have limited the participatory aspect of the method.

Despite this background, the method still seems to be appropriate, in particular because of the following reasons. At first, it allowed players to explore transformation possibilities in, and across all spheres of transformation mimicking the multi-level complexity involved in transformation processes.

Second, serious-games provide the researcher with a platform where a combination of methods can be interconnected (fact finding, process orchestration, qualitative modelling, and semi-quantitative data collection) (Voinov et al., 2018).

Third, the game fostered realistic interactions and allows multi-stakeholders to have these interactions at a level playing field, with actors that they usually do not engage with (e.g. resident and public-sector representative). More importantly, these interactions are not heavily restricted to a pre-defined topic, other than the neighbourhood transformation in general, and give room to sometimes-irrational expressions of emotions likely hidden in other participatory methods.

Fourth, people do not need a lot of persuasion to join for a workshop. A simple email and follow-up by key partners brings participants to the table because people are interested into a novel method. Moreover, it does not come across as a heavy or dreadful workshop or plenary “town-hall meeting” because it is an engaging and fun activity, making it more appealing.

Finally yet probably most important, the consequence of bringing the “fun-factor” into these complex and serious issues allows stakeholders to explore alternative possibilities – subject to realistic feedback – loops, yet without having to endure the real-life consequences. The immersiveness of the experience was striking because even the presentation of refreshments did not seem to pull the participants out of their enthusiastic exploration of transformation possibilities – showing the researchers up-close how transformation processes are being navigated.

Scientific validity of the participatory place-making game

The games in this research have particular game dynamics and game elements, case-specific geographic as well as demographic background of participants. And a particular spatial coverage (neighbourhood) - the unit of analysis.

The dynamics in the game are simulated by the game-board, game-rounds, and the particularities of the case studies reflected in the projects, actions, events, players and their game-objectives. The scope of projects is limited, because players need to have the possibility to understand their variety as well as their effects on game-objectives or changes in the neighbourhood. Nonetheless, the projects were modelled after realistic possibilities. In Hochdorf this was based on interviews with key partners and municipal studies, in Sompasaari these were based on expert-workshops (see section *Adapting the game*), citizen input (Helsinki OmaStadi project⁹), and verification by local stakeholders. For Hochdorf, the projects were largely known by the players, yet in the case of Sompasaari they needed some additional guidance which was dealt with by creating categories to give the players some initial overview; the projects were classified according to economic, mobility, social, and environmental transformations. In all workshops, however, the players would have liked to know the project options beforehand, because they were overwhelmed by their amount at first. Player actions, external events, and player objectives are modelled after the researchers’ common sense, and calibrated to stimulate active discussions as well as keeping a playful atmosphere. This could thus be better represented by e.g., prior surveys. Finally, the complexity of the interactions between game-board, game-elements, game-dynamics, and game-play make it difficult to measure precise and accurate for example causality or specific variables. Next iterations, therefore, could adopt a more refined simulation to create a more “controlled” environment. Examples could be the incorporation of hedonic house pricing models (personal communication Prof. Dr. Kay Axhausen, December 2021), or discrete choice experiments (personal communication Prof. Dr. Bodo Steiner, December 2021).

The selection of case studies was not particularly based on geographic or demographic background, yet on the potential to study enabling and hindering processes. Hochdorf is selected because of an intrinsic long-standing desire of some of the participants involved to transform the area. The amount of resources already invested, unsuccessfully, led the actors to reach out to other means. This resulted

⁹ The Helsinki OmaStadi project allocated 8.8 million euros to realising citizen wishes. See more at <https://omastadi.hel.fi/?locale=en>. Latest access Juli 21st 2022.

in a good case to study the hindering factors of this particular transformation. The neighbourhood in Helsinki is selected after consultation with the core-team of experts involved in the adaptation process. The area in which the Sompasaari neighbourhood is situated (Kalasatama), is supposed to reflect state-of-the-art planning practice, being in the final stages of its development. Although there was no primary interest from the participants themselves, the academic interest was there because of the neighbourhoods' state-of-the-art condition. Having the possibility to study an area where the development is stuck versus one where the development is rapid and ongoing is interesting in terms of what hinders (Hochdorf) and what enables (Sompasaari) urban neighbourhood transformations. Cultural differences were also perceived, for example because in Sompasaari the discussion was much more structured and formal, whereas in Hochdorf the atmosphere was more amicable.

The spatial extent of both case studies covered the size of a neighbourhood. For both cases, this scale seemed to induce familiarity, and especially the residents could recognize their day-to-day reality in the game. The simulated area for Hochdorf was a factor five smaller than Sompasaari. Because we are interested in the general urban neighbourhood transformation however, the size of the area is deemed less important to understand specific trade-offs. In particular, because the game-elements and game-dynamics could remain the same and only the contents of elements would change (e.g. the amount of apartments and thus a potential perception of more or less people being subject to particular changes in the neighbourhood). Most important is to choose the area such that all players can position themselves well within, identify themselves with, and at best know peculiarities from the selected area to enhance the interactions. Because the place-specific expertise is hard to measure, however, it is likely that representation issues arise (Figure 11).

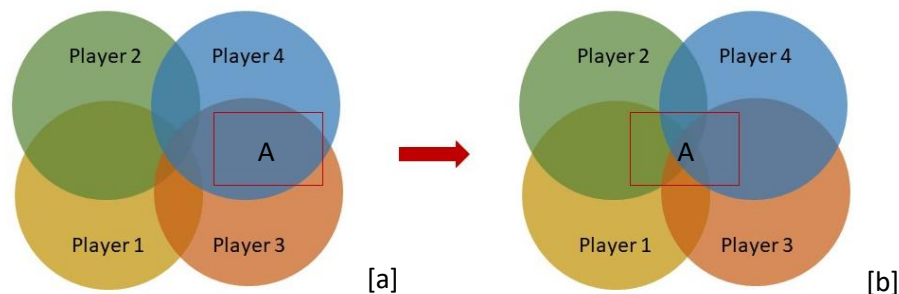


Figure 11. Each sphere represents the place-specific expertise from the participants. Selection of spatial extent (A) should ideally cover the overlapping understanding of all players (b). Failing to achieve this could result in representation issues (a). Concept based on discussion with Dr. Nicolas Salliou.

Related to the spatial extent is the demographic coverage of the players involved. There are issues of bias that could arise because of the following. First, the municipality (one of the participants) selected the players for the Hochdorf game, which could result in a skewed representation of representative participants and topics discussed. In Sompasaari on the contrary, participants were selected by the researchers to avoid this potential bias. Yet, the cultural background (Western) and income level (mid to high) could result in topical representation bias. Second, it is likely that the participants are active stakeholders in general, which fails to vocalize silent voices from the community. And, personal preferences or attitudes towards speaking in plenum versus holding back can also skew the results (hence the follow-up interview). Third, the professional background of participants heavily influences the topics that they bring to the table or the direction of transformation pursued.

In addition, in the second Hochdorf workshop a municipality member assumed the role of the cultural centre, thus effectively role-playing. Related is that players sometimes perceived difficulties with maintaining their given role in the game, because it was difficult to conform to either personal, professional, or game-induced objectives. However, players “kept falling back into reality” (Landowner, follow-up interview, Hochdorf session 2), which adds to the effectiveness argument of the game. Last, the participant roles selected for the game are supposed to reflect the most important stakeholders from the area. However, a representative from the private sector failed in both cases, which was repeatedly addressed to be an issue by the participants themselves. For Hochdorf, these multiple private landowners were perceived as blocking factors in the real-life development of the neighbourhood, and therefore not invited to the game sessions by the municipality. For Sompasaari, the most important private actors would be the developers, which have not responded to any of the invitations or inquiries concerning the development nor participation in the game session. The issue of single vs multiple landowners could be worth a study in itself, because in the case of Helsinki (the city being the largest landowner), a single landowner could make the transformation likely more easy as compared to the case in Hochdorf where there are multiple landowners (after Dr. Markus Nollert, personal communication, April 2022).

From the discussion above, it is clear that differences between both case studies are manifold, and it is difficult to control for differences in geographic, demographic, game-interactions, etc. However, keeping the game-elements and game-dynamics as equal as possible at least ensure that the best possible experimental conditions are met to be able to compare both cases. A word of caution here is that results are by large point-specific (specific to either of the case studies) and overlap between the case studies, due to a small sample size (17 participants), cannot be extrapolated to general understanding. Moreover, they also reflect time-specific understanding of factors that enable or hinder transformation. Although the games are rather simplistic in light of the foregoing discussion, they do evoke rich discussions, and argumentation is supported by using the game to detail particular themes in the transformation. And, they allow the researcher to get an in-depth insight into the procedures that enable or hinder transformations.

Scientific validity of the data-collection

The methods are prone to interpretation issues and the scope of data collection is large. This section reflects on the data-collection methods and inherent differences resulting from transferring the method to another team.

In general, the data-collection methods include observations, questionnaires, voting-cards, in plenum-semi-structured (warm debriefing) and individual structured interviews (cold debriefing) are meant to help paint a picture of respectively the visions of the players involved, their attitudes towards particular transformations, context to their decisions within the transformation procedures, as well as in-depth questioning of personal attitudes and motivations. The validity of these methods can be discussed in view of what they were intended to measure. The intend to identify enabling and hindering factors could be troubled by differences in perceptions of theory, the practice of observing by the observers, perceptions of participants when asked a certain question, the question design itself, let alone any personal reasons that can influence the data.

The multitude of data makes the method complex, but simultaneously presents rich potential for analysis. It is now for example possible to triangulate data between the game and interviews, between interviews and observations, and between observations and participant attitudes. Despite the potential for triangulation, the method can be further optimized to keep, extend, or let go parts that are unnecessary. For example, the written verbal and non-verbal observations are not considered, because the analysis was deemed more rigorous if it was based on interview transcriptions.

Questionnaires were based on open-questioning and restricted by time. The time-restriction could fail to achieve more elaborate answers, yet the point of this time-restriction was to extract the primary thoughts from the participants. The answers to these were very valuable in the individual follow-up interviews (cold debriefing) to inquire about specific topics or extract more context to a particular thematic. However, the questionnaires could have resulted in framing the transformation in the game according to the place-making concept whilst anchoring thinking about enabling and hindering factors. Because the primary aim of the game is to identify these enabling and hindering factors, however, this is not seen as an issue.

Voting-cards were easy to implement, did not disturb the flow of the game, and served as heuristic device to measure individual attitudes towards the transformation. This allowed to re-assess particular game situations with respect to realistic situations during the cold debriefing. Besides using them as simple heuristic, they cannot be used for statistical analysis. In particular because of the small sample size, players not filling them out entirely, and the transformation in the Sompassaari game taking shape over three rounds instead of four in Hochdorf. The choice of the 5-point Likert scale running from -2 (very dissatisfied) to 2 (very satisfied) is arbitrary, but includes a neutral option to give players a “don’t know” possibility, next to remaining neutral. The two levels beyond (e.g., satisfied, very satisfied) require the participants to put some more thought into their vote than just being “positive” or “negative” about the transformation, yet avoids making the voting too time-consuming which could be the case in a 7-point Likert scale. Voting on the projects, actions, and events seemed most relevant because they correspond to the transformation in the game. The voting on their general attitude tracks the progression of overall satisfaction and could be used as “factual” or “control” measure of their voting efforts. Last, a potential anchoring effect could arise because voting on the different topics was done on one sheet of paper. A prior choice could thus influence the remaining answers.

The *warm debriefing* (in-plenum semi-structured interviews) forms the main data-material for this research. Apart from having to kick-start the discussion with the initial question on everyone’s impression of the game, the discussion flowed naturally and did not need additional motivation from the facilitator. The players even addressed issues of transformation without the researchers specifically asking about it. The guiding questions (see Supplementary Information C.1 Workshop protocol) helped to elaborate on particular topics or to bridge to other themes concerning place-making.

The semi-structured nature of this discussion brings about inherent differences between all four workshops. Not all questions were addressed, because the facilitation perceived questions to be discussed already, time-restriction resulted in foregoing particular questions, and the manner of pooling questions, or asking follow-up questions steer the discussion differently in each workshop. In general, the questions asked by the researchers were received with enthusiasm, because the players

were eager to highlight the problematic, or address potential solutions of the transformation. Especially in the case of Hochdorf it felt as if the discussions could continue until long after the scheduled three hours. In the case of Sompassaari, participants were less formal in following the planned schedule, and left for example half an hour into the discussion, without prior notification.

The *cold debriefing* (follow-up structured interviews) were used primarily to follow-up on individual attitudes from each participant. These interviews flowed naturally, and were only minimally troubled by technical issues (with Zoom or Microsoft Teams). Inherent differences in the depth of the interviews arose depending on the participants' available time. Some had more time and were happy to talk for more than one hour. The interviews made it possible to enrich the already collected data, to validate the method and concepts used, and to expand on any additional thoughts that were not addressed during the game.

Transferring the method

A team of Finnish researchers moderated the workshops in Helsinki. This made it possible to host the workshops in Finnish, just like in Hochdorf where the game sessions were held in Swiss-German. For both cases it is believed that it indeed aided the interactions between the players. The gaming-protocol (see Supplementary Information C.1 Workshop protocol) ensures that the game sessions were as equal as possible in view of reproducibility.

However, a different team means different approaches and objectives. This altered the game-play, where for example the introduction was much more elaborate, the timing and schedule was handled more flexible, and the moderation of the warm debriefing was different than in Hochdorf. Facilitation during the workshops thus introduces inherent differences. This is first related to the introduction into the thematic after the EU ERC GLOBESCAPE project, but also to interfering during the game and discussions. During the game the facilitator ensures a lively and interactive atmosphere, but should be careful not to steer the transformation in a particular direction or express any value-judgements. Subjective interferences can bias the decisions made in the game as well as the discussions afterwards. For example in the Hochdorf workshops, I have expressed that a particular action was "good", which could have influenced the perception of the participants. I was made attentive of this issue by the observers and kept clear of such expressions thereafter. In Helsinki, the facilitator interfered by stating, "You didn't discuss at all the use of the roof space of the buildings you owned". This is a clear example of how a discussion is steered in a particular direction. Despite having a protocol where the role of the facilitator is clearly laid out, it is thus still difficult to keep entirely clear of any subjective interferences.

Through consultation with the principal researcher and the EU ERC GLOBESCAPE team it was agreed that objectives from the Finnish team could be interweaved into the methods. This ought to be done in a way to not disturb the flow or ordering of questions as they were used in the Hochdorf case. The material collected, however, shows that the focus departs from enabling and hindering factors and place-making, and frames questions to focus on sustainability dimensions instead.

The transferability of the method is guaranteed by the protocol, yet its interpretation and differing research objectives have induced differences in the collected data. Yet, despite these differences, the

approach has shown that it is in general possible to transfer the game to a different team, even in a different language and culture distant from the original one.

Data collection and preparation

For Sompasaari, we made the decision to drop the verbal observations in view of the required resources. The back-up recording then became the primary data-device, from which the warm debriefing could be transcribed as input for the analysis. A Finnish master student involved in the project was hired to do the transcriptions and translations for Sompasaari. In the case of Hochdorf, a project-independent Swiss bachelor student created the transcripts. *DeepL* was used to translate the transcriptions into English, and were checked on correctness by the Finnish student and the principal researcher who is in good command of the German language. The Swiss-German case rendered good translations with some exceptions, yet in the Finnish case they were difficult to understand, even by the Finnish coder. For both cases, it helped to have the transcripts in original language along-side the coding of the translated material.

Potential consequences of this procedure are two-fold. First, using voice-to-text software loses the original value of the spoken language, because it becomes difficult to understand for example intonations or emotions, and even software interprets. Second, the translations could result in the loss of e.g., sayings, or specificities that cannot be captured because languages differ. However, hosting the workshops in the native language was meant to make people feel comfortable during the workshop, and general understanding of topics is not lost. We therefore argue we can use software to do the time-consuming parts for us and use human transcriptions only where needed, e.g., when discussions are very lively.

Scientific validity of the data analysis

In this section I will reflect on the strategy followed to perform the qualitative data analysis, starting with a discussion on the choice of coding method. I will then continue with a reflection of the iterative coding process, the use of ICR as measure of agreeance, and the involvement of two project-independent coders in a first coding cycle, and only the principal researcher in the subsequent rounds of coding. Last, I will comment on the choice of software that was used to support the coding.

Coding method

Because we are dealing with translated data, it could have been better to code in the original language to remain close to the exact phrasing used by the participants. Yet, the coding approach involved three coders of different nationalities that required the use of a common language.

Concerning the choice of the method itself, I have opted for ‘Structural Coding’ in the first cycle of coding, and used a self-defined method to analyse the material in subsequent coding rounds. A potential flaw of the former could be that its use is originally intended for larger segments of text to make a first classification of the data. However, from all first-cycle coding methods described by Saldaña in his 2021 “The Coding Manual for Qualitative Researchers”, ‘Structural Coding’ is found to be the best fit for this research.

In the latter case (the subsequent coding rounds), the analysis could be flawed by not following an explicit coding method for the subsequent coding cycles. In spite of that, Michael Quin Patton (in Saldaña, 2021) states that “because each qualitative study is unique, the analytical approach used will be unique”. Saldaña confirms by saying that there is no “best-way” to code qualitative data.

Alternative methods for the subsequent coding rounds however, could have been a *Grounded Theory* approach, after for example Corbin & Strauss (Corbin & Strauss, 2014). This would have allowed for an inductive, bottom-up assessment of the themes that emerge from the discussions between the participants, without being limited by the deductive approach based on existing conceptual frameworks and initial inquiries. Yet, involving two other coders and having a clear direction for the inquiry (identifying enabling and hindering factors) fits a deductive oriented approach. I have refrained from mixing coding methods even though there are elements from different methods that would fit. I wanted to ensure that the approach remained structured and based on proven methods at least in the first coding cycle. Moreover, Saldaña (2021) argues that although integration of multiple methods is possible, analytical validity generally reduces upon mixing more methods.

Iterative code-book development

A number of iterations took place before a final code-book (see Supplementary Information E.1 *Code-book*) could be determined. The code-book was first iterated within the EU ERC GLOBESCAPE project-team and based on codes that reflected the conceptual frameworks after O'Brien & Sygna (2013), and Switalski et al. (forthcoming). After reaching a point of marginal returns, and not knowing which codes were best to use, I have started the iterative coding process to “learn-by-doing” (after Michal Switalski). To keep the inquiry relatively open, however, I chose to remain with the codes ‘drivers’ and ‘barriers’.

Based on an initial set of codes and coding-rules, we have refined the coding protocol until the codes, descriptions, rules, and coding of data itself funnelled into a common understanding between all three coders. This took about seven iterations, where we tested the agreement between the coders based on an ‘Inter Coder Reliability’ (ICR) scoring. This process greatly helped to reduce the complexity, reflected in changing the initial codes ‘Drivers’ and ‘Barriers’ to ‘Needed’ and ‘Prevents’, as surrogates for respectively enabling and hindering factors. The latter understanding made it easier to capture “any type of change”, to then further analyse in subsequent coding rounds. However, the subjective twist of coding quotations were “something, someone, or a specific intervention helps/prevents reaching a *better* neighbourhood”, could have been avoided, because it requires the coders to interpret if the change is good or not. Last, the names of the codes and examples given could frame the way of looking at the material, which could have been avoided if more concrete sample quotations from the data were used as examples, or a grounded-theory approach was followed.

ICR-scoring

Coding for the ‘Three Spheres of Transformation’ (Cu-Alpha = 0.426) for example has shown to be more difficult than coding ‘Place-making’ (Krippendorf Cu-Alpha = 0.487 or ‘Mechanisms’ (Cu-Alpha = 0.850) This exemplifies the difficulty of arriving at a high or at least satisfactory ICR-score (typically

~0.667 (Friese, 2020)). Reasons for a low ICR-scoring could in large be the result of differences when selecting segments of text to code. The principal researcher, therefore, pre-coded segments of text, and potential bias was balanced by first having the coders code freely for the 'Additional' category. As O'Connor & Joffe (2020) state, "it is of minimal analytical significance to have all coders agree on where to start and end an quotation. It is more important that when given a particular segment of text, similar codes are applied."

We used the ICR score as a measure to ensure "systematicity, communicability, and transparency of the coding process; promoting reflexivity and dialogue within research teams; and helping convince diverse audiences of the trustworthiness of the analysis" (O'Connor & Joffe, 2020). A possible alternative would have been to use consensus coding, an approach where all coders code the material separately and meet afterwards to discuss the differences. This was deemed too laborious in view of the thesis time-constrictions.

Coding protocol

To ensure reproducibility, a specific set of steps and rules were followed (see Supplementary Information E.2 Coding protocol – first coding cycle). Nonetheless, the problem remains that the interpretation and application of codes is difficult. This is not only because of limited understanding of the concepts from the code-book, nor literature, but also the different backgrounds of the coders comes in play when trying to convey meaning out of unstructured data. Moreover, coding concepts seems to be fluid because the precise understanding or meaning of the different categories morphs throughout the coding process. Therefore, it is deemed very important to give reasons for each and every coding decision, and to interpret the text around the selected quotations. Following this approach gave us at least some degree of systematicity, because all coders need to independently agree on the meaning of a piece of text.

First coding cycle

Here, I will present a collection of thoughts that arose during the discussions with the two independent coders in the first coding cycle. The selection of a quotation can change the meaning of the text, and under what category it should be coded. A potential anchoring effect still comes in play even when coding one concept after the other, especially because the concepts are hypothesized to overlap. In addition, the anchoring effect is also felt when coding all the material separately, because the codes become "second nature", and so the lens with which the data is approached becomes stronger and stronger rooted as a combination of all the categories. This might lead to a systemic bias. Further, it is difficult to maintain the same focus at all times. External influences of sleep, surrounding, mood, getting more into the coding, seeing codes more clearly or seeing the boundaries more fuzzy, all influence the coding decisions. Here an *intra*-coder reliability tests could have been used to give some measure of reproducibility. Further, the varying data-quality is sometimes difficult to deal with, because it requires different degrees of interpretation, reducing reproducibility. We attempted to counter this by coding conservative, i.e. "if unsure – do not code!" (see Supplementary Information E.2 Coding protocol – first coding cycle). Last, one feels drawn to code every quotation. On the one hand, this could be a flaw of the coding protocol, that at least one of the codes from each categories fits the quotations. On the other, the quotations are pre-selected based on the inquiries of

this research, and the game itself also provokes discussions that revolve around the concepts that we are looking for.

Subsequent coding cycles

Other than the methods for second coding cycles suggest, I employ a self-defined subsequent round of coding to further scrutinize the meaning of the data. Lacking of a particular method to analyse the data-corpus in these subsequent coding rounds could be the largest drawback, although the applied method is transparent and systematic (see section Coding the data). A potential established method could have been 'Themeing the data' choosing either 'categorically' or 'phenomenologically' after Saldaña (2021).

The use of software

We have used Atlas.ti to do the coding in the first coding cycle because of the expertise from one of the coders. One mayor drawback of Atlas.ti was that the 'Fokus Group Coding' option did not allow for automated coding of the selected participant quotes. The link was attempted through the reference numbers (corresponding to the line-numbers in the transcripts), yet this process took longer than assigning the player codes to each quotation manually. This has led me to start using Rstudio, after which I discovered its qualitative data analytical possibilities (Estrada, 2017)¹⁰. Here, the potential would arise to dive more into 'Natural Language Processing' (NLP) which reduces the coder bias. However, the classification of codes from the different concepts cannot be done by a NLP approach, because it requires human interpretation to apply a particular code to a selected chunk of text. The NLP approach could however be used in a second round of coding to extract themes that pop-up out of the data. The interpretation of these themes (and their content) need however still be done by the researcher.

Future research vectors

Based on the foregoing discussion, I see a number of possibilities for future research that can either extend, or improve the work done for this thesis. Not all factors are addressed in the literature, exemplified by the theme *mobility* including the enabling and hindering factors 'aboveground parking' and 'alternative infrastructure' which could warrant dedicated research. Further, future research could include finalizing the assignment of quotations to the remainder of themes besides 'planning' (finalizing the third coding round) or further detailing the serious-gaming method for urban transformation research (methodological research). Conceptually, assessing the potential overlap between the 'three spheres of transformation' (O'Brien, 2018) and 'place-making' (Switalski, Marcelo, et al., forthcoming) frameworks could help build more general understanding of urban transformation processes (conceptual research). Related is investigating the effectiveness of the perceived factors, for example based on the leverage points framework from Meadows. This would also entail determining

¹⁰ Approaches to Qualitative Data Analysis in R, see for example: <https://datascienceplus.com/qualitative-research-in-r/>, or <https://www.red-gate.com/simple-talk/databases/sql-server/bi-sql-server/text-mining-and-sentiment-analysis-with-r/>. Latest access Juli 19th 2022.

a sufficient versus necessary condition for each of the factors (after Prof. Dr. David Kaufmann). Another possibility includes mapping the factors and their perceived effectiveness onto a 'hierarchy of policy design' policy framework, e.g. after Howlett & Cashore (2014) or Sewerin (2020) (policy oriented research).

Finalizing the third coding round

This would result in similar results as for the theme 'planning' (Table 3), and follows the steps as outlined in the third coding round. There is potential that a reshuffling of themes then occurs, because the manual assignment of themes after the automated assignment would result in a final set of themes and assigned participant quotations.

Methodological research

The sheer amount of data collected for both games could be used to determine the effectiveness of the methodology – serious gaming and qualitative data analysis. For example, comparisons can be made between analyses of written observations and transcripts, between warm debriefing and cold debriefing, and between the discussions during the game versus those in the warm debriefing. Further, the choice of data collection methods can be re-assessed. For example, the Likert-scale voting is supposed to measure the participant attitudes towards the transformation. However, certainty about which attitude is actually measured cannot be given. This would require first the definition of a specific attitude variable (Thurstone, 1949). Concerning the qualitative data-analysis, one could assess whether the coding method was the most appropriate method for the type of data gathered, and if differences arise when instead of a deductive coding method an inductive coding method such as in *grounded theory* results in a different story altogether.

Conceptual and policy oriented research

Addressing the potential overlap between the concepts 'place-making', 'three spheres of transformation', in combination with the enabling and hindering factors identified in this thesis could help build understanding "the how" of urban transformation. By linking the factors to place-making, and to general transformation frameworks could help assess where potential for intervention could arise (Figure 12). This linkage can readily be extracted from the data-set resulting from the first coding cycle in which we coded for both concepts alongside the enabling and hindering factors.

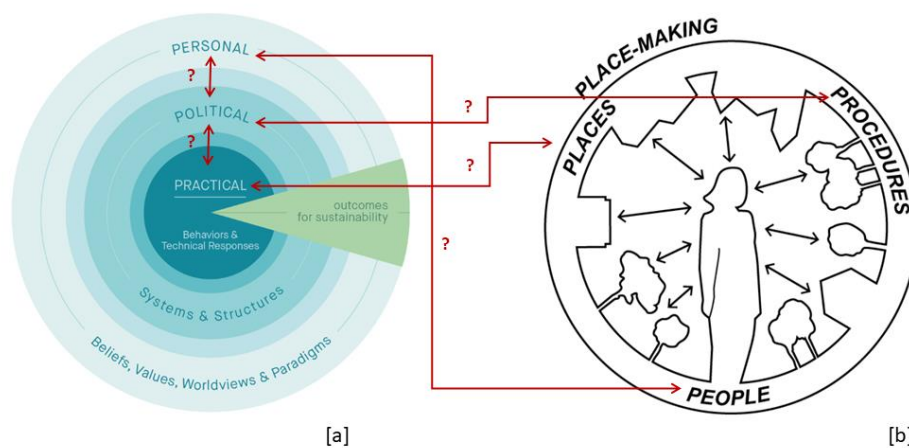


Figure 12. Mapping related concepts to assess 'the how' of urban transformation. With a) the three spheres of transformation after O'Brien & Sygna (2013), and b) the place-making concept after Switalski et al. (forthcoming). Adapted from O'Brien & Sygna (2013) and Switalski et al. (forthcoming).

Related to this is the perceived effectiveness of enabling and hindering factors. When we understand the themes found in this research as the 'leverage points' of the urban neighbourhood system – place to intervene in the urban system. Then we could see the factors within these themes – the levers – as the specific “actions and interventions promoting transformative change” (Chan et al., 2020). It then becomes evident that some similarities arise. In mapping the results onto the leverage point framework from Meadows, a preliminary assessment can then be made (Table 5). Table 5 shows, that the results obtained address various leverage points, even within one enabling or hindering factor. For example, the enabling factor *Inclusion* might as well be connected to *Early participation & Cooperation*, because both incorporate the understanding of leverage point 4. *The power to add, change, evolve, or self-organize system structure* and 6. *The structure of information flows*. The link between *Identity* (enabling factors *Character* and *Place-attachment*) and the leverage points by Meadows does not exist directly, yet could tap into 3. *The goals of the system* and 4. *The power to add, change, evolve, or self-organize system structure*. Fostering identity could be a goal of the urban system in itself, which includes any of the underlying leverage points such as the fourth, because this requires the urban neighbourhood to step away from the top-down planning all-together. In sum, the enabling and hindering factors show at least a weak link to the leverage points coined by Meadows. These leverage points could therefore serve a heuristic assessment of effectiveness of the enabling and hindering factors. The perceived factors indicate in general mid-level effectiveness to transform an urban neighbourhood.

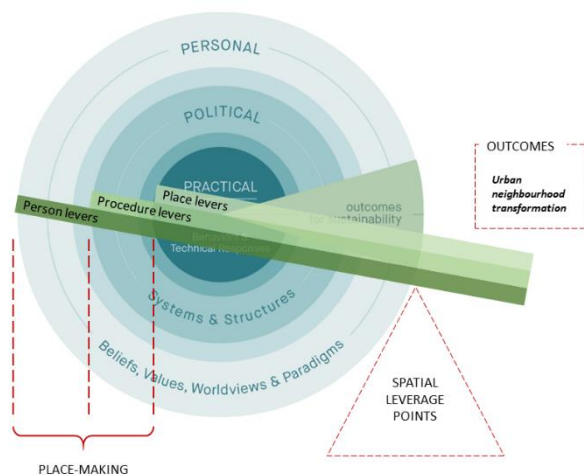


Figure 13. Mapping of all related concept. The effectiveness and potential pathway of the urban transformation can be assessed based on the enabling and hindering factors, the three spheres of transformation, and the leverage point framework. The operationalization of these factors could then result from the classification according to the place-making framework as the levers of for transformative change. Adaptation based on the three spheres of transformation, reprinted from O'Brien & Sygna (2013) and based on Chan et al. (2020), Switalski et al. (forthcoming)

A detailed analysis (and verification), however, is beyond the scope of this discussion, yet could be part of future research. Combining all frameworks – three spheres of transformation (O'Brien & Sygna, 2013), place-making (Switalski, Marcelo, et al., forthcoming), leverage points (Meadows, 1999), and levers (Chan et al., 2020; Koskimäki, 2021) could conceptually be combined as shown in Figure 13. Moreover, Seto et al. (2016) describe three main types of carbon lock-in including the scale, magnitude, and longevity of the effects, and policy implications. The types of lock-in include 'infrastructure and technological', 'institutional', and 'behavioural', which resonates with the understanding from 'the three spheres of transformation' after (O'Brien & Sygna, 2013). Policy implications could therefore be drawn up on the basis of

the interrelation of all these concepts, and linked to, for example, a 'hierarchy of policy design' policy framework after Howlett & Cashore (2014) or Sewerin (2020) (Figure 14).

Table 2.1 A modified taxonomy of policy components following Hall (1989, 1993)

	High-level abstraction	Programme-level operationalization	Specific on-the-ground measures
Policy ends or aims	Goals What general types of ideas govern policy development? (e.g. environmental protection, economic development)	Objectives What does policy formally aim to address? (e.g. saving wilderness or species habitat, increasing harvesting levels to create processing jobs)	Settings What are the specific on-the-ground requirements of policy? (e.g. considerations about the optimal size of designated stream-bed riparian zones, or sustainable levels of harvesting)
Policy focus	Instrument logic What general norms guide implementation preferences? (e.g. preferences for the use of coercive instruments, or moral suasion)	Mechanisms What specific types of instruments are utilized? (e.g. the use of different tools such as tax incentives, or public enterprises)	Calibrations What are the specific ways in which the instrument is used? (e.g. designations of higher levels of subsidies, the use of mandatory vs. voluntary regulatory guidelines or standards)

Note: Cells contain examples of each measure.
 Source: Modified from Cashore and Howlett (2007).

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Figure 14. Mapping the three spheres onto a policy framework. By classifying the enabling and hindering factors according to the three spheres of transformation, and mapping them onto a policy framework could help start design specific policies for urban transformations integrating the different levels of effectiveness. No single factor can be seen as the 'golden nugget' for urban transformation, yet it is likely the interplay with other factors that could help build effective transformation policies. The figure is an adaptation of the taxonomy of policy components, reprinted from Howlett & Cashore (2014), and the three spheres of transformation, reprinted from O'Brien & Sygna (2013).

Additionally, specifically assessing the sustainability dimensions of the urban transformation could help give political backing to potential pathways. The projects within the game are already classified according to economic, environmental, and social dimensions (triple bottom line of sustainability), which could feed into a specific assessment, for example after Binder (2020b).

Table 5. Perceived effectiveness of enabling and hindering factors. Mapping the factors onto the leverage point framework from Meadows allows for a preliminary assessment of potential effectiveness of these factors. Where I coin the factors to be the levers, and the themes to be the leverage points.

	“Leverage point”	“Lever”	Leverage point Meadows (12 – 1 -> low – high effectiveness)	Effectiveness based on Meadows (low, mid, high)
Enabling	Planning	Early participation & Cooperation	6. The structure of information flows 4. The power to add, change, evolve, or self-organize system structure	Mid-High , if diversity of actors, variability in approaches and experimentation is ensured, and the structure of the system, i.e. who has the power to make the changes, also changes. Self-organization is essential to survive any change, because it has the power to evolve and develop new responses based on a highly variable stock of information to select and test new patterns. This in turn requires appropriate information flows and accessibility by all actors.
		Anticipation & agility		
		Bridging Visions		
	Mobility	Above ground Parking	10. The structure of material stocks and flows and nodes of intersection 5. The rules of the system	Mid , if initially designed for pedestrian zones, bike infrastructure, or public transport. Low , if infrastructure already exists, and building zone regulations require road-access and residential parking.
		Alternative Infrastructure		
	Spatial	Meeting places	10. The structure of material stocks and flows and nodes of intersection 5. The rules of the system	Mid , if initially designed to incorporate meeting places around for example (historic) landmarks, and open-structure allows accessibility from multiple directions, and the possibility to create spaces oneself. Low , if meeting places and open structures are non-existent and building zone regulations prevent these places.
Open structures				
Liveliness	Trilogy of services	7. The gain around driving positive feedback loops	Mid , the more services there are, the more life will come into a place, the more services could sustain themselves.	
Policy	Resources	12. Constants, parameters, numbers	Low , the amount of resources available is set, the allocation determines how much is available where, but it does not address the system characteristics.	

Hindering	Identity	Place-attachment	NA	NA
		Character	NA	NA
	People	Inclusion	6. The structure of information flows 4. The power to add, change, evolve, or self-organize system structure	Mid , if people are confronted with feedback directly, it incentivizes motivation to intervene. High , if inclusion means self-organization.
	Planning	Resources & Competing Interests	12. Constants, parameters, numbers	<i>See fifth cell</i>
		Changing Needs	4. The power to add, change, evolve, or self-organize system structure	<i>See first cell</i>
	Spatial	Open structures	10. The structure of material stocks and flows and nodes of intersection 5. The rules of the system	<i>See third cell</i>
	Liveliness	Trilogy of services	7. The gain around driving positive feedback loops	<i>See fourth cell</i>
Policy	Resources	12. Constants, parameters, numbers	<i>See sixth cell</i>	
People	Inclusion	6. The structure of information flows	<i>See ninth cell</i>	

Conclusion

The research conducted for this thesis helped to develop a serious place-making game that was successfully hosted in workshops within both case studies of Hochdorf and Helsinki. In these workshops, the neighbourhoods around the Braui-Areal (Hochdorf), and Sompasaari (Helsinki) were “transformed” by participants that included representative stakeholders for the public and private sector, as well as local experts and citizens. A large body of qualitative and quantitative data was collected. The identification of enabling and hindering factors of urban neighbourhood transformation arises from the qualitative data analysis of the warm debriefing. Specifically, three coding-cycles – where the first involved two project-independent qualitative coders – resulted first in the extraction of a number of initial themes connected to the urban transformation those being ‘planning’, ‘mobility’, ‘identity’, and ‘spatial’. Second, the themes were extended by an automated language processing approach resulting in the additional themes ‘policy’, ‘liveliness’, and ‘people’. Within the last coding round, a thematic analysis resulted in the identification of enabling and hindering factors within these themes. These are the factors that enable or hinder an urban neighbourhood transformation as perceived by the participants themselves. For ‘planning’, these are ‘early participation and cooperation’, ‘anticipation and agility’, and ‘bridging visions’ (enabling), and ‘resources and competing interests’ and ‘changing needs’ (hindering). For ‘mobility’ these are ‘aboveground parking’ and ‘alternative infrastructure’ (simultaneous enabling and hindering). Under the theme ‘spatial’, the factors are ‘meeting places’ (enabling) and ‘open structures’ (enabling and hindering). For ‘liveliness’ these are ‘trilogy of services’ (enabling). Within the theme ‘policy’, the factor ‘resources’ seems to hamper and support urban transformation (enabling and hindering). The theme ‘identity’ harbours both factors ‘place-attachment’ and ‘characteristics’ (both enabling). Under the last theme ‘people’, the factor ‘inclusion’ emerges (both enabling and hindering).

The emerging factors from this research seem to resonate well with existing research that either focuses explicitly on factors of urban transformation, or on urban transformation in general. Interestingly, however, is that the enabling and hindering factors ‘aboveground parking’ and ‘alternative infrastructure’ are not directly reflected in the existing research. Despite these factors likely arising as a result of the neighbourhood simulation, they seem to echo a sincere real-life problematic within both urban neighbourhoods. This could warrant the need for more research on this topic.

In sum, the serious place-making game could be seen as an effective participatory method to extract enabling and hindering factors of urban neighbourhood transformation. The game lets representative stakeholders explore possible transformation pathways, and the warm debriefing directly after allows us to relate this transformation to real-life issues. Even though the method is resource intensive, the sample size is small, participants are motivated to participate, have fun playing, and a constructive and highly interactive discussion are fostered by the game.

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Supplementary information

A Globescape project folder

A.1 Additional game-development information

This thesis is part of the larger EU ERC GLOBESCAPE project. As such, there is information that is not part of this thesis, yet was crucial in the development of both games. This information can be found in the project folder EU_ERC_GLOBESCAPE > 13 Game Development. More guidance to be requested with the author.

Material includes:

1. Adaptation process, kick-off and confirmation workshops;
 - a. Invitation mail
 - b. Time-plan and actors involved
 - c. Protocols
 - d. Surveys and response

2. Gaming workshops Hochdorf and Helsinki
 - a. Invitation mail
 - b. Time-plan and actors involved
 - c. Data (recording, transcripts, handwritten material)
 - d. Pictures

B Participatory place-making game

B.1 Elements and dynamics

Table 6. Generic game- components and dynamics. The game components give structure to the game, the dynamics are governed by the interaction between the content of these components and players.

	Type	Specifics	Theory
GAME ELEMENTS	Tabletop game-board	Shape; grid size; tiles	Place-making: place
	Attributes	Point-indicator scale; hour-glass; turn-of-the-game indicator	Place-making: procedure
	Tokens	Houses; businesses; parking space; private space; green space; landmarks	Place-making : person, place, procedure
	Project-blocks	Collective transformation possibilities	Place-making : person, place, procedure
	Actions	Individual transformation possibilities	Place-making : person, place, procedure
	Event-cards	External transformation	Place-making : person, place, procedure
	Players & player-objectives	Four urban-district stakeholders; assumed professional objective	Place-making : person, procedure
	Player scoring sheet	Tracking income per turn; overview of actions, player-objective	NA
	Money	NA	Place-making : person, procedure
GAME DYNAMICS	Trade-offs	Costs & benefits, space, negotiation, external events	Place-making : person, place, procedure
	Project	Costs & benefit, size, effect, collective or individual	Place-making : person, place, procedure
	Action	Cost & benefits, effect, individual	Place-making : person, place, procedure
	Event	Cost & benefit on game situation, external	Place-making : person, place, procedure
	Player objective	Assumed professional attitude, individual	Place-making : person, procedure
	Scoring indicator	Neighbourhood appeal; public approval	Place-making : person, place, procedure
	Timed negotiation	10 min. for negotiation, financing, and project	Place-making : procedure
	Game-rounds	Guided stages and timed negotiation	Place-making : procedure
	Power-dynamics	Proximity and sight of both project-blocks and game-board; position of players around the table; differentiated ownership and income levels	Place-making : person, procedure
	Facilitator	Time and rule-keeping, stimulating play-full atmosphere, moderating	NA

SOMPASAARI GAME

Overall description of the game

The board is a simplified representation of the Sompasaari Neighbourhood in Helsinki. There is no winning condition, the game is open-ended. **The game message should be clear after three to four rounds. There is little need to go over 5 turns.**

Game set-up

The initial set-up of the board is according to the picture. Each cell represents roughly 50 x 50 meters.

Parking space is maxed-out at the start of the game. Each parking token represents 10 parking spaces. In the north, the second lot from the left holds 20 (2 tokens) parking spaces, the second from the right 30 (3 tokens).

Neighbourhood introduction

Sompasaari is an old harbour transformed into residential area. It is surrounded by water on all its sides and the shore is about a meter above the water-level.

The neighbourhood consists of a public park that is surrounded by housing blocks combined with businesses which are in turn flanked by two roads (and parking lots) leading to the southern island that is currently under development.

On the East there is the Mustikkamaa island, connected to Kalasatama by a pedestrian and bicycle accessible suspension bridge. Between the Eastern shoreline of Sompasaari and the island runs a boating route for small vessels. The wind direction is predominantly in North-South / South-North direction and winds can be strong.

On the South-East end of Sompasaari is a public transport stop, and in the South there is Vincent square, a public square that depresses towards the water.

The western shoreline looks out over the soon-to-be-retired coal plant. Although there is water on this side, it is discontinuous and ends parallel to the northern shore of Sompasaari.

Surrounding the island there are a total of 8 floating pontoons planned (each +/- 1200 m²) to be used for the public, for businesses, or to be filled in by the City of Helsinki.

The neighbourhood can be explored by foot within half-an-hour.

We are in the Urban Lab, REDI Shopping center where we can see part of Sompasaari towards the south.



Players

City of Helsinki (red tiles)

Objective: (1) Reach a good level of Political Approval, and (2) reduce the neighbourhoods' vulnerability to Climate Change

Resident Association (yellow tiles)

Objective: Advocate for the needs of all residents in a socially equal way

Cooperative (blue tiles)

Objective: (1) Increase Neighbourhood Attractivity, and (2) ensure a minimum positive cash flow

Sustainability Expert (purple tiles, no assets at start of game)

Objective: Ensure a sustainable transformation of the neighbourhood

Player sheets

Each player has a personal sheet that describes their objective, assets and displays a table where they track their income for each round. Opening the player sheet, players have the possibility to keep their income, take notes, and review which possible actions they can perform during the game. Players start the game without any money.

Tokens

1. Building
2. Tall building (2 x building)
3. Business
4. Parking lots. Each token = 10 parking lots.

Tiles

Tiles from the board that are the property of a player, are resembled by their respective colour: red for the City of Helsinki, blue for the Cooperative, yellow for the Resident Association, and purple for the Sustainability Expert.

1. **Road tiles.** These are public domain.
2. **Green tiles** represent green spaces. Green spaces in the courtyards as well as central park are public domain. Green spaces on roofs can be either private or public, the underlying tile-colour indicates the corresponding owner.
3. **Blue tiles** represent blue spaces. These are public domain.
4. **Floating pontoon tiles.** These are public domain.
5. **Vincent-square tile.** This is public domain.

Elements (all details and calibration in 211129_game_dynamics_sompasaari.xlsx)

Project blocks: Each project (see Project table at end of document) has requirements for implementation (costs, benefits, spatial imprint, other conditions), and an effect of the implementation (on Neighbourhood Attractivity and Political Approval).

Events cards: Event cards enforce external events with implications on the neighbourhood. The deck with event cards is placed face-down next to the board. Players are unaware of the possible events, and a particular order to these cards is used to simulate scientifically relevant scenarios (for order: Event table at end of document).

Actions: Each player has the possibility to perform actions according to their income and fulfilling certain conditions, e.g. needing the agreement from the City of Helsinki (see Action table at end of document).

Income: Players receive income based on their assets and can use it to finance projects or actions. The game master is the bank of the game and thus distributes income and collects the funding for Projects and Actions.

Turn-of-the-game-disc and hour-glass:

Place visible to all players on the table and set the indicator on the first phase: Neighbourhood Attractivity.

The Political Approval & Neighbourhood Attractivity scale:

The value of Neighbourhood Appeal and Political Approval is indicated on a scale that must be visible to all players. A “thumb” is used for Political Approval, and a “star” for Neighbourhood Attractivity. The thumb faces downwards for negative values of Political Approval and vice versa for positive values. The initial values are: Neighbourhood Attractivity = -2, and Political approval = 0. Place the metal ball in the track for later use.

Situating of game components

All four players sit around a square table, where the board, appeal/approval scale, game elements and player sheets are displayed. To recreate power-dynamics, the municipality is placed opposing the three other players, with the board placed closer to the three other players (see picture below)



Game play

Game masters' role before the start of the game

1. Presenting the storyline
2. Explanation of the game-rules. Special attention should be paid to:
Reading out aloud the objective of each player

Explaining the effect of low/high attractivity in the area (decreased income from businesses and parking)

Explain that buildings adjacent to green space receive more income

3. Mention that the project-blocks have a three-level nature (small to big scale)
4. Ask players to be clear about their thoughts and arguments during the discussion, and keep the discussion central at all times.

Turn of the game

A game-round follows four phases and concludes with each player to vote on their satisfaction (use the disc to indicate in which phase players are):

Phase 1: Neighbourhood Attractivity

Phase 2: Income

Phase 3: Project and Action

Phase 4: Events

Note: the Neighbourhood Attractivity phase is skipped when it is equal to zero.

Phase 1 (Neighbourhood Attractivity): A player takes the metallic ball and releases it from the current level of Neighbourhood Attractivity and reads out aloud the number, if any, on which the ball lands (positive, neutral, or negative result). Deduct or add the result to the income of each business.

Note: the deduction holds for the current turn only, i.e. will apply the next income phase only.

1 Business	+ 5
1 Parking lot	+ 1
1 Building	+ 2
1 Building + adjacent green space	+ 3
1 Tall building	+ 4
1 Tall building + adjacent green space	+ 6
Private green roof accessible	+ 5
Private green roof inaccessible	+ 6
Public green roof	+ 5

Phase 2 (Income): All players receive income according to their assets (see table below)

Rules for income:

For a building to benefit from a green space it must be directly next to a green space

Any debt from a previous turn is deducted from the current income

Phase 3: (Projects and Actions)

The City of Helsinki has the lead during 10 minutes to propose project(s) and implement it/them.

The 10-minute hour-glass is used to time this phase. Implementation of a Project requires space on the board, and compliance with the project-conditions as indicated on the respective project-block.

Other players are allowed to propose Projects if the City of Helsinki allows them to do so, is out of ideas, and there is time left. Once a project is implemented, the effects apply immediately and should be updated on the Neighbourhood Attractivity and Political Approval scale.

During the 10 minute phase, players can also implement Actions. Possible Actions are listed on the player sheets.

Note: there is no retroactive benefit to a project (e.g. if 1 x “Opening public pontoon” is implemented, the Public Approval increases by 1 point. If in a later round all remaining “Opening

public pontoons” are implemented the Public Approval increases by 1 point, not 2 points. Public Approval only increases by 2 points if all are implemented at the same time.

Phase 4: (Events) Each player except the City of Helsinki draws an Event card from the top of the deck, and reads it out loud. The text has to be interpreted and the game updated accordingly. Events can take effect immediately, or in the next turn (e.g. less income). In case a player is running out of money (e.g. has to pay due to an Event), the debt is deducted from the income in the next round.

Tables

Projects

Project	Category
Green & Blue corridor	Environmental
Wind blocking elements	Environmental
City farming plot (vegetables, fruit and flowers)	Environmental
Nature-based-solution: natural on-site storm and wastewater management	Environmental
Green & Blue infrastructure	Environmental
Biodiversity restoration	Environmental
Creating shadow	Environmental
Opening public pontoon	Social
Public sauna and showers	Social
Multifunctional community center	Social
Outdoor gym	Social
Movable street furniture	Social
Easy accessible bathing water	Social
Pedestrian area	Social / Economic
Pop-up bar	Economic
Bike- and micro-mobility P + charge	Mobility
Public transport stop	Mobility

Actions

Action	Category
Private green roof	Environmental
Public green roof	Environmental
Densification, tall building	Social
Addition of parking lots	Mobility
Removal of parking lots	Mobility
Business	Economic

Events

	Event	Category
Round 1	6th Covid-wave	Economical
	governmental mandate: adapt to climate change	Environmental
	bad press for grey neighbourhood	Economical
Round 2	downpour: heavy rainfall overloads the stormwater system	Environmental
	international recognition for maintenance free NBS	Economical
	green spaces require upkeep	Environmental
Round 3	heat wave	Environmental
	share of older people increases	Social
	cold winter: icy winds and rains deteriorate shore-line	Environmental
Round 4	new families cannot find affordable housing	Social
	young people are bored	Social
	poor developments undermine Green Kalasatama brand	Economical
Round 5	public courtyards attract noisy people late at night	Social
	pedestrian zone boosts economy	Economical

HOCHDORF GAME

Overall description of the game

The board is a simplified representation of the Braui-areal in Hochdorf and its immediate surrounding, the “Zentrumszone”. There is no winning condition, the game is open-ended. **The game message should be clear after three to four turns. There is little need to go over 5 turns.**

The initial set-up of the board is according to the picture. Each cell represents roughly 10 x 10 meters. For distribution of parking spaces, see respective assets from players on Page 3.

The game is made for four Players: Municipality, Landowner, Cooperative, and Cultural Center.

Description of the board:

Game tokens:

1. White house: building. Each building contains 4 apartments.
2. White rectangle: building with an extra floor, contains 6 apartments (no such building at the beginning of the game)
3. The Braui tower (fixed)
4. The terrace of the Braui restaurant.
5. Braui stairs
6. Parking lots. Each token = 1 parking lot. Exception: the parking lot on the Braui Areal is an underground parking (players can extend this parking with 50 parking lots during the game).



Tiles:

1. Tiles from the board that are the property of a player, are resembled by their respective colour: red for the municipality, blue for the cooperative, yellow for the landlord. NB: The cultural centre owns no property at the beginning of the game.
2. Road tiles have a dotted line. This is public domain.
3. Green tiles represent green spaces. Green spaces on coloured tiles are private and the colour indicates the corresponding owner. Green spaces on grey tiles are owned by non-players.
4. Grey tiles with a house token are owned by non-players, and can be bought.

Game elements: for details, see: *projects_actions_events.xlsx*)

Project blocks: Each project has conditions for implementation (costs, needed agreement, etc.), and an effect of implementation. These are indicated on the blocks. (see Project table at end of document)

Events cards: These cards enforce external events with implications on the neighbourhood. The deck with event cards is placed next to the board. (see Project table at end of document. Players are unaware of possible Events, an order to Events is used to simulate scientifically relevant scenarios)

Actions: Each player has the possibility to perform actions according to their income and upon agreement from the Municipality (see Action table at end of document).

Income: Players receive income based on their assets and can use it to finance projects or actions. The game master is the bank of the game and thus distributes income and collects the funds for Projects and Actions.

Turn-of-the-game-disc and sand-hour: Place both visible to all players on the table and set the indicator on Neighbourhood Appeal.

The public approval/appeal scale.

The value of Neighbourhood Appeal and Public Approval is indicated on a scale. The Neighbourhood Appeal & Public Approval scale must be visible to all players. A thumb is used for Public Approval, and a star for Neighbourhood Appeal. The thumb faces downwards for negative values of Public Approval and vice versa for positive values. Place the metal ball in the track for later use. The initial values are:

Neighbourhood appeal = -2 (Attraktivität);

Public approval = 0 ("Öffentliche Zustimmung").

Player sheets: Each player has a personal sheet that describes their objective, owned assets and a table to track their income for each round. Opening-up the player sheet, players have the possibility to keep their income, take notes, and review which possible actions they can perform during the game. Players start the game without any money.

Players:

- **Municipality (red tiles)**

Objective: (1) Reach a good level of Public Approval

Assets: Owns 15 parking lots as well as a business (space to rent out for events)

- **Landowner (yellow tiles)**

Objective: (1) Increase financial assets, and (2) guarantee peace and tranquillity for tenants.

Assets: 15 Parking lots, 2 businesses, and 8 apartments

- **Cooperative (blue tiles)**

Objective: (1) Increase neighbourhood appeal, and (2) maintain financial assets

Assets: 12 apartments and 3 private green spaces

- **Cultural centre (purple tiles)**

Objective: (1) Increase neighbourhood appeal, and (2) increase the soul of the area.

Assets: 1 business

Description of the place of players:

All four players sit around a table where the board, appeal/approval scale, game elements and player sheets are displayed. To recreate power-dynamics, the municipality is placed opposing the three other players.

Game

Game master action. Before the start of the game

Introduction of the rules. Special attention should be paid to:

Reading out aloud the objective of each player

Explain the effect of low/high appeal in the area (decreased income from shops)

Explain that apartments with a private green space or parking lot receive more income

Invite municipality to present the project blocks in front of him/her visible to the remaining players.

Mention that the project-blocks have a three-level nature (small to big scale)

Ask players to be clear about their thoughts and arguments during the discussion

Turn of the game

A turn of the game follows these phases (use the disc to indicate in which phase players are):

1. (Neighbourhood) Appeal (Attraktivität)
2. Income (Einkommen)
3. Tax (Steuern)
4. Projects
5. Events (Ereignisse)
- 6.

1: APPEAL PHASE: This step is skipped when the Neighbourhood Appeal is equal to zero.

One player takes the metallic ball and releases it from the current level of Neighbourhood Appeal and says aloud if the ball landed on a positive, neutral, or negative result.

→ Deduct or add the result to the income of each shop. The deduction holds for the current turn only, i.e. will apply the next INCOME PHASE only.

2: INCOME PHASE: All players receive their income in a covert according to their assets (Eigentum). (see table below)

1 Business	+ 5
1 Parking lot	+ 1
1 Apartment	+ 2
1 Apartment + 1 Parking lot	+ 4
1 Apartment + 1 private green space	+ 4

Rules for income:

- a parking lot associated with an apartment should not be counted twice (e.g. having an apartment + parking receives + 4, NOT 1 + 2 + 4)
- For an apartment to benefit from a private green space it must be on top of a green space (for the bottom apartment). A private green space only benefits one apartment. For the remaining apartments in the house, the ownership of private green space is indicated by a green side / apartment on the house token
- For an apartment to benefit from a parking lot, it must be within five road tiles from a private parking lot.
- A parking lot in the Underground Parking can be counted as Apartment + Parking lot in case it follows the rule of being within five road tiles.
- Any debt from a previous turn is deducted from the income

3: TAX (Steuern) PHASE: Municipality indicates if it wants to raise the local taxes (in this game there is no basic tax). It sets a certain sum that all players need to hand over to the municipality. The municipality can set a different tax level for different players. **Decision to raise tax declines Public Approval by 2.**

4: PROJECT & ACTION PHASE

The municipality has the lead during 10 minutes to propose project(s) and implement it/them. The 10-minute hour-glass is used to time this phase. Implementation of a Project requires space on the board, and compliance with the project-conditions as indicated on the respective block. Other players are allowed to propose Projects if the Municipality allows them to do so, is out of ideas, and there is time left. Once a project is implemented, the effects apply immediately.

During the 10 minute phase, other players than the Municipality can implement Actions. Possible Actions are listed on each players' player-sheet.

Note: there is no retroactive benefit to a project (e.g., the Underground Parking does not bring more benefit if the condition of "no parking lots" is only achieved AFTER implementing the Underground Parking).

STEP 6: EVENT (Ereignisse) CARD: Each player except the Municipality draws an Event card from the deck, and reads it out loud. Follow the text and update board accordingly. Events can take effect during the next turn (e.g. less income) or effects take immediate effect. In case a player is running out of money (e.g. has to pay due to an Event), the debt is deducted from the income in the next round.

Tables

Projects

Public Park	Creating Shadow	Opening braui stairs	Extra policing	Cooperative arealentwicklung
Facade painting	Buvette (+1 business)	Village center	Pedestrian area	Private arealentwicklung
Street furniture	Uniform floor covering	Underground parking (50 parking lots)	Youth Center in Braui	

Actions

Action	Costs	Benefit	Effect	Conditions
Addition of extra level to a building	40	+ 2 apartments		Municipality agreement
New parking lot	1		Appeal -1, Approval +1	Municipality agreement; max five P per tile
Remove parking lots	0		Approval -1 per round	
Build a new building	120	+ 4 apartments		Municipality agreement

Buy non-player building	100	+ 4 apartments		
Buy non-player green space	30			

Extra action, only if players ask specifically. We then use the opportunity to ask about why, where, etc.

Create a shop	10			Municipality agreement
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Events

House facades are old and decaying	Bad press for grey neighbourhood	Nearby village get more attention	Drunks at the buvette yelling until late	People looking for seats outside after concert	More and more old people in the hood	Federal law: "please adapt to climate change"
The Canton of Lucern decides to reduce speedlimit on Rossentalstrasse to 30km/h	Public parks need to be cared after	Good reviews of Braui Center	6th wave of coronavirus, activity is down	Noisy discussion late in the evening	Young people are bored	Federal law: "Municipalities are expected to stimulate affordable and quality housing"
Most beautiful center award	Grafitis on buildings	Not enough parking space for events	Heat wave	New families can't find affordable housing in the area	Pedestrian zone boosts economy	

Objectives of game session

Specific scientific objective

“Understanding driver and barrier mechanisms of place-making in transformation of peri-urban landscapes towards sustainability”.

General objective

Fostering constructive stakeholder dialogues through an easily accessible format

General approach

1. Elicit driver and barrier mechanisms of urban transformations categorized by the elements of place making¹¹. Here, the players answer – from their professional perspective – two small questionnaires: 1) **directly before the game**, asking about players’ professional attitudes, 2) **after game and debriefing**, focused on possible renewed professional attitudes.
2. Run game session (a game session consists of game (multiple rounds) + debriefing) and observe in which elements of place making these drivers and barriers occur and how they in turn affect the urban transformation.
 - a. Recreate real-life power-dynamics (i.e. City of Helsinki has the lead in proposing projects for implementation)
 - b. Voice-record the session as back up.
 - c. **Game-master** 1) welcomes participants, introduces the sessions’ objective and organization, hands out questionnaires (before and after game session, see **Questionnaire**), briefs the players on the rules and game-elements, 2) facilitates interactions between the players, maintains playful atmosphere, and ensures the discussions to remain central (to aid observations), and 3) keeps players updated in which phase of the game they are.
 - d. **Observer 1 / verbal observations** manually collects qualitative data during game-rounds that consists of, 1) the verbal interactions between the players with each other and with the game (see **Verbal observation sheet**), and 2) **indicates implicit (ambiguous) statements / key moments**. The latter can be used to notify the game-master, which can then mobilize this during the **warm debriefing** to enrich the discussion / clarify ambiguous statements.
 - e. **Observer 2 / non-verbal observations** manually collects qualitative data during game-rounds that consists of, 1) the non-verbal interactions (behaviour) between the players with each other and with the game (see **Non-Verbal observation sheet**). Again, **key moments** can be indicated and mobilized during the **warm debriefing**.
 - f. **Observer 3 / indicator observations** is 1) responsible for the audio recording, 2) before and after photo of the game-board, and collection of 3) indicator data (see **Indicator observation sheet**), and 4) satisfaction voting from the players after each round.

All observers have printed observation sheets allowing them to be mobile, having a good sight on the players and the game, and (only when necessary) to ask for clarification. (Note: the observer should

¹¹ Switalski et al. (forthcoming)

avoid disrupting the flow of the game, bring players out of the game experience, or force them to reveal reasons for their behavior or action).

- g. **Each player** collects data on their income, keep their finances hidden from the other players, and cast their satisfaction votes. The voting is done after each round based on a Likert-scale and allows to later assess the strength of support for potential driver and barrier mechanisms during the cold debriefing and analysis.
 - h. After the game rounds, the **game-master** gives space to each player separately to let off steam (cooling down) and to transition to a reflective stage that is required for the warm debriefing. Observer 3 could bring some refreshments to the playing table to add to a relaxed atmosphere.
 - i. **Warm debriefing** in the form of group discussion moderated by the **game-master**, assisted by input from the observations. This is based on elements of place-making in connection to 1) the game events as observed by players themselves as well as the observers and 2) should relate as much as possible to realistic scenarios to assess where the game dynamics diverge / converge from reality and learn where conclusions about real-life can be drawn.
 3. After the game session, the researchers have a brief discussion and collect their general experiences of the game-session in a short written feedback.
 4. **Cold debriefing** through interviews based on 1) changes in the game in relation to players interactions, 2) questionnaires, 3) validation of drivers and barriers and use of serious-game, 4) role and objective of players in the game vs reality, and 5) validation of concept of place-making and use of serious-game.

Elements to be observed

Abbreviations used: non-verbal (**NV**), verbal (**V**), indicators (**I**) ; observation tools: observation sheet (**OBS**), player sheet (**PS**), indicator tracking sheet (**ITS**); place-making concept: Place (**PL**), Person (**PE**), Process (**PR**).

	Code	Elements	Tool	Place-making
Drivers	NV	<i>Signs of interest, cooperation, participation (e.g. players listen; players pick up projects; players are willing to help each other; participatory processes)</i>	OBS	PE, PR
		<i>Positions taken by players in group dynamics (e.g. X takes the lead; X wants to restructure the process)</i>	OBS	PE, PR
	V	<i>Sentences expressing drivers (e.g. "this is great"; "this would help"; "we need")</i> <i>Sentences expressing interest, need for understanding (e.g. "how would that work?"; "could you explain?")</i>	OBS	PE, PR
Barriers	I	<i>Increasing Neighbourhood Appeal</i>	ITS	PL, PE
		<i>Increasing Public Approval</i>	ITS	PE, PR
		<i>Projects implemented</i>	ITS	PL, PE, PR
		<i>Actions implemented</i>	ITS	PL, PE, PR
		<i>Events with positive outcomes</i>	ITS	PL, PE, PR
		<i>Share of green space (as # tiles / total tiles)</i>	ITS	PL, PE
		<i>Share of public space (as # tiles / total tiles)</i>	ITS	PL, PE
		<i>Satisfaction (general, project, action, event)</i>	PS, ITS	PL, PE, PR
Barriers	NV	<i>Signs of information asymmetry (e.g. certain order in presentation of projects; project conditions are hidden; players are prevented from looking at project too closely / too long)</i>	OBS	PR
		<i>Signs of conflict, tension, or exclusion</i>	OBS	PL, PE, PR
		<i>Signs of disinterest (e.g. reluctant to participate; passive)</i> <i>Positions taken by players in group dynamics (e.g. X takes the lead; X blocks the process; X is dominant)</i>	OBS OBS OBS	PE, PR PE, PR
Barriers	V	<i>Sentences expressing barriers (e.g. "we can't because"; "there is no space" (Place); "this is not working" (Process), "this is not important" (Person))</i> <i>Sentences expressing lack of understanding (e.g. "I don't understand why we")</i>	OBS	PL, PE, PR
		I	<i>Number of times the municipality uses the full 10 min</i> <i>Decreasing Neighbourhood Attractivity</i> <i>Decreasing Political Approval</i> <i>Share of parking lots (as # tiles / total tiles)</i> <i>Share of private space (as # tiles / total tiles)</i> <i>Number of times each player speaks</i> <i>Unsatisfaction (general, project, action, event)</i> <i>Events with negative outcomes</i>	ITS ITS ITS ITS PS ITS PS, ITS ITS

Tools for collection of data

Questionnaire

See templates folder for print version of material.

City of Helsinki = page 1, Resident Association = 2, Cooperative = 3, Sustainability Expert = 4

1. Before game briefing
 - a) Think of Sompasaari 5 years from now. Please describe using only a few words:
 - a. What do you see?
 - b. What do you feel?
 - c. Which people are there?
 - d. What do these people do?
 - b) Please describe in a few words, what do you need to achieve this vision?
 - c) Using a few words, what do you miss to achieve this vision?
2. After game + debriefing
 - a) Do you feel that your vision for Sompasaari is changed after the game and the discussion? Please describe this new vision using only a few words:
 - a. What do you see?
 - b. What do you feel?
 - c. Which people are there?
 - d. What do these people do?
 - b) Please describe in a few words, what do you need to achieve this new vision?
 - c) Using a few words, what do you miss to achieve this new vision?

Observer tasks

We use the concept of place making¹² as a guiding framework for the observations. This means that we are particularly interested in observations that reveal elements within the three categories of **1) Place** (when and where a project is (not) implemented), **2) Person** (why and by who a project is (not) implemented), and **3) Process** (how a project is (not) implemented).

Place itself is built up from the sub-categories of **1.1) Form** (what does a project (not) look like), **1.2) Function** (what functions does the project (not) have), and **1.3) Image** (how would one describe a project, e.g. does it aid to a feeling of safety, to the image of a green neighbourhood, socially acceptable, or futuristic, etc.).

Verbal observer

The **verbal observer** should **focus on spoken dynamics** between the players, and between the players and the game. These observations should reveal driving or hindering elements of urban transformations. If possible, quoting players directly would enhance the understanding, and the observer should indicate any key moments as “follow-up” if they seem interesting for the debriefing and show these to the game-master accordingly.

Examples of observations are:

	Observations
Drivers	<p>Sentences expressing drivers (e.g. “this is great”; “this would help”; “we would need..”; “this is pretty”; “this is important”; “here is free space”; “changing parking would require”; “this would give great benefit”; “we should work together”)</p> <p>Sentences expressing interest (e.g. “how would that work?”; “could you explain?”)</p>
Barriers	<p>Sentences expressing barriers (e.g. “we lack..”; “we can’t because..”; “there is no space”; “this is not working”, “this is not important”; “this looks silly”; “this isn’t useful”; “this is unsafe”; “this is too expensive”; “the benefits are too low”; “I don’t like..”)</p> <p>Sentences expressing lack of understanding (e.g. “I don’t understand why we”)</p> <p>Signs of information asymmetry (e.g. “you keep information from us”)</p>

¹² Switalski et al. (forthcoming)

Non-verbal observer

The **non-verbal observer** should **focus on unspoken dynamics** between the players, and between the players and the game. These observations should reveal driving or hindering elements of urban transformations. Indicating key moments helps to mobilize game events during the warm debriefing. The observer should indicate any key moments as “follow-up” if they seem interesting for the debriefing and show these to the game-master accordingly.

Examples of observations are:

	Observations
Drivers	<p>Signs of interest (e.g. player listens; players pick up projects; players are willing to help each other; show support of participatory processes)</p> <p>Positions taken in group (e.g. X takes the lead, supported; X wants to restructure the process)</p>
Barriers	<p>Signs of disinterest (e.g. reluctant to participate; leans back passively)</p> <p>Signs of conflict, tension, or exclusion (e.g. X throws hands in the air from disbelieve / giving up; X points angry at Y; X cannot join the discussion; X does not let Y finish speaking)</p> <p>Signs of information asymmetry (e.g. certain order in presentation of projects; players prevented from looking at project too closely / too long)</p> <p>Positions taken in group (e.g. X takes lead, unsupported; X blocks the process; X is dominant)</p>

Indicator observer

The **indicator observer** should focus on the collection of quantitative data about changes in the game elements, is responsible for the audio recording, before and after photo of the game-board, as well as for the collection of voting from the players after each round.

See indicator sheet for details.

Verbal observation sheet

See templates in project-folder for print version of material.

Location:

Date:

Game version:

Briefing

Abbreviations: City of Helsinki (CH), Cooperative (C), Resident Association (RA), Sustainability Expert (SE)

	Key quotes	Follow-up

Game

Abbreviations: City of Helsinki (CH), Cooperative (C), Resident Association (RA), Sustainability Expert (SE)

Above table is repeated for each round

Debriefing

Abbreviations: City of Helsinki (CH), Cooperative (C), Resident Association (RA), Sustainability Expert (SE)

	Key quotes

Additional comments:

Non-verbal observation sheet

See templates in project-folder for print version of material.

Location:

Date:

Game version:

Briefing

Abbreviations: City of Helsinki (CH), Cooperative (C), Resident Association (RA), Sustainability Expert (SE)

	Observations	Follow-up

Game

Abbreviations: City of Helsinki (CH), Cooperative (C), Resident Association (RA), Sustainability Expert (SE)

Above table is repeated for each round

Debriefing

Abbreviations: City of Helsinki (CH), Cooperative (C), Resident Association (RA), Sustainability Expert (SE)

	Key quotes

Additional comments:

Indicator tracking sheet

See templates in project-folder for print version of material.

Location:

Date:

Game version:



Briefing start time:

Briefing end time:

Game start time:

Game end time:

Abbreviations: City of Helsinki (**CH**), Cooperative (**C**), Resident Association (**RA**), Sustainability Expert (**SE**)

		Round 1	Round 2	Round 3	Round 4
Projects Discussed (D) Projects implemented (I)					
Actions	CH				
	C				
	RA				
	SE				
Time used					
Events	1				
	2				
	3				
Total score of Approval 					
Total score of Attractivity 					
Voting collected?					

Debriefing (verbal dynamics)

Debriefing start time:

Debriefing end time:

Abbreviations: City of Helsinki (**CH**), Cooperative (**C**), Resident Association (**RA**), Sustainability Expert (**SE**)

	Key quotes

Additional comments:

Mobilization of observation data

Warm debriefing (directly after game session)

In plenum, cooling down, devote time to each player

1. How was the gaming experience for you?
2. How do you feel about the change of the neighbourhood?
3. What did you do to get to this result?
4. Is there something missing, or is something not relevant for the area?

Questions below are used to guide the discussion. From this point onwards, the context should be to discuss about elements of place making, as well as what drives or hinders an actual urban transformation. The discussion should NOT be about the game itself. Devote time to each player

Place

5. What would be the result of such a transformation in real-life? ***E.g. what are the practical outcomes?***

Form

6. Think of colour, shape, and materials - what do you see? ***E.g. vibrant, natural, green, blue; high, low, horizontal, diverse; concrete, asphalt, glass, wood, sand?***
7. Think of the scale of change? ***E.g., how large is it? Does it influence more than the neighbourhood?***

Function

8. Think of its use, what do you see? ***E.g., public function or private function***

Image

9. Think of the experience that you have created? ***E.g. vibrant street life, people watching, sense of community, local and traditional values?***
10. Think of the meaning of the place to you ***E.g. do you feel more connected, your home?***
11. How does it make you feel? ***E.g. safe, unsafe, inspired?***

Process

12. Think about who or what was needed ***E.g., were all actors in favour?***
13. What made it happen? ***E.g., what were the conditions?***
14. Will there be any other players involved? ***E.g. a particular stakeholder is important because...***

Person

15. Do you have priorities in the changes?
16. Why is it important to you? ***E.g., is it because intrinsic value?***

General, concerning game experience

17. What is your take-away from this workshop?

If situations from the game seem unrealistic, we can ask the following question, and expand with the questions above

18. We observed that <insert specific Project, Action, Event> was implemented / occurred, how would this work in reality?

Cold debriefing (2 – 4 weeks after game session)

Here, we use the data gathered from the questionnaires, the indicator sheet, and the satisfaction voting. The data is mobilized in individual semi-structured interviews with the players from the gaming sessions, through a video-call software. Record interview, and get interviewees consent.

Structure:

Introduction (~5 min)

1. How are you?
2. Do you have any thoughts that you wish to share concerning the game, the discussion, or in general?

Show before and after photo of the game-board

3. This is the transformation of the game. Do you have any thoughts concerning the transformation? ***E.g. are you satisfied, unsatisfied, is something important missing?***
4. In this cold debriefing, I would like to discuss your experiences. First, we start with the questionnaire and elaborate on things that were unclear or ambiguous. Second, I would like to discuss a framework of drivers and barriers of urban transformations. Third, I would like to elaborate on your gaming experience. Last, we discuss the concept of place making and your understanding of this concept.

Questionnaire (~20 min)

Show scans of questionnaire corresponding to interviewee

5. Clarify and expand on statements from questionnaires

Drivers and barriers (~10 min)

Show framework of drivers and barriers

6. Validate framework of drivers and barriers with players. ***E.g. do you agree with this framework?***
7. Expand on drivers and barriers with players. ***E.g. would you add anything to the drivers, barriers, or both?***
8. Do you believe that the serious-game (game + debriefing) is a suitable method to understand drivers and barriers of urban transformations?
9. Evaluate if player learned about drivers and barriers from another particular player, or from the whole session in general.

Game (~15 min)

Show player sheet displaying objective

10. Recall the objective corresponding to the player that is interviewed, and ask them what they think about that objective, and how this played out in the game.
11. Ask what their real-life professional objective is (beside from the one in the game)
 - a. How do you pursue this objective in real-life?

Present graphs from satisfaction voting from Rstudio

12. Go through the separate graphs for projects, actions and events, and discuss the satisfaction for each round.

E.g. in round one, project A and B were implemented and C was only discussed, why were you satisfied?

For the events you have voted neutral in round two when 1) [event 1], 2) [event 2], and 3) [event 3] happened. What do these events mean to you?

For the actions in round three you were unsatisfied when player X removed parking, and player Y built densification. Why were you unsatisfied?

Place making (~5 min)

Show place-making graphics and description

13. Evaluate if players would add anything to the concept / understand it differently (to expand or refine understanding and terminology) ***E.g. this is how we understand place making, would you add anything?***

14. Ask in which of the place making elements drivers and barriers mainly occur ***E.g. in which element would the largest barrier occur?***

15. Would you say that the serious game (game + debriefing) is a good method to think and discuss about place-making?

Wrap-up (~5 min)

16. What is for you the most important in the transformation of Sompassaari?

17. Ask if they see any other actors that are important to participate in the game

18. Thank you for your time and insights, during the workshop and for this interview. We learn a lot from your views, and find it important to have this individual follow-up. We will reach out to you with the results once we have finalized the analysis.

19. Do you have any remaining questions?

D Data preparation

D.1 Source, type and amount of collected data

Table 7. Source, type, and amount of raw data collected during workshop and cold debriefing for both case-studies in Hochdorf (Luzern, Switzerland) and Sompasaari (Helsinki, Finland). The number of rounds corresponds to the number of game-rounds played in each workshop.

Source		Workshop			
		Hochdorf 1 (4 game- rounds)	Hochdorf 2 (4 game- rounds)	Sompasaari 1 (3 game- rounds)	Sompasaari 2 (3 game- rounds)
Game-time	Non-verbal observations, handwritten	3 pages, German	3 pages, German	2 pages, English	3 pages, English
	Verbal Observations, handwritten	3 pages, German	3 pages, German	NA	NA
	Indicators	1 page	1 page	1 page	1 page
	Recording	~1.25 hour, Swiss-German	~1.25 hour, Swiss-German	~1.25 hour, Finnish	~1.25 hour, Finnish
Warm debriefing	Non-verbal Observations, handwritten	5 pages, German	4 pages, German	5 pages, English	2 pages, English
	Verbal Observations, handwritten	3 pages, German	2 pages, German	NA	NA
	Recording	~1 hour, Swiss-German	~1 hour, Swiss-German	~1 hour, Finnish	~1 hour, Finnish
Questionnaire	Ex-ante, handwritten	NA	5 pages, German	4 pages, English/Finnish	4 pages, English/Finnish
	Ex-post, handwritten	5 pages, German	4 pages, German	3 pages, English/Finnish	3 pages, English/Finnish
Cold debriefing	Recording	~1 hour, Swiss-German	~1 hour, Swiss-German	~1 hour, Finnish	~1 hour, Finnish
	Transcript	~43, Swiss-German	NA	75 pages, Finnish	69 pages, Finnish

D.2 Characteristics of origin

Table 8. Characteristics of parties and location involved in the data collection and production. Characteristics include the professional and socio-cultural background, motivation, and target group, for data collected during the workshops and cold debriefing.

Characteristics	Case-study	
	Hochdorf (Luzern, Switzerland)	Sompasaari (Helsinki, Finland)
Workshop location	Braui Stübli, overseeing the game-area.	Urban Lab, REDI Shopping Center, partial view on game-area.
Participant selection	Through representative (and participant) from the municipality of Hochdorf	By principal researcher based on suggestions from core-team, and local actors.
Professional background from authors of material and parties involved in production	<p>Data recorded by members from the EU ERC GLOBESCAPE project-team, and project-independent researchers from ETH Zürich, Chair of Planning of Landscapes and Urban Systems.</p> <p>Data produced by nine representatives from the municipality of Hochdorf Gemeinde Hochdorf, Braui Cultural Centrum, Hochdorf Housing Cooperative, and local Landowners.</p>	<p>Data recorded by the principal researcher in collaboration with researchers from the University of Helsinki, Urban Environmental Policy Research Group, and Helsinki Institute of Sustainability Sciences.</p> <p>Data produced by eight representatives from the City of Helsinki, the Finnish Environment Institute, the Sompasaari Resident Association, and a local Housing Cooperative.</p>
Emotional, cognitive, and motivational background of authors	<p>Research objectives</p> <p>Stuck urban development</p>	<p>Research objectives</p> <p>Interest in urban development approaches</p>
Socio-cultural background	Mid-high income, western	Mid-high income, western
Target group for which material is intended	Scientific community, policy makers, local decision makers	Scientific community, policy makers, local decision makers

E Data analysis

E.1 Code-book

Category	Sub-category	Code	Sub-code	Definition / Description	Example quote	Category assignment	Source
Urban neighbourhood transformation	<i>Place making</i>	Place-making depicts the interaction between the individual and the environment. It is seen and experienced from the individual perspective. Place-making is a social construct, we take the lense from the individual	Place	"the physical space as experienced by a person"		Deductive	Switalski & Grêt-Regamey (2021)
			Form	"physical characteristics and inventory of a place"	<i>high-rise concrete buildings;</i> <i>small-scale shrubs on side of street;</i> <i>shops at ground floor, living on top</i>		Switalski & Grêt-Regamey (2021)
			Function	"possible and actual activities accommodated by a place"	<i>interacting with neighbours;</i> <i>doing shopping;</i> <i>get a coffee and sit in the sun</i>		Johann S. Schuur Switalski & Grêt-Regamey (2021) Johann S. Schuur
			Image	"how a space is understood or perceived based on affective-cognitive processes"	<i>feeling safe;</i> <i>vibrant area;</i> <i>feels like home</i>		Switalski & Grêt-Regamey (2021) Johann S. Schuur

		the passive mental experience, perception, impression of a place		
	Person	"one's personal attitudes to place making" the active willingness, liking, wanting to interact with a place	<i>important because; I don't like because</i>	Switalski et al. (forthcoming) Personal communication Grê-Regamey, March 2022
	Procedure	"the influence of collective or governance processes on place making" approach to interact with a place	<i>participatory planning; a voting system to get residents opinions; public gardens maintained by the residents</i>	Switalski et al. (forthcoming) Personal communication Grê-Regamey, March 2022

<p><i>Three spheres of Transformation</i></p> <p>The three spheres of transformation depict the interaction between the environment and the individual. What is revealed from the environment? Here we take more of an engineering-lense.</p>	<p>Practical sphere</p> <hr/> <p>Political sphere</p>	<p>"practical sphere represents the core of transformation: this is where outcomes have an observable and measurable influence""technical responses ... changes in management practices, the introduction of new technologies, and socio-technical and cultural innovations""changes in strategies, practices, and behaviours""the "outcome" sphere, where the numbers, parameters, and indicators are ... measured"</p> <p>the measurable result of a transformation (physical, mental, individual, collective)</p> <p>"political sphere ... represents the system and structures that define the constraints and possibilities under which practical</p> <p><i>a speed-limit of 30 km/h;the share of active people increased</i></p> <p><i>the current planning process takes several years; the council changes every four years;</i></p>
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O'Brien & Sygna (2013)

Johann S. Schuur

O'Brien & Sygna (2013)

transformation take place"
"includes economic,
political, legal, social and
cultural systems ... politics
and power influence the
rules of the game ... social
movements, collective
action campaigns,
lobbying, electoral politics,
and revolutions respond to
them"
"also involves management
of "natural" systems"

*each house needs a
parking space*

**the boundary conditions in
which a transformation
happens (rules, processes,
system)**

Johann S.
Schuur

**Personal
sphere**

"the personal sphere ... is ...
where the transformation
of individual and collective
beliefs, values and
worldviews occur"
"changes in this sphere can
lead to different ... ways of
understanding and
interacting with the world"
"discourses and paradigms

*I believe people from
all sorts of
background should
be able to live here*

O'Brien &
Sygna (2013)

			<p>emerge from the personal sphere, and influence the framing of issues, the questions that are asked or not asked, and the solutions that are prioritized in the political and practical spheres"</p> <p>"changes ... result in "seeing" systems and structures in new ways"</p> <p>the (world)views, prioritizations, and values from an individual</p>	
Mechanisms	Describes "the how" of transformations	Driver	<p>"providing impulse or motivation"</p> <p>something or someone that provides an impulse or motivation (it moves or changes)</p>	<p><i>overarching vision; small steps to reach a larger goal; this player is needed in the transformation; tax-incentives help;</i></p>
		Barrier	<p>"something ... that impedes or separates"; "prevents or hinders movement or action"</p> <p>is a reason, mechanism or person that prevents or</p>	<p><i>this person blocks the development; development plans are too old to reflect current needs when</i></p>

Johann S. Schuur

Merriam-Webster, March 2022

Johann S. Schuur

Merriam-Webster, March 2022
Johann S. Schuur

**blocks something from
moving, changing, or work**

*development begins;
we lack the resources*

<i>Additional</i>	Relation	A relation or comparison between (multiple) players and / or between a player and a particular topic and / or between an object and a particular effect	<i>this is the responsibility of the cooperative; the city should revise parking policy; the neighbouring village ...; the main square attracts people from the region</i>
	Other	A repeating, interesting theme	

Inductive

Johann S. Schuur;
Adrienne Grêt-Regamey

Johann S. Schuur

This coding protocol is used to guide the qualitative content analysis of the qualitative data that was collected from a series of four serious-games, with a total of 17 players from two workshops in Hochdorf (Luzern, Switzerland) and two in Sompasaari (Helsinki, Finland).

General approach

1. Coder 1 (principal investigator (PI)) skims the raw material freely to get a first impression of the data.
2. Coder 1 develops an initial coding protocol, based on the first impressions, theoretical foundations, and the research question.
3. Coder 1 defines an initial code-book, circulates the codes within the project-team and refines the codes.
4. Coder 1 applies the coding to a sample data-set with statements on a related topic (place-attachment).
5. Coder 1 has the coding verified by a third-person on the same data-set, iterates the protocol based on the feedback, and discusses with coder 2 (native Swiss-German) and coder 3 (native Finnish) to kick-off the iterative coding-process:
 - a. Coder 1 refines the coding protocol, prepares Atlas.ti, and creates a sample coding to set a base line.
 - b. Coder 1, 2 and 3 independently apply the coding protocol on a sub-set of the actual data, and discuss to fine-tune the protocol, as well as train all coders in an iterative, critical reflection process until a point of diminishing marginal returns is reached.
 - c. Coder 1, 2, and 3 independently apply the final coding protocol on a sub-set of the actual data, where the PI pre-codes segments of texts: “more important is ensuring that when given a certain segment of text, similar codes are applied.” (O’Connor & Joffe, 2020). Reliability is measured by an inter-coder reliability (ICR) test. Here, we take 10-25% (O’Connor & Joffe, 2020) from each data-type (warm debriefing and cold debriefing material), where we aim for a minimum ICR, measured by Krippendorff’s C_u / α ($c \sim 0.667$) (Friese, 2020).
 - d. Coder 1, 2, and 3 then independently apply the coding protocol on the serious-game data, and comment on anything that is unclear.
 - e. The output from each coder is compared. Where codes overlap, a mutual, understanding is assumed. This material feeds into the final analysis by the PI.

Timeline & Milestones

(due by) Date	Milestone(s)	Tasks	Amount [pages]	Notes
22.04.22	Start of coding-process			
29.04.22	Wrap-up iterations	Hochdorf 2	28	
03.05.22	Test 4	Helsinki 1	22	
16.05.22	Wrap-up	Hochdorf 1, ICR-test	22	
	Warm debriefing	Hochdorf 2, ICR-test	28	
		Helsinki 2, ICR-test	25	
		Helsinki 1, ICR-test	22	
16.05.22	Start	Helsinki s1p1, ICR-test	20	Priority, All coders
	Cold debriefing	Helsinki s1p2	19	Priority, Heidi
		Helsinki s1p3	19	Priority, Heidi
		Helsinki s1p4	17	Priority, Heidi
		Helsinki s2p1	17	Heidi
		Helsinki s2p2	20	Heidi
		Helsinki s2p3	17	Heidi
		Helsinki s2p4, ICR-test	15	All coders
20.05.22	Wrap-up	Hochdorf s1p1	?	
	Cold debriefing	Hochdorf s1p2	?	
		Hochdorf s1p3	?	
		Hochdorf s1p4	?	
		Hochdorf s1p5	?	
		Hochdorf s2p1	?	
		Hochdorf s2p2	?	
		Hochdorf s2p3	?	
		Hochdorf s2p4	?	

We are interested to understand the mechanisms behind transformations. The research is governed by the following:

N.B. we define urban transformation as any change within one land-use type, e.g. car-dependent residential to less car-dependent residential; lack of retail in residential to more retail in residential; addition of a shop; etc.

Research question

“Understanding driver and barrier mechanisms of place-making in transformations of urban landscapes towards sustainability”

In simple terms: Understanding what is needed and what prevents the development of “better” places. I.e. what helps or what hinders any change of a place, how does this fit into existing transformation frameworks, and how does this overlap with a place-specific transformation framework, leading to the following sub-questions:

“What are driver and barrier mechanisms that govern changes?”

“Where do these drivers and barriers appear in a transformation framework?”

“To what extent does the place-making framework - a specific instantiation of changing a neighbourhood – overlap with sustainability transformations?”

Coding

On the next pages, you will find the rules, and codes that we will use for the qualitative content analysis. The coding material consists of transcripts from the serious-game, specifically the warm debriefing (in plenum discussion, directly after the game session), and cold debriefing (one-to-one discussion, two to four weeks after the game session).

Please familiarize yourself deeply with the codes, code-rules and examples. Further, please discuss anything that is unclear or when disagreements between the coded segments arise. Communication is key! This approach retains as much data as possible, deemed crucial because of a small sample size.

Rules for all material

1. The coding unit (smallest unit of text to quote) is one word, the context unit (largest portion of text to quote) a sentence, and recording unit the respective document that is coded.
2. To avoid an anchoring effect, **code each of the four categories separately** in a dedicated Atlas.ti Snapshot. I.e. code on a clean, pre-coded set of data each time! First, read the material and add **Additional: Other**, whenever you find an interesting segment of text that has not been selected by the PI. Then code the material for **Mechanisms**, followed by **The Three Spheres of Transformation**, **Place-making**, and last **Additional: Relation**. Send a Snapshot of each category separately in the following format: final_<name>_<category>_Understanding Urban Transformations. E.g. *final_Johann_Mechanisms_Understanding Urban Transformations*
3. We treat the participants as objects of information, not as subjects because we have a small sample size (we do not go into subject analysis based on sex, background, profession, etc.).
4. If a particular instance of a code is mentioned multiple times, code it every time. “Code it always” (Heidi Annala, personal communication, April 2022)
5. Use the context around the quotation to interpret which code fits best.
6. If you’re unsure – do not code!
7. Whenever you code something that is multi-interpretable, or needs context, give the reason for your coding decision in a comment on the quotation as: **<Code>, <the reason>**. **If multiple codes, separate by semi-colon**. E.g. *Function, here they talk about the things one wants to do in the neighbourhood.*
8. We do not code segments from the Facilitator, Q1-20, WQ1-20, FQ, H1 nor Interviewer.

Additional rules for cold debriefing only

1. Quotations
2. Do not code for game-specific statements that clearly do not relate to reality.
For example:
“It was exciting that the housing company representative who was at first, that the parking spaces are important and then they were taking them away after 2 rounds” (Ss1p1)
“it would have been good if there had been the windbreak or something that would have protected from the storm and so.” (Ss1p1).
3. Skip questions Q16.1-n and start again from Q17
4. Use the memo “Helsinki cold debriefing” to note down interesting themes, and quotes.

Code-book

Category: Mechanisms

Describes what is needed to reach “better” neighbourhoods

Code: Needed

Something, someone, or a specific intervention that is needed to reach a better neighbourhood

E.g., we need small steps to reach a larger goal; a tax-incentive would help; we need a vision from the residents.

Code: Prevents

Something, someone, or a specific intervention that prevents reaching a better neighbourhood

E.g., the landowner blocks any change; development plans are too old to reflect current needs; we lack the resources.

Category: Three spheres of transformation

Describes the interaction between the environment and the individual

Specific coding-rules:

1. Prioritize: choose the code to which the quotation fits best, if another code fits as well: list it in a comment on the quote

Code: Practical sphere

The outcome / measurable result of any change (numbers, parameters, indicators)

E.g., the speed limit reduced to 30 km/h; the share of active people; mixed-residents.

Code: Political sphere

The boundary conditions in which any change happens (rules, processes, system)

E.g., the planning process takes several years; the council changes every four years; each house needs a parking space.

Code: Personal sphere

The (world) views, prioritizations, and values from an individual that underlie any change

E.g., I believe people from all backgrounds should be able to live here.

Category: Place-making

Describes how places emerge from the interaction between people and their environment.

Specific coding-rules:

1. When a quotation fits the category Place, try and code for Form, Function and Image when certain, otherwise code Place.

Code: Place

The physical space as experienced by an individual

Sub-code: Form

Physical characteristics and inventory of a place (shapes, materials, colours, things)

E.g. high-rise concrete buildings; small-scale shrubs on the side of the street.

Sub-code: Function

Possible and actual activities accommodated by a place (what one can (and can't) do)

E.g., interacting with neighbours; doing shopping; getting a coffee and sitting in the sun.

Sub-code: Image

The passive mental experience, perception, impression of a place

E.g., a feeling of safety, the place feels vibrant.

Code: Person

The active willingness, liking, or wanting to interact with a place (personal attitudes)

E.g., I find it important ...; I do not like because ...; I feel attached to ...

Code: Procedure

The influence of collective or governance processes (approach to interact with a place)

E.g., participatory planning; a voting system to get residents opinions; public gardens maintained by the residents.

Category: Additional

Code: Relation

Relation between, comparison between, or addressing off (multiple) players and/or a player and particular topic and/or an object and a particular effect.

E.g., this is the responsibility of the cooperative; the city should revise parking policy; the neighbouring village ...; the main square attracts people from the region; they need to be able to understand.

Code: Other

Repeating, interesting themes that do not occur in the other codes

Mark your own quotations

Data analysis- subsequent coding rounds

Johann S. Schuur

02 06 2022

Data initialization

```
## relevant Libraries and packages

# install.packages("wordcloud")

# for working with data-frames in tidyverse
library(readxl)
library(tidyverse) # ggplot2 is part of tidyverse

## -- Attaching packages ----- tidyverse
1.3.1 --

## v ggplot2 3.3.5      v purrr  0.3.4
## v tibble  3.1.3      v dplyr  1.0.7
## v tidyr   1.1.3      v stringr 1.4.0
## v readr   2.0.0      v forcats 0.5.1

## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()

library(data.table)

##
## Attache Paket: 'data.table'

## Die folgenden Objekte sind maskiert von 'package:dplyr':
##
##   between, first, last

## Das folgende Objekt ist maskiert 'package:purrr':
##
##   transpose

library(stringr)
library(xlsx)
# for Natural Language Processing
library(writexl)
library(tm)
```

```

## Lade nötiges Paket: NLP

##
## Attache Paket: 'NLP'

## Das folgende Objekt ist maskiert 'package:ggplot2':
##
##   annotate

library(wordcloud)

## Lade nötiges Paket: RColorBrewer

## working directory
setwd("C:/Users/jschuur/polybox/Projects/MSc Thesis/analysis/coding/round
2/Rstudio/")

## Loading coded data

# mechanisms
myCol1 <- as.character(read_xlsx("quotations_codes_coders.xlsx", sheet = "
mechanisms", n_max = 1, col_names = FALSE)) # extracting column names

## New names:
## * `` -> ...1
## * `` -> ...2
## * `` -> ...3
## * `` -> ...4
## * `` -> ...5
## * ...

mechanisms <- read_xlsx("quotations_codes_coders.xlsx", skip = 2, col_name
s = myCol1) # dropping second row with quotation from facilitator

## New names:
## * Comment -> Comment...5
## * Codes -> Codes...6
## * `Created by` -> `Created by...7`
## * Comment -> Comment...8
## * Codes -> Codes...9
## * ...

# three spheres of transformation
myCol2 <- as.character(read_xlsx("quotations_codes_coders.xlsx", sheet = "
three_spheres", n_max = 1, col_names = FALSE))

## New names:
## * `` -> ...1
## * `` -> ...2
## * `` -> ...3

```

```

## * `` -> ...4
## * `` -> ...5
## * ...

three_spheres <- read_xlsx("quotations_codes_coders.xlsx", sheet = "three_
spheres", skip = 2, col_names = myCol2)

## New names:
## * Comment -> Comment...4
## * Codes -> Codes...5
## * `Created by` -> `Created by...6`
## * Comment -> Comment...7
## * Codes -> Codes...8
## * ...

# place making
place_making <- read_xlsx("quotations_codes_coders.xlsx", sheet = "place_m
aking", skip = 2, col_names = myCol2)

## New names:
## * Comment -> Comment...4
## * Codes -> Codes...5
## * `Created by` -> `Created by...6`
## * Comment -> Comment...7
## * Codes -> Codes...8
## * ...

# relation
relation <- read_xlsx("quotations_codes_coders.xlsx", sheet = "relation",
skip = 2, col_names = myCol2)

## New names:
## * Comment -> Comment...4
## * Codes -> Codes...5
## * `Created by` -> `Created by...6`
## * Comment -> Comment...7
## * Codes -> Codes...8
## * ...

# other
other <- read_xlsx("quotations_codes_coders.xlsx", sheet = "other")

# player-codes, run seperate!
myCol_players <- as.character(read_xlsx("quotations_codes_coders.xlsx", sh
eet = "player_codes", n_max = 1, col_names = FALSE))

## New names:
## * `` -> ...1
## * `` -> ...2

```

```

## * `` -> ...3
## * `` -> ...4
## * `` -> ...5

players <- read_xlsx("quotations_codes_coders.xlsx", sheet = "player_codes",
", skip = 2, col_names = myCol_players)

## attaching player codes to quotations
players_sub <- players %>%
  subset(select = -c(1:3,5))

mechanisms <- cbind(mechanisms, players_sub)
three_spheres <- cbind(three_spheres, players_sub)
place_making <- cbind(place_making, players_sub)
relation <- cbind(relation, players_sub)

```

Second coding round

For the second coding round I use the initial themes from the first coding cycle (mobility, planning, identity, spatial) to categorize the participants statements into a final set of 7 themes. Three additional themes (policy, liveliness, people) are constructed based on reading the statements categorized by the initial themes. Statements are assigned to a category based on a string of words that are perceived to belong to a particular theme. Participant codes are transformed to the participant roles and added to the corresponding participant statements.

```

## assigning themes based on initial results from first round of coding: m
obility, planning, identity, spatial
# mobility
mobility <- "mobility|car|parking|P|road|traffic|bike|walk|pedestrian|publ
ic transport|bus|train|station"

# planning
planning <- "plan|procedure|process|system|actor|stakeholder|investor|expe
rt|step|reali|adapt|include|part|communicate|cooperation|negotiation|discu
ss|talk|conversation|dialogue|learn|intermediat|requirement|method|tools|d
evelop|involvement"

# identity
identity <- "identity|attach|community|unique|character|image|feel|ownersh
ip|sense of home"

# spatial
spatial <- "place|space|structure|green|environment|park|material|architec
t|hous|flat|centre|square"

## assigning four additional themes based on second round of coding
# policy
policy <- "incentives|resources|benefits|maintain|money|financ|cost|time|c

```

```

hange|measures|year|contract|strategy|legal|regulation|advis"

#liveliness
liveliness <- "activ|liv|life|attractiv|interact|recreation|services|shop|
gastronomy|restaurant|bar|pub|beer|coffee|offer|diversity"

# people
people <- "people|person|citizens|resident|everyone|customer"

# private
private <- "private|business|trade"

## allocation of players across workshops
# Hochdorf, Luzern, Switzerland
municipality <- "Hs1p1|Hs2p1"
landowner <- "Hs1p2|Hs2p4"
h_housing_cooperative <- "Hs1p3|Hs1p5|Hs2p3"
cultural_center <- "Hs1p4|Hs2p2"
# Sompasaari, Helsinki, Finland
city_of_helsinki <- "Ss1p2|Ss2p1"
resident_association <- "Ss1p1|Ss2p4"
s_housing_cooperative <- "Ss1p4|Ss2p3"
sustainability_expert <- "Ss1p3|Ss2p2"

# assign topics and participants to quotations
mechanisms <- mechanisms %>%
  mutate(topic = if_else(grepl(mobility, `Quotation Content`), "mobility",
# searching string for patterns included in mobility
    if_else(grepl(planning, `Quotation Content`), "pl
anning",
    if_else(grepl(identity, `Quotation Conten
t`), "identity",
    if_else(grepl(spatial, `Quotation
Content`), "spatial",
    ifelse(grepl(policy, `Quo
tation Content`), "policy",
    ifelse(grepl(livel
iness, `Quotation Content`), "liveliness",
    ifelse(grep
l(people, `Quotation Content`), "people",
    ifel
se(grepl(private, `Quotation Content`), "private", "other"))))))) %>%
  mutate(player = if_else(grepl(municipality, Pcodes), "municipality", # a
ssigning players across workshops
    if_else(grepl(landowner, Pcodes), "landowner",
    if_else(grepl(h_housing_cooperative, Pco
des), "hochdorf housing cooperative",

```

```

        if_else(grepl(cultural_center, P
codes), "cultural center",
        if_else(grepl(city_of_he
lsinki, Pcodes), "city of helsinki",
        if_else(grepl(re
sident_association, Pcodes), "resident association",
        if_else(
grepl(s_housing_cooperative, Pcodes), "sompasaari housing cooperative",
"sustainability expert")))))))

```

Statement statistics

The set of participant statements used for the analysis consists of those for which agreement exists between the coders. A 100% agreement results in 301 out of 828 statements, a 66% agreement (statements for which at least two coders agree) results in 424 out of 828 statements.

filter overlapping codes

mechanisms

```

m_100_match <- mechanisms %>% # agreement between all coders
  filter(Codes...6 == Codes...9 &
        Codes...9 == Codes...12) %>%
  select(-c(Reference, Document, `Created by...7`, `Created by...10`,
           `Created by...13`, Codes...9, Codes...12))

```

```

m_66_match <- mechanisms %>% # agreement between at least two coders
  filter(Codes...6 == Codes...9 |
        Codes...9 == Codes...12)

```

assessing occurrences

#share of quotations per player, per workshop

```

tot_quotes <- mechanisms %>% group_by(Document) %>% tally()
player_quotes <- mechanisms %>% group_by(player, Document) %>% tally()

```

count number of occurrences of topic, per player, and order by most occurring to least occurring

```

m_100_needed <- m_100_match %>%
  filter(grepl("Needed", Codes...6)) %>% # keep only needed
  add_count(topic, player) %>%
  arrange(-n, topic)

```

```

m_100_prevents <- m_100_match %>%
  filter(grepl("Prevents", Codes...6)) %>% # keep only prevents
  add_count(topic, player) %>%
  arrange(-n, topic)

```

```

# extract occurrences of topic per player
m_100_needed %>% select(topic, player, n) %>% filter(player == "landowner"
) # sub "cultural center", etc.

##      topic    player n
## 1    other landowner 6
## 2    other landowner 6
## 3    other landowner 6
## 4    other landowner 6
## 5    other landowner 6
## 6    other landowner 6
## 7  liveliness landowner 4
## 8  liveliness landowner 4
## 9  liveliness landowner 4
## 10 liveliness landowner 4
## 11  mobility landowner 4
## 12  mobility landowner 4
## 13  mobility landowner 4
## 14  mobility landowner 4
## 15  identity landowner 3
## 16  identity landowner 3
## 17  identity landowner 3
## 18  planning landowner 3
## 19  planning landowner 3
## 20  planning landowner 3
## 21   policy landowner 2
## 22   policy landowner 2
## 23  spatial landowner 2
## 24  spatial landowner 2

```

Visualization

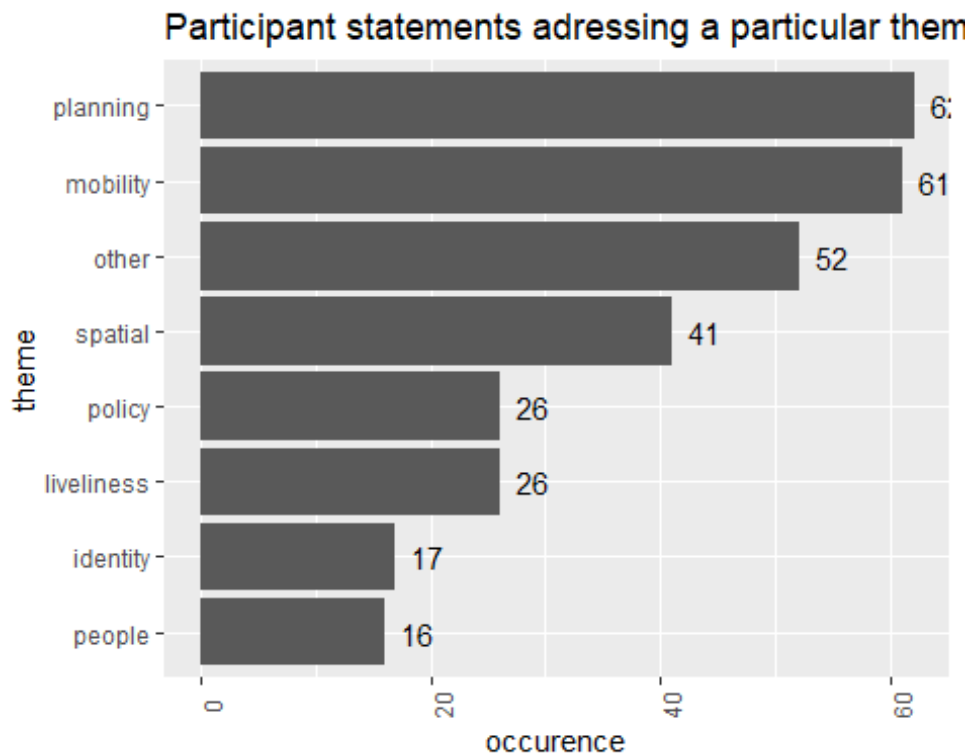
Presentation of player statements differentiated by theme and code.

```

# assigning levels to extract order of occurrence
m_100_match$topic= factor(m_100_match$topic, levels = c('planning', 'mobility', 'spatial', 'liveliness', 'policy', 'other', 'people', 'identity'))

# plot summary statistics
ggplot(m_100_match, aes(y = reorder(topic, topic, function(x) length(x))))
+
  geom_bar(stat = "count") +
  #facet_wrap(vars(Codes...6)) + # un-comment for histogram seperated by Needed and Prevents
  theme(axis.text.x = element_text(angle = 90)) +
  geom_text(stat="count", aes(label=..count..), hjust = -0.5) +
  labs(x = "occurrence", y = "theme", title = "Participant statements addressing a particular theme")

```

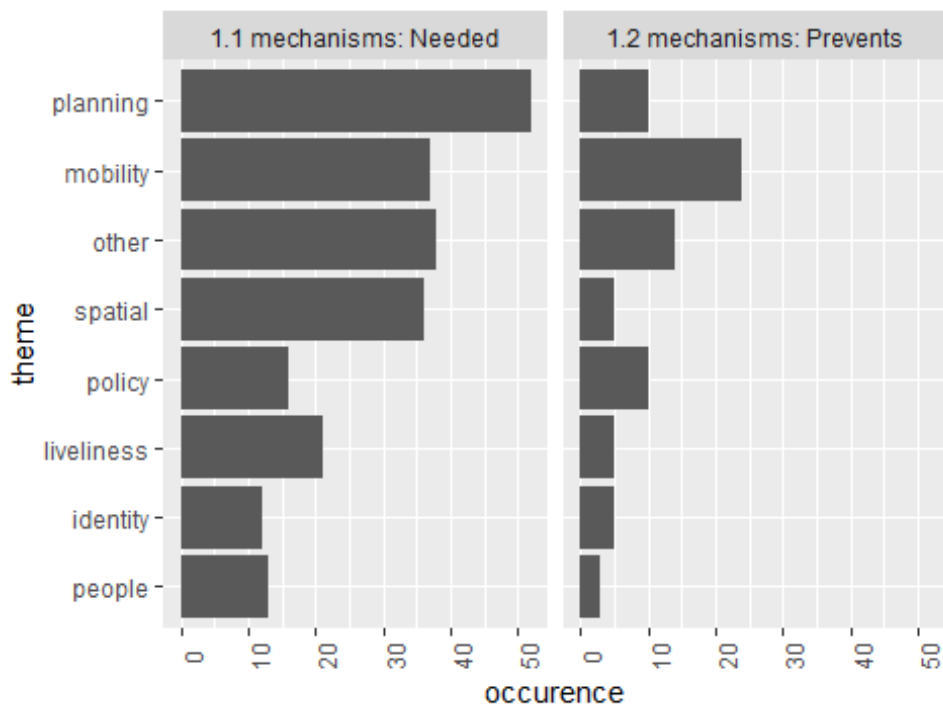
```

# save plot
ggsave("statements_themes.png", width = 20, height = 10, units = "cm")

# plot summary statistics
ggplot(m_100_match, aes(y = reorder(topic, topic, function(x) length(x))),
fill = factor(Pcodes)) +
  geom_histogram(stat = "count" ) +
  facet_wrap(vars(Codes...6)) +
  theme(axis.text.x = element_text(angle = 90)) +
  labs(x = "occurrence", y = "theme", title = "Participant statements diffe
rentiated by enabling and hindering issues")

```

Participant statements differentiated by enabling a



```
# save plot
ggsave("statements_themes_factors.png", width = 20, height = 10, units = "cm")
```

Third coding round

Exporting the statements per theme allows for the analysis in the third round of coding. Here I can extract the themes that arise based on the participant statements.

```
# extract statements per theme

m_100_planning <- m_100_match %>%
  filter(topic == "planning") %>%
  arrange(Codes...6)

m_100_mobility <- m_100_match %>%
  filter(topic == "mobility") %>%
  arrange(Codes...6)

m_100_liveliness <- m_100_match %>%
  filter(topic == "liveliness") %>%
  arrange(Codes...6)

m_100_other <- m_100_match %>%
  filter(topic == "other") %>%
  arrange(Codes...6)
```

```
m_100_spatial <- m_100_match %>%  
  filter(topic == "spatial") %>%  
  arrange(Codes...6)
```

```
m_100_policy <- m_100_match %>%  
  filter(topic == "policy") %>%  
  arrange(Codes...6)
```

```
m_100_identity <- m_100_match %>%  
  filter(topic == "identity") %>%  
  arrange(Codes...6)
```

```
m_100_people <- m_100_match %>%  
  filter(topic == "people") %>%  
  arrange(Codes...6)
```

output xlsx-files, uncomment to export

```
# write_xlsx(m_100_match, "m_100_match.xlsx") # all topics  
# write_xlsx(m_100_needed, "m_100_needed.xlsx")  
# write_xlsx(m_100_prevents, "m_100_prevents.xlsx")  
#  
# write_xlsx(m_100_planning, "m_100_planning.xlsx")  
# write_xlsx(m_100_mobility, "m_100_mobility.xlsx")  
# write_xlsx(m_100_liveliness, "m_100_liveliness.xlsx")  
# write_xlsx(m_100_other, "m_100_other.xlsx")  
# write_xlsx(m_100_spatial, "m_100_spatial.xlsx")  
# write_xlsx(m_100_policy, "m_100_policy.xlsx")  
# write_xlsx(m_100_identity, "m_100_identity.xlsx")  
# write_xlsx(m_100_people, "m_100_people.xlsx")
```

E.4 Example software assisted (Atlas.ti) qualitative coding

The screenshot displays the Atlas.ti software interface. On the left, the 'Explore' panel shows a search bar and a tree view of documents and codes. The main window shows a document titled 'D 23: Helsinki session 1_warm_debriefing'. The text in the document is as follows:

of an experience was this game, in terms of the development of this area? You can, of course, talk about any details, but more related to playing the game and game progression.

8

9

10 So, here perhaps the most challenging is this agency problem, like so there are different actors who have different time horizons, resources and the city has money and land. So it is always the strongest. And on the other hand, the city looks at things in a very long term.

11

12 Hmm and then like the residents who already live here, so think about then in a way their own environment and can just feel that the area is already full, even if there would be building plots still.

13

14 Hmm and then the environmental authority is quite limited in it. In a sense, may be able to be like, kick forward certain things or catalyst or come along, but not able to participate in a broader like discussion about what is a good area.

15

16 And then the residents' association, of course, has only little money and few resources and so they must be able to negotiate with others. And then I think that this is in a way this situation is good, because now we are in real time thinking about these. But often it is so that the city thinks like this, and then the residents' association thinks 10 years from now or something like 7 years from now, that how it likes the end result, so they have a little different rhythm to it.

The right side of the interface shows a ribbon of codes. The codes are organized into a vertical stack, with some codes highlighted in different colors. The codes include:

- 1.2 mechanisms: Prevents
- 1.2 mechanisms: Needed
- 2.2 Three spheres: Political sph...
- 2.2 Three spheres: Practical sp...
- 4.1 additional: Relation
- 2.1 Three spheres: Political sph...
- 2.1 Three spheres: Practical sp...
- 3.3 place-making: Procedure
- 2.2 Thre...
- 4.1 add...
- 4.1 add...

The ribbon also includes a vertical scroll bar and a 'Collapse the Ribbon' button at the top right.

E.5 Example manual qualitative coding

Table 2. Mechanisms Planning presenting overlapping findings from both case-studies.

	Findings	Exemplary quotations	Assessment
		certainly the good dialogue between the private and the public sector.	
	Adaptivity & anticipation	<p>preparing for things that can not be seen in advance - so, so that would also require such like pre-negotiation or consideration.</p> <p>could there be like gradual learning, that one would learn now somewhere, how this was done and then like the next could be better.</p> <p>there should be some intermediate stage, where you could like check the contents without having to remake everything from the beginning again.</p> <p>the idea of agile urban development</p> <p>it is important that we are on the way and make this starting signal, so that we do it now and go and one step at a time</p> <p>Just building up with small steps</p>	<p>Negotiation in advance could help prepare for unexpected events. Peer-learning and reflective stages during development ensure incorporation of best-practice solutions. Serious-games visualize / help imagine what "could be there".</p> <p>preparing participating small steps / gradual learning / intermediate steps</p>
	Participation & cooperation	<p>we could think of ways in which to generate discussions of this kind in the earlier stage as well.</p> <p>it would be good to get something like random sampling or some kind of action, because on these kinds of things, those who often participate are those who have strong opinions</p> <p>to start discussing with different parties early enough and looking for the common ground, so I think it would be so important</p> <p>Hearing then those real stakeholders, especially when an empty area is built.</p> <p>Something has to come out together where everyone can discuss on the same level and where a good goal comes out.</p> <p>We have to talk to individual people</p> <p>we should take everyone with us, that everyone should discuss with each other on the same level, at the same eye level, and seek solutions with them.</p> <p>For me, two things are interesting: that if you join forces, you can also realise things that offer advantages, added value for everyone somewhere</p>	<p>Serious games support dynamic dialogues and constructive interactions, and could be a potential method to use early on in planning processes. For example, to make everyone understand the benefits of cooperation and finding common ground at an early stage</p> <p>It is important to incorporate random sampling to avoid only sampling "those with strong opinions". In particular the game showed the importance of early planning or ideation.</p> <p>early discussions all stakeholders present, puts, remarks... everyone considered common ground / same level</p>
Needed			
	Plan	<p>That there would be an overall plan of the like green, urban green and urban nature.</p> <p>it could be said in the plan that light-coloured materials.</p> <p>But we have to have a plan of where we want to go.</p> <p>they should be conceptual, structured plans, and not just individual topics, patchwork in the end</p>	<p>overall plan conceptual plan including visions, non-quantifiable topics</p>
	Resources	<p>there are different actors who have different time horizons, resources</p> <p>They are so long processes</p> <p>the area development (... That is simply the problem.</p>	<p>actors time money relates to resources</p>
Prevents	Changing needs	<p>the participants do not exist in such an area</p> <p>the city zoning process and hearing, and I think it is quite good, but it does not take into account the fact that... how people then use the area or live.</p> <p>the requirements are now for the environment are different than they were even 5 years ago.</p> <p>I have kind of like image that the involvement of residents is quite zero.</p>	<p>demographics needs</p>
	Participation		