An Exploratory Research on Urban Street Experiments and Transitions in Urban Mobility

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August 2022

Colophon

Full title	An exploratory research on urban street experiments and transitions in urban mobility – a case study research into how street experiments can contribute to transitions in urban mobility towards sustainability.
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Date	August 17th, 2022
Word count	

Abstract

Since the advent of the automobile, urban streets have been planned to primarily serve the interests of motorized vehicles, resulting in streets for cars rather than people. However, global events like climate change and rapid urbanization are increasingly putting pressure on urban streets to accommodate more functions of public space. Furthermore, bringing streets 'back to the people' is important in achieving sustainable mobility systems.

Consequently, streets experiments have increasingly been proliferating amongst city officials and urban communities as an approach to temporarily reformulate the balance of city streets. Research has shown these interventions to boast positive short-term impacts yet their long-term impacts that go beyond their immediate spatial and temporal boundaries has been unresearched. Through three case studies in North America, this qualitative thesis explored how Parklets, Open Streets, and Pavements to Plazas can encourage transitions in urban mobility.

Interview and document analysis data revealed that the urban context can create favourable conditions for experiments to diffuse their innovations into wider society. Particularly, moments of crises, demographic changes and Climate Change all created destabilising pressures on the regime which offered windows of opportunity for street experiments to diffuse their innovations. Deepening, broadening, scaling up, replication and translation have also been identified as mechanisms through which experiments encourage transitions, with concrete practices differing based on experiment goals and aim.

Key words: tactical urbanism, urban experimentation, sustainable mobility, public space, sustainable urban design

Acknowledgements

The author would like to thank the thesis supervisor and coordinator for providing continued support and flexibility for the research process. She is also massively grateful to all the participants who gave up their time to share their thoughts and experiences with street experiments.

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Introduction

1.1 Background: sustainable mobility & public space

City streets are the epitomes of current mobility challenges (Von Schönfeld and Bertolini, 2017). More people now are living in urban rather than in rural areas and it is estimated that by 2050, 70% of the world's population will live in cities (UN, 2019). To accommodate an increasing volume of people in a constrained space, and to do so in a healthy and socially just way, is one of the biggest challenges facing governments and planning practitioners today. Urban spaces are struggling to successfully integrate an increasing volume of competing forms of mobility, such as motorized and non-motorized, individual and collective, or fast and slow (Bertolini, 2020). At the same time, cities are faced with the urgent need to transition into sustainable mobility systems which are perceived as integral for sustainable development (Holden, Gilpin and Banister, 2019).

Sustainable mobility is an elusive term and a normative goal of policy and society at large. It is an elusive term because since it's introduction in the 1992 *Green Paper on the Impact of Transport on the Environment* (EU, 1992), its understanding has become much more holistic and multidisciplinary with a broad array of theories, approaches, and formulations (Holden, Gilpin and Banister, 2019). Sustainable mobility is now perceived as a highly complex, or a 'wicked' problem, meaning that solving it is difficult due to a plethora of agents who all have their own views and strategies (Holden et al., 2020). That is evident in the fact that since 1992, insufficient progress has been made in achieving sustainable mobility systems which is alarming since demand for transport is constantly on the rise. Contrary to the slow pace of change of mobility systems, there is a growing sentiment amongst academics, policy makers and governments that time is running out to find solutions to complex sustainability problems such as mobility. For example, to meet the 2015 Sustainable Development Goals global carbon dioxide emissions need to be reduced by 45% by 2030 from 2010 levels (Tattini and Petropoulos, 2020). That is an ambitious target considering that transport accounts for 24% of global carbon emission, three quarters of which is attributed to road transport (IBID). Thus, it is imperative that we think completely differently about how we move as time to reduce carbon emissions is running out.

Debates over sustainable mobility are increasingly being centered around its relationship to public space. According to an EU policy report, "a sustainable city must have attractive open public spaces and promote sustainable, inclusive and healthy mobility" (EU, 2011, pg. 2). Afterall, mobility involves space. Soft mobility options such as walking and cycling, which are paramount in achieving sustainable mobility, will fail in spaces that are primarily designed for cars (Ravazzoli and Torricelli, 2017). In fact, streets can be termed as "quintessential social public spaces"

(Mehta, 2013, pg. 6). However, since the advent of automobiles, other functions of public space have been dismissed to serve motorized transport. The fact that cars are taking up the majority of urban public space is seen as highly problematic; it is not only dangerous for other vehicles and people but is also an impediment to sustainable mobility.

1.2 Tactical urbanism: a way forward?

As a result of these tensions as well as the complex puzzle that is sustainable mobility, city streets are increasingly turning into spaces for experimentation (Evans, 2016; Bertolini, 2020). Already in 1961, Jane Jacobs stated that “cities are an immense laboratory of trial and error, failure and success, in city building and design” (Jacobs, 1961, pg. 6). Urban experiments are not only a way to understand a city but are also vehicles to transform it through flexible, iterative and community based approaches. Thus, they are quickly becoming a preferred urban design strategy (Bulkeley and Castan Broto, 2013). The premise regarding experiments is that they provide a safe space to test radical, alternative solutions to pressing urban problems on the ground. Furthermore, they allow people to experience first-hand what alternative futures of urban living can look like.

Citizen groups and governments are also embracing experimentation for social innovation, as a means to reformulate the balance of city streets in favor of active forms of transportation and other uses of public space like socializing, playing or relaxing, in pursuit of streets for people instead of streets for vehicles which transport planning currently dominates (Lydon and Garcia, 2015). These types of urban experiments could be categorized as *tactical urbanism* interventions or street experiments, an urban design and planning approach aimed at activating space using low-cost, flexible, short term and scalable interventions (Lydon and Garcia, 2015). This approach is essentially a retaliation to the outdated and slow pace of conventional planning procedures that often fail to meet the needs for open space or transportation for residents (IBID). Tactical urbanism interventions view the street as the object of experimentation and involve a myriad of actros like the government, civil society, business groups, academics and non profit organisations. Through the combination of an open, iterative process as well as the multitude of stakeholders involved, creative potential for innovative ideas can be unleashed and urban space is immediately reclaimed by its interested parties (IBID).

In a comprehensive overview of tactical urbanism interventions, Bertolini (2020) derived five types of urban street experiments that differ slightly in their aim, scale and approach yet all of which question the purpose of a street as a channel for solely motorised traffic. They range in their functional complexity from simple remarkings of streets to closing off entire sections of the street to motorised traffic. They all boast significant positive impacts on physical activity by

encouraging mobility via walking, cycling and public transport, increased sense of safety, higher levels of community interaction and social capital, and at the very least an absence of negative effects on local business (Bertolini, 2020). Despite the numerous positive outcomes as well as the proliferation of experiments in the urban policy sphere, there is little to no critical assessment of their long-term outcomes on city-wide mobility patterns, policy or planning institutions. To date, research on tactical urbanist interventions focuses on their immediate impacts rather than long-term effects. If street experiments do not have any influence beyond their immediate spatial and temporal boundaries, then it would seem they are conducted for the simple sake of experimenting which would be redundant given the current situation of mobility. It is still unclear as to how experiments can contribute to achieving more sustainable mobility patterns or what long lasting change they may create for society at large.

1.3 Scientific relevance

The first aim of this study is to better understand how street experiments can be positioned as tools or vehicles to help achieve sustainable mobility systems in urban environments through a theory lens. To date, research on street experiments has primarily focused on the immediate impacts of individual experiments rather than how those positive impacts could be consolidated beyond the single event (Bertolini, 2020). Thus, using theoretical debates on sustainability transitions this thesis will first begin by creating a framework that could be used to assess the transformative potential of street experiments. The second part of this thesis will aim to test the framework with three real life cases of street experiments. Since this is an explorative study, the real-life cases may not only lend support or negate the theory, but also offer novel insights into the ways that street experiments create wider and long-term impacts in urban environments which is currently a heavily under researched area of interest.

1.4 Societal relevance

The second aim of this study is to provide practical guidelines for any actors and/or organizations interested in conducting street experiments on how to ensure that the experiments can act as steppingstones towards real change in urban environments, rather than just be single events with no wider influence (i.e., experimenting for the sake of experimenting). In other words, this thesis hopes to contribute towards the formulation of requirements and resources that are necessary to ensure urban street experiments can contribute to long-term change.

1.5 Research question

Thus, this thesis will explore the main research question of: *How can street experiments contribute to urban mobility transitions?*

The main research question will be answered via two sub-questions:

1. *How can street experiments be conceptualized within sustainability transitions literature?*
2. How can the urban context facilitate or hinder the potential for experiments to diffuse their innovations beyond their immediate temporal and spatial boundaries?
3. *Through which practices do street experiments diffuse their innovations beyond their narrow spatial and temporal boundaries?*

2. Theoretical Framework

This chapter will summarize the theory gathered from the literature review. First, transition theory will be explained as it serves as the basis for this research. Subsequently, the concept of experimentation will be unpacked, including how it fits in within sustainability transitions literature. The characteristics, mechanisms and conditions under which experiments can contribute to transitions will be expanded and reflected upon which will ultimately result in a visual summary of all concepts used to answer the research question.

2.1 Transition theory

Transportation studies have traditionally been pervaded by neoclassical, engineering and technological approaches that emphasize technology, economic instruments or infrastructure provision in achieving sustainable mobility (Geels, 2012). However, as mentioned in section one, progress towards sustainable mobility has been extremely slow and insufficient which highlights (a) the urgent need to think completely differently about our mobility systems and (b) embrace and address the complexity of those systems. In this regard, sociotechnical transition theory (henceforth, 'transitiont theory') is the most appropriate as it addresses both of those points. Furthermore, transition theory contains concepts that explicitly address the role of experiments in bringing forth system (i.e., mobility) change and thus it could directly be applied to explore the impacts of street experiments on cities.

As aforementioned in section one, mobility is a system and specifically, a socio-technical system that needs to transition towards more environmentally and socially sound ways of meeting human needs. A socio-technical system is defined as a stable configuration of institutions, norms, values, practices, networks and technologies within a specific domain, that embody a dominant way of satisfying human needs (Brown and Vergrat, 2008). This perspective embraces the complexity of sustainable mobility as it implies that solutions cannot be found within one societal domain, by one type of actor or through a single technology. These systems exhibit deeply vested interests regarding the best practices and technologies, established user practices, lifestyles and institutions that determine the path of their development which create path dependency and lock-ins (Markard et al., 2012). This means that it is easier and more cost-effective for a system to continue its current unsustainable path and thus any change or innovation is usually slow and incremental.

Opposing the inherently stable and predictable nature of socio-technical systems, transition theory was developed to understand and encourage a specific kind of societal change, a *transition,* which is a fundamental change in the dominant mode of meeting a societal need such as energy, mobility, agriculture and so on (van den Bosch and Rotmans, 2008). Research on transitions has shown that for challenges like sustainable mobility, technological innovation or system optimisation alone will not suffice and rather, the entire system needs to completely change which coincides with point (a) (Wirth et al., 2019). System innovation can be understood as deep, structural changes of the markets, practices, cultures, institutions and even life styles that underlie the respective sector that the challenge lies in. Moreover, 'socio-technical' stresses the mutually reinforcing relationship between technological and social innovation. This thesis in particular will focus on social innovations such as planning institutions, mobility policies and everyday user practices and behavior. Rotmans et al., (2001, pg. 16) defined a transition as "a gradual, continuous process of structural change within a society or culture". Key here to understanding transitions is their long time horizon which usually spans one generation or 25 - 50 years (van der Brugge et al., 2005). This implies that theoretically, a single experiment should only facilitate incremental progress towards a transition rather than completely changing the entire system. It is the nature of this incremental progress or 'steppingstones' that this thesis is interested in.

2.1.1 Multi - Level Perspective

Furthermore, within transition theory a few key concepts have been developed that arguably simplify the complex nature of transitions, so they are understandable and manageable for academics and practitioners. Within research aiming at understanding and explaining long-term, societal structural changes the multi-level perspective (MLP) was developed (van der Brugge, 2005). Rooted in innovation studies, the MLP delineates between three different societal levels that transition processes occur and are influenced by, namely the micro (niche), the meso (regime) and the macro (landscape) levels (Geels and Kemp, 2000).

Niche

The niche level is the source of radical innovations, deviations from the status quo and alternative social practices and technologies (van der Brugge, 2005). The niche level provides a temporary, 'protected' space that nurtures new practices and innovations that eventually allow them to compete with dominant, unsustainable structures and practices and hopefully, replace them. A protected space can be created through financial means (i.e., subsidies, investment), legal means (i.e., exemptions from taxes and regulation, institutional means (involvement of powerful actors) and environmental (i.e., creating a space that inspires creativity) (van den Bosch and Rotmans, 2008). In the context of this research, street experiments are defined as niche

environments as they stray from the entrenched rules, practices and norms of urban design and transport policy. The scale that these experiments occur on range from one neighborhood street to multiple streets in a city. In regard to the transformative capacity of the innovations within niche environments, Smith and Raven (2012) differentiate between two modes of change, namely 'fit and conform' and 'stretch and transform'. The former mechanism implies that the sociotechnical innovation becomes competitive within an unchanged regime environment whereas the latter implies that the innovation transforms the regime environment and prompts institutional and societal internalization of its environmental values (IBID). In respect to transitions towards sustainability, 'fit and conform' poses some drawbacks. For example, aligning socio-technical innovations with incumbent institutional norms and structures can be disempowering for sustainability as it essentially means that sustainability values and improvements that drove the innovation must be downplayed. Therefore, the 'stretch and transform' mechanism is more favorable when transitioning societies towards sustainable practices, yet this process is not entirely dependent on the niche level but also on processes within the regime and broader society (i.e., the landscape level). To institutionalize niche practices, attracting resources and power to participate in political debates over the future shape of institutions is crucial and thus, empowering niche innovations should be a collaborative effort between niche and regime actors (Smith and Rave, 2012).

Regime

The regime level is the dominant way a societal need is met through its structures, practices and cultures that are pervaded by vested interests and incumbent power (van den Bosch and Rotmans, 2008). Structures can be institutional (i.e, organizations, power structures), physical (i.e., infrastructure, technologies), economic (i.e., financial) and refer to the ways in which actors *organize* how they do things. Practices are all of the activities (i.e., routines, daily behaviors) that characterize how actors work, behave, or *do*. Actors can range from civil society to business organizations and/or government bodies. Finally, culture refers to the shared images and values that frame a perspective from which action is taken and thus changing culture implies shifting *thinking* and perceptions (van den Bosch and Rotmans, 2008). The three structures constitute the dominant way of doing, organizing and thinking (DOT) and are central in understanding what niche innovations (i.e., experiment innovations) aim to change. Generally change at the regime level is slow due to sunk investment costs like infrastructure, vested interests, habits and bureaucracy which provide stability and lock-ins while constraining flexibility and opportunities for radical change (Whitmarsh, 2012). For example, the mobility regime in most Western countries is dominated by an automobility lock-in which implies a heavy reliance of the transport system on motorized, individual transport (Berger et al., 2014). This means that not only civil society largely depends on cars to move and commute but also that land use planning primarily serves the interests of cars (i.e., street designs that favor motorized vehicle drivers and policy instruments

dominated by technical solutions and know-how). Thus, shifting away from the automobility path is extremely difficult since the alternatives developed in niche environments are generally more expensive, require drastic changes in people's everyday behavior, do not fit in with existing regulations or lack the necessary support (Geels, 2012). Moreover, research on small scale experiments with sustainability as a normative goal has shown that their innovative practices seldom get fully assimilated into dominant practices but rather these niches act as stepping stones towards a regime shift (Hoogma et al., 2002; Smith 2007). The nature of these 'stepping stones' or 'seeds of transformation' is the primary interest of this thesis.

Landscape

Finally, the exogenous landscape level encompasses the regime and niche and it includes broader (i.e., city wide) environmental, political, social, and demographic trends (Whitmarsh, 2012; Schönfeld and Bertolini, 2017). It is the broader societal context that can not be directly influenced by the regime or niche (van den Bosch and Rotmans, 2008). Landscape level developments can induce destabilizing pressures on the regime level which open up windows of opportunity for niche level developments to proliferate into the regime. On the other hand, they can also induce stabilizing pressures, which make it harder for niche level developments to proliferate into the regime (IBID). According to Brown and Vergrat (2008), large scale disasters and unpleasant societal surprises (i.e., crises) could induce collective self reflection which may lead to shifting perceptions of the adequacy of the dominant socio-technical system. Thus, landscape level developments can either slow down or speed up a transition.

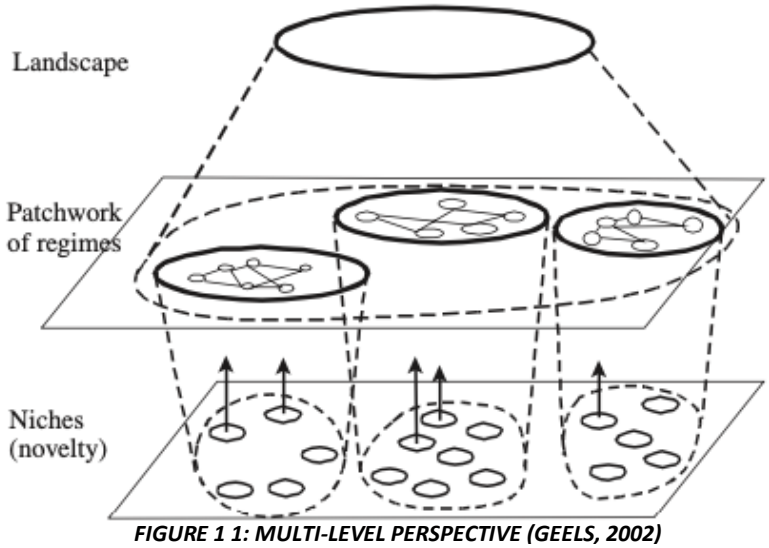

FIGURE 1 1: MULTI-LEVEL PERSPECTIVE (GEELS, 2002)

2.1.2. Transition Management

The previous concept deals with *understanding* transitions yet the governance approach of transition management (TM) is concerned explicitly with *influencing* transitions towards sustainability (van den Bosch and Rotmans, 2008). Amongst a portfolio of TM instruments,

experimentation is an important tool to stimulate transitions (IBID). However, experimentation is only seen as a successful instrument if it is combined with other instruments in the TM cycle. Such instruments include: problem structuring, establishing a transition arena, developing coalitions, networks and transition agendas, monitoring and evaluating the results (Loorbach, 2007). There is not enough space or time for this research to include the other instruments in its analysis and thus, only experiments and specifically their influence on wider society will be explored. The concept of experimentation will be unpacked in the following subsections.

2.2 Experiments

The concept of 'experimenting' is central to the philosophy of transitions. To accelerate societal change towards sustainability, transitions literature highlights purposive experimentation as an important driver of innovation within socio-technical niches and thus, structural regime change (Wirth et al., 2019). The logic behind experimentation is to provide a means to translate long term societal visions and goals into more short term, concrete actions (Karvonen and van Heur, 2014). In other words, experiments embody a novel and a more sustainable socio-technical configuration of meeting human needs within a domain like mobility, which is tested in real life settings to learn about what works and what does not. The standing assumption is that if experiments are successful on a local niche level, they should be scaled up to contribute to the transformation of the unsustainable socio-technical system at the regime level (Sengers, 2016).

The definition of socio-technical experimentation is rather broad and strays from the natural sciences definition. In the context of experimenting for sustainability, experimentation implies a "purposive intervention in which there is more or less explicit attempt to innovate, learn or gain experience" (Bulkeley and Castán Broto, 2013, pg. 363). Experimentation can be spontaneous or organized and the city may serve as the site for or the object of experimentation (Farelly and Brown, 2011; Evans, 2016). For this research, the focus is on experimentation where the city, or more specifically city streets, are the focus of the experiment. Moreover, experimentation is a collective process involving a plethora of actors like businesses, universities, government officials, civil society and non governmental organizations. All stakeholders work together in an iterative process of learning by doing and vice versa, to better understand how innovations works in real life settings while navigating problem definitions and thus, reducing uncertainty about future development (Wirth et al., 2019). It must be noted that theory stresses that the eventual aim of socio-technical experiments is to contribute to achieving a societal transformation in the direction of sustainability (Sengers, 2016).

From the inception of the transitions field in the 1990s, there has been a great expansion in the diversity of terms used to categorize socio-technical experiments. These include concepts like

'niche experiments' (Kemp et al., 1998), 'bounded socio technical experiments' (Brown et al., 2003), 'transition experiments' (van den Bosch and Rotmans, 2008), 'sustainability experiments' (Bai et al., 2010), and grassroot experiments (Seyfang and Smith, 2007). The different experiment types contain similar albeit different conceptual vocabularies that express their unique characteristics like their normative orientation or the actors involved. For example, the goal of sustainability experiments is to achieve sustainability, the goal of transition experiments is to stimulate transitions based on broadly defined societal goals, and grassroot experiments aim to develop green niches through social innovations (IBID). In addition, experiments can be geared towards introducing a novel technology and/or a novel social practice and this depends on the experiment type. Another dimension that differs between experiment types is the analytical emphasis (i.e., the ways that they are analyzed by researchers). For example, niche experiments that aim to stimulate the creation of niche environments are analyzed via three nurturing strategies and have an implicit aim to influence the wider transition process (Caniëls and Romijn, 2008). On the other hand, transition experiments literature posits three strategies that enable experiments to influence wider society (van den Bosch and Rotmans, 2008) while sustainability experiments literature puts forth five types of transnational linkages (Berkhout et al., 2009). The types of actors that initiate or are critical to the experiment also differ per experiment type. The literature on niche experiments emphasizes the role of 'regime outsiders' (Van de Poel, 2000) whilst transition experiments emphasize 'front runners' (Loorbach and Rotmans, 2010). The actors from these two experiment types are business/government focused. Literature on grassroot and bounded socio-technical experiments have a different focus. They emphasize the role of civil society and local communities as important drivers of transitions towards sustainable development (Seyfang and Haxeltine, 2012).

The types of street experiments that this research will focus on are ones that are conducted with the intention of repurposing streets away from motorized traffic towards different functions of public space. In other words, experiments that aim to create fundamentally different arrangements of urban mobility and re-imagine urban life. The street is not simply the backdrop but is the focal point of the experiment. The starting point for all three experiments is a complex societal problem, i.e., how to organize urban streets to serve people and active transport rather than cars, and therefore increase liveability. This also means that the types of experiments that this research is interested in focus on social innovations, rather than technological ones. However, the scale, the intention, and the types of actors who initiate and are involved differ per experiment.

For this research, it is interesting and relevant to explore how experiments initiated by both government as well as by civil society organizations can contribute to transitions in urban mobility as they may provide different insights into practices, strategies and their relative power to

influence transitions. It would be expected that government initiated experiments would have more power since it involves regime actors who can directly influence institutions and thus indirectly civil society. On the other hand, government experiments may not be as radical or innovative as grassroot experiments for the same reasons, and thus provide meager contributions to sustainability transitions. Thus, conceptually and analytically two different types of experiments can be distinguished which will be expanded on in the following subsections.

2.2.1 Grassroot Experiments

Grassroots operate through a network of activist and civil society organizations, who generate "novel bottom-up solutions for sustainable development", and whose solutions respond to local situations and address the interests, values and needs of the communities involved (Seyfang and Smith, 2007, pg. 585). Grassroot initiatives can include cooperatives, neighborhood associations and informal community groups and may take on various forms such as organic farming initiatives or low impact housing (Sengers, 2016). Grassroots predominantly operate in the civil society realm and involve committed activists who experiment with social innovations as well as green technologies (Seyfang and Smith, 2007). Chanan (2004) identified the majority of grassroot groups to be small-scale, low profile, voluntary and citizen led initiatives who oftentimes worked alongside official or semi-official groups in a complementary or competitive relationship. This reinstates the idea that niche groups (e.g., grassroots) may need support from regime level actors (e.g., official groups) to empower their innovations. Even though operating at a local and oftentimes neighborhood scale, community action and innovations are important when considering sustainable development on all scales (IBID).

Grassroot initiatives possess certain benefits and challenges that are unique to them, which may also hold implications for practice and diffusion (Seyfang and Haxeltine, 2012). The benefits of grassroots for sustainable development are very similar to the benefits derived from experimenting in general, as they open up space for: creating and testing novel ideas and practices; experimenting with innovative systems of provision; allowing people to express bold and alternative values; as well as tangible sustainability improvements albeit on a small scale (Seyfang and Smith, 2007). On the other hand, the principal challenges that grassroots come to face are related to maintaining a viable structure and space within an unsustainable regime. This challenge is translated into issues regarding obtaining funding, which has an impact on the possibility to institutionalize the innovation or consolidate what was learnt, to manage the organization and any of its changes, to effectively network and link up with other societal actors, and even diffuse innovative ideas into wider society (Seyfang and Smith, 2007; Seyfang and Haxeltine, 2012).

Analytically there is no widely developed method used to analyze the contribution of grassroot initiatives on sustainability transitions. Seyfang and Smith (2007) examined the innovative potential of grassroots via the evaluation of intrinsic and diffusion benefits. Intrinsic benefit implies the grassroot was operating for its own sake with no explicit intention for regime change whereas diffusion benefit implies that the grassroot explicitly seeked regime change (Seyfang and Smith, 2007). The conclusions drawn were that innovations from grassroots with mainly intrinsic benefit remained very localized and improved the lives of the local communities. They delivered sustainability benefits to communities where top-down, national government interventions failed to do so due to their lack of contextualized knowledge and inflexible procedures. On the other hand, innovations within grassroots that had diffusion benefits held substantial power to change incumbent socio-technical regime systems. Their radically different values and actions that starkly contrasted the regime offered opportunities to critically reflect and assess unsustainable practices within incumbent systems of provision and thus, develop new perspectives on how 'things should be'. However, the general consensus was that there is not enough research to understand the direct links between niche level grassroot innovations and socio technical regime change (Seyfang and Smith, 2007).

Most recently, Seyfang and Haxeltine (2012) studied the potential of the Transitions Town movement (a civil society initiative) on systemic change in the context of sustainability transitions using the practical governance approach of Strategic Niche Management (SNM). Moreover, it focused on social innovation rather than technological innovation which has been the primary focus in literature on socio-technical transitions (Seyfang and Haxeltine, 2012). The authors used the three key concepts from Kemp et al., (1998) on ways in which niche innovations can influence the regime, namely: replication, growth in scale and translation. Their analysis revealed that SNM theory is a fruitful lens to analyze the growth and diffusion of grassroot social innovations from niche to regime, even though SNM theory has a technologically orientation. Since grassroot experiments do not possess their own, specific theories of innovation development and diffusion, SNM theory offers a useful lens to explore that. Ultimately, SNM explores how innovations in niche environments, i.e., grassroot initiatives, develop and grow their innovations and how those processes can be used strategically to influence and potentially replace the existing socio-technical regime (Hargreaves et al., 2013).

2.2.2 Transition experiments

The second type of experiment that this research will focus on is transition experiments, which can be characterized as particular innovation projects that explicitly attempt to find new ways to meet societal needs like for energy, mobility or health care (van den Bosch and Rotmans, 2008). They aim to solve persistent and uncertain societal problems and similarly to grassroot

experiments, these are not limited to technological innovations but also include institutional, socio-cultural, legal and so on (IBID). In the Dutch policy domain, transition experiments have been utilized as a governance instrument to transition into more sustainable societies, and are considered as part of the toolset of TM (van den Bosch and Rotmans, 2008; Sengers, 2016). Its theoretical development derives from *complex systems theory* which posits that small changes can result in large consequences (Kauffman, 1995) and *innovation theory* which stresses the importance of creating innovations in niches (Levinthal, 1998). Moreover, transition experiments are closely related to and build on the concepts of Strategic Niche Management (SNM) and Bounded Socio-Technical Experiments (BSTE) yet they differ in a couple of critical ways.

SNM and BSTE are very technical in nature meaning their starting point is a technological innovation, such as experimenting with electric vehicles. Conversely, transition experiments take a societal challenge as their starting point, such as how to meet the needs for transportation in more sustainable ways (van den Bosch and Rotmans, 2008). They further differ from other, more conventional types of innovation projects where the starting point is oftentimes a predefined goal or solution rather than a persistent societal problem (van den Bosch and Rotmans, 2008). A feasible scale is utilized to test out alternative practices, with the intention to scale up (Roorda et al., 2012). For this research, the feasible scale is a street. Transition experiments should also be linked to larger and more long-term visions and goals in their respective contexts such as a city, as the normative goal of such experiments is to serve as stepping stones in achieving those goals (Sengers, 2016; Rosenbloom et al.,, 2018). Particularly, transition experiments aim to translate broad societal objectives into smaller, concrete steps (Loorbach, 2007). Unlike civil society in grassroot initiatives, for transition experiments frontrunners are of critical importance (van den Bosch and Rotmans, 2008). TM literature posits that frontrunners should be people who are heavily involved in sustainability issues, who bring novel ideas and who can transcend organizational boundaries (Sengers, 2016). The latter point is especially important for the effectiveness of transition experiments in regards to diffusing its innovative practices into wider society, which will be expanded on in its analytical dimensions. Frontrunners should possess a portfolio of transition experiments that are in accordance with broader societal goals and sustainability objectives of the respective context and are therefore also complementary to each other (Sengers, 2016). In addition, front runners should be a group composed of people from a variety of backgrounds such as government officials, citizens, businesses, NGOs, arts and media and so on (IBID).

Inherent to transition experiments are three characteristics that define them and which allow them to contribute to socio-technical transitions (Caprotti and Cowly, 2016; Sengers, 2016; Wirth et al., 2019). Thus, it is necessary to unpack the three concepts, namely: *societal challenge, innovation and learning.*

Societal Challenge

Transition experiments take a long term societal challenge as their starting point which may be positioned at the level of a societal sector or a region (Rotmans, 2005). These challenges give meaning and direction to transition experiments, guiding the search and learning process so that regions and/or societal sectors could meet societal needs more sustainably (van den Bosch and Rotmans, 2008). Moreover, these types of societal problems could be labeled as *complex* because they are deeply embedded within the dominant practices, culture and structure of society which implies that they cannot be solved in the short term (Loorbach, 2010). This deep embedding also means that solutions to these problems cannot be found within the dominant way of thinking or by a homogeneous group of actors. In other words, these types of problems can not be solved by a singular technology or a single sector, company or institution with entrenched rules and regulations. The societal challenge and questions that experiments in this thesis have addressed are: “how can urban streets and spaces be designed in such a way that would give priority to pedestrians and slower transport modes, promote liveability and reduce car dependence?”.

Innovation

The second defining concept of transition experiments is innovation, which can be regarded as something new (van den Bosch and Rotmans, 2008). In the context of transition experiments, innovations are characterized as ‘systems innovations’ as they go beyond the classic forms of innovation of products or services. Whilst systems innovations may still include product innovations they also address organizational, cultural and structural innovations at a level of a societal subsystem (IBID). Related to the MLP, these innovations aim to fulfill a societal need in fundamentally different ways through changing dominant ways of DOT at the regime level. Even though societal challenges like how to reorganize urban mobility and space operate on a large scale (i.e., a sector), innovations on smaller scales like neighborhoods can still offer valuable contributions. The mechanisms through which this is theoretically possible will be discussed in the following sub section.

Learning

Learning, and in particular the interactive relationship between doing and learning, is a crucial component of transition experiments (Rosenbloom et al., 2018). According to the Marriam-Webster dictionary, learning can be generally understood as the process of gaining knowledge or skills through various means, one of which is through experience. In regards to transition experiments, learning facilitates a transition through experiment actors developing new ways of DOT (van den Bosch and Rotmans, 2008). Unlike experiments in the natural sciences, transition experiments take place in a real-life environment which, according to SNM literature, allows for

high quality learning. Raven (2005) posits that successful experiments should possess (a) *broad* learning processes, which means understanding the societal problem from multiple perspectives (i.e., institutional, technological, environmental etc.) and how those dimensions interact with one another (b) *reflexive* learning processes or questioning the underlying assumptions, values, perceptions of a problem (or the DOT). In addition, research on sustainability transitions has also pushed for (c) social learning or a process whereby multiple heterogeneous actors interact to form new perspectives on reality (Leeuwis, 2003). The latter form of learning is key in the transition processes as it implies a change in the 'frame of reference' and prevailing (and oftentimes 'unsustainable') perspectives of actors involved (Rotmans and Loorbach, 2006).

Rosenbloom et al., (2018) research on transition experiments in a low carbon context revealed two types of learning processes that are important. The first type of learning is internal learning, which implies learning about the experiment itself. Transition experiments allow for the "opportunity to tinker with new approaches, practices and institutions on a small scale and/or temporarily" (Kivimaa et al., 2016, pg. 2). Thus, by testing out novel approaches to practices it is to not only possible to reveal whether this new model works but also which aspects of the innovation are the most promising and could be replicated elsewhere or on a larger scale (Rosenbloom et al., 2018). The second type of learning is external learning which implies observing how the innovation interacts with the established system within which it operates (i.e., the regime context). This could shed light on any obstacles for diffusing the innovation into the mainstream, such as a mismatch between the new design of the street and social behavior and acceptability. Hence, consistent assessment, reflection and evaluation is necessary for transition experiments to successfully diffuse their innovations into the mainstream and thus, move society more confidently in the right direction of change. It should be noted that not every experiment is guaranteed to be 'successful' or be mainstreamed (Schot and Geels, 2008). What is critical are the lessons learnt from every experiment as they give direction for progress, with failures often serving as the best opportunities to learn (Romijn, Raven and de Visser, 2010).

2.3 Conditions

Section 2.2 unpacked the theoretical understanding and conceptualization of the street experiments. Section 2.3 and 2.4 will unpack how the external environment (*conditions*) may encourage or hinder the transformative potential of those experiments. Finally, specific ways (*mechanisms*) that the experiments can influence wider society will be discussed.

Unlike experiments in the natural sciences, urban experiments do not occur in isolated spaces and are embedded within a broader city context. According to theory, the niche is interrelated to the regime and landscape and all three levels influence each other and are important during the

transition process. Thus, landscape and regime level developments are also relevant to explore when trying to understand how experiments can have an influence beyond their immediate boundaries. de Haan and Rotmans (2008) elaborated on three conditions that, if were to arise, would compromise the functioning of the societal system (i.e., the regime) which would in turn provide fertile ground for a transition of that system.

Tensions

Tensions refers to problems within the environment of the societal system. Particularly, it means problems with the functioning of the regime in relation to its external environment. In the context of this research, tensions occur when developments within the landscape level (i.e., the external environment), for example the wider social and environmental developments at the country level that are beyond the control of the regime, negatively influence the regime. In turn, this opens windows of opportunity for the regime to change. de Haan and Rotmans (2008) posited that tensions could include problems like resource depletion, environmental awareness, and pressing public opinion on certain issues. However, my own themes will be inductively explored throughout the data collection process.

Stress

The second condition is stress, which is defined as the malfunctioning of the regime itself. Signs of stress would manifest if the regime is in mismatch with what it initially intended to provide and what it currently provides, or if its provision of meeting societal needs is inadequate. For example, streets were initially and for a long period of history planned to serve the interests of public space rather than the private car and in some places like the developing world, that is still the case (Schönfeld and Bertolini, 2017; Mehta, 2015). Furthermore, transportation systems play a crucial role in the daily lives of people, who rely on it to commute and carry out other social functions (Arnold, 2013). When these needs cannot be met, the transportation system could be perceived as being *stressed*. The malfunctioning of the regime can be studied through its components as discussed in section 2.1.1. Namely, *doing* (how people move around), *organizing* (institutions and infrastructure), *thinking* (shared images and values from which action is taken).

Pressure

Finally, pressure refers to the emergence of alternatives such as a new technology or innovative systems of provisions that directly compete with dominant structures (i.e., the regime). It could be understood as niche-innovations diffusing into the regime level and creating direct competition. In the case of this research, street experiments could be understood as niche innovations that are directly competing with the regime, causing pressure to change. How street experiments create pressure will be addressed through mechanisms in the following section.

2.4 Mechanisms

Mechanisms refer to the modes of diffusion of innovative practices from experiment (niche) to the wider niche or mainstream context (regime).

2.4.1 Transition Experiments

The analytical emphasis of transition experiments is on three mechanisms, namely: deepening, broadening and scaling up.

Deepening

Deepening refers to a learning process through which experiment participants gain as much knowledge about the nature, purpose and limiting conditions of the experiment in a particular context (Sengers, 2016). Furthermore, it means learning in a specific, local context how to meet a societal need in a fundamentally and radically different way, including the barriers and opportunities to make the experiment more permanent (van den Bosch and Rotmans, 2008). This strongly coincides with literature on sustainability transitions which emphasizes social learning processes whereby actors, through interaction with others, develop alternative perspectives on reality (Wals et al., 2007). In regards to what is learnt, it may be new practices, habits, and routines (*doing*), it may be about the way the institutional and/or physical environment is set up (*organizing*), or changes in ways of thinking, values, and perspectives (*thinking*) (van den Bosch and Rotmans, 2008). Furthermore, Loeber et al., (2007) has emphasized 'systems learning' within innovation projects, which is a process of reflecting on the interrelationship between structures and practices. For example, the transition experiment Rush Hour Avoidance learnt about how changes in a financial reward system (structure or *organizing*) affected mobility behavior (practices or *doing*) (van den Bosch and Rotmans, 2008). This is based on the idea that structure influences behavior and so by changing the underlying structure it is possible to alter patterns of behavior (Senge, 1990). Transitions literature also posits that behavior (i.e., doing) can also influence structures (i.e., organizing) and culture (i.e., thinking) and thus, this dynamism is what makes it possible to change in a sustainable direction (van den Bosch and Rotmans, 2008).

Deepening can be incentivized through providing a safe space to experiment, encouraging social learning processes, and providing support when challenges and problems arise (Sengers, 2016). In addition, it is crucial that experiment organizers and/or leaders implement adequate monitoring and evaluation during and after the experiment (IBID).

Broadening

Broadening is an important concept within transitions literature and it refers to repeating the experiment in diverse contexts and consequently learning from those related experiments (Rotmans and Loorbach, 2006). It suggests that different yet similar experiments can build on one another to eventually emerge as a field or community (Geels and Raven, 2006). Broadening refers not only to repeating the type of experiment but also to repeating the new ways of DOT in different contexts, which implies an increase in influence and stability of the experiment (van den Bosch and Rotmans, 2008). It is important to highlight that broadening generally refers to repeating with some variation, meaning that each experiment should be a slightly different endeavor (van den Bosch and Rotmans, 2008). This is supported by research on innovations by Levinthal (1998), who states that structural change (i.e., regime shift) only takes place when an innovation has had time to develop, change and grow in a niche before it can enter the mainstream context. Variation can include having different learning objectives, different partners, goals and activities. Each new context holds different opportunities and barriers for experiments which means more opportunities to learn and adapt the experiment to different localities. Broadening can be stimulated by allocating enough resources to replicate the experiment elsewhere, facilitating interaction between the different experiments, creating a network, and sharing and making the learnings widely accessible (Sengers, 2016).

Scaling up

Scaling up refers to the embedding of alternative ways of DOT into the mainstream context or regime (van den Bosch and Rotmans, 2008). However, within literature on transitions there are generally two ways that authors conceptualize scaling up. The first way is placing the focus on niche development, or understanding scaling as an accumulation of many experiments in a niche environment to create a 'global niche' or an emerging field/community, that will eventually lead to regime shift (Weber et al., 1999; Geels and Raven, 2006). The second understanding is the direct translation of radical and alternative ways of DOT into the mainstream, regime context (Smith, 2007). This implies the embedding of the experiment in society and existing institutions (Kivisaari et al., 2004; Rotmans and Loorbach, 2006). In other words, the first understanding conceptualizes scaling as the expansion of the number of experiments whereas the second understanding conceptualizes scaling as the translation of deviant ways of DOT into the regime. The second one seems like a better fit for understanding transitions since it implies that the alternative, more sustainable ways of DOT are increasingly becoming the dominant way a societal need is met rather than simply repeating experiments. However, both are valid in transition literature.

Empirical research on transitions has shown this step to be extremely challenging because new practices developed in experiments adapted to those specific environments, which makes them difficult to be adapted into mainstream environments (Smith, 2007). Whilst this is a valid

observation, the translation process between niche and regime is not a single step but rather a series of small, intermediary steps. Thus, broadening the experiment into different contexts is a crucial step between deepening within one experiment and scaling up into the regime. It should also be noted that scaling up transition experiments is different from geographical scaling up or the scaling up of markets. For transition experiments, what is important to scale up are perspectives, cultures, routines, values, norms, procedures, institutions, policies etc (van den Bosch and Rotmans, 2008). Douthwaite et al., (2003) typology of three different types of scaling supports this notion. In his typology, which has been used in empirical studies on projects that influence change in complex agricultural systems, scaling up is distinguished from scaling out (i.e., geographical expansion) and spatial scaling (i.e., increasing operation size). Scaling up refers to an institutional expansion from frontrunners and niche players to other key players within the regime context (such as wider civil society, policy makers, government officials etc), that have the power to realize actual changes in the regime (Douthwaite et al., 2003).

This typology highlights the importance of key stakeholders, which is also emphasized in transition literature (van den Bosch and Rotmans, 2008). Ultimately, a principal notion in Transition Management is that no single actor has the capacity to control the transition process in a fully bottom up or top down approach (Rotmans and Loorbach, 2006). Thus, whilst niche players are crucial in conducting the experiments, front runners are just as critical. Front runners are actors who have the power and will to directly influence the regime such as: government officials, policy makers, ministries etc. Other frontrunners include civil society, NGOs and businesses who all have the power to indirectly influence the regime through having a strong interest to adopt sustainable practices (van den Bosch and Rotmans, 2008).

2.4.2 Grassroot initiatives

SNM theory proposes three principal ways through which niche innovations can influence the regime, namely: replication, scaling up and translation.

Replication

Similarly to broadening for transition experiments, replication is the spread of experiments in a niche environment through dedicated activists or niche players (Boyer, 2015). It is assumed that multiple small experiments will have aggregative effects which will eventually lead to changes in the regime (Seyfang and Haxeltine, 2012). Empirically this is one of the most observed pathways of grassroot innovation development. For example, Seyfang (2010) observed how a grassroot, straw bale housing initiative spread itself through workshops, trade publications, and through actors interacting with one another across the globe. However, he also noted that the initiative failed to expand beyond its activist following in part because was a complete contradiction to the

mainstream rules and practices of housing production (Seyfang, 2010). In addition, Seyfang and Haxeltine (2012) made a similar observation in their study of the grassroot initiative 'Transition Towns'. As opposed to broadening, literature does not seem to specify the necessity to differentiate amongst different experiments or the necessity to spread its innovative ways of DOT rather than the experiment itself.

Scaling up

Scaling up of grassroot initiatives is slightly different to the scaling up of transition experiments. For grassroots scaling up implies expanding the experiment beyond the group of committed activists to attract a broader group of actors (Boyer, 2015). In other words, expansion in scale of the experiment to a plethora of individuals and groups in other societal domains.

Translation

The previous two mechanisms focus on growth within or of the niche which are necessary predecessors for the mechanism that is more directly involved in regime change. Translation is similar to the scaling up of transition experiments, which implies the adoption of grassroot innovative practices into mainstream settings such as wider society, dominant institutions, and business practices (Seyfang and Haxeltine, 2012). Translation from niche to mainstream context may require grassroot initiatives to compromise and adapt their ideologies and sustainable practices to successfully attract regime actors (Boyer, 2015). Smith (2007) posits that a niche that is ideologically similar to the regime will inspire minimal change or progress towards sustainability, whilst a very radical niche would fail to attract regime actors as embedding its innovations into the mainstream would necessitate too many structural changes. Thus, Smith (2007) proposes that intermediate projects can be a vehicle to translate between niche and regime, since they act as bridges between the contrasting contexts. He uses the example of the Beddington Zero Energy District in South London, a grassroot development that prospered due to the collaboration between niche activists and regime actors (i.e., scaling up). The project required the two groups to spend extra time in special workshops and feedback lessons to understand and create a design criterion (Smith, 2007). It was evident that translation had occurred when both of the distinct groups internalized the design criteria and values of one another into a common framework (Smith, 2007).

However, to date there has been very limited empirical evidence of circumstances where niche to regime translation has occurred from grassroot initiatives. If, as Smith (2007) proposed, intermediary projects between niche and regime actors are required for translation to occur, then for researchers it is necessary to uncover more empirical accounts of what constitutes such projects, how to identify and create them and particularly, how to include regime actors in the first

place. The precise strategies and practices that enable these mechanisms are largely unknown and will be explored in this thesis.

2.4 Conceptual model

Based on the theoretical debates outlined above and the key concepts that can be derived from them, a conceptual model has been created (figure 1), which visualizes the key concepts and how they are connected to answer the research question. This research is interested in transitions in urban mobility and how that can be influenced by street experiments thus, they form the central part of the research which is indicated through the largest dark blue boxed. The dotted line squares delineate the three different levels that transition processes occur on. The conditions that may favorably or negatively affect the experiments are shown in the light blue boxes and are located within the landscape environment (i.e., external context). The mechanisms are depicted in the grey boxes and are the ways that experiments can directly influence the transition process. Ultimately, the experiments are aiming to influence the dominant way of D.O.T., which constitutes the regime.

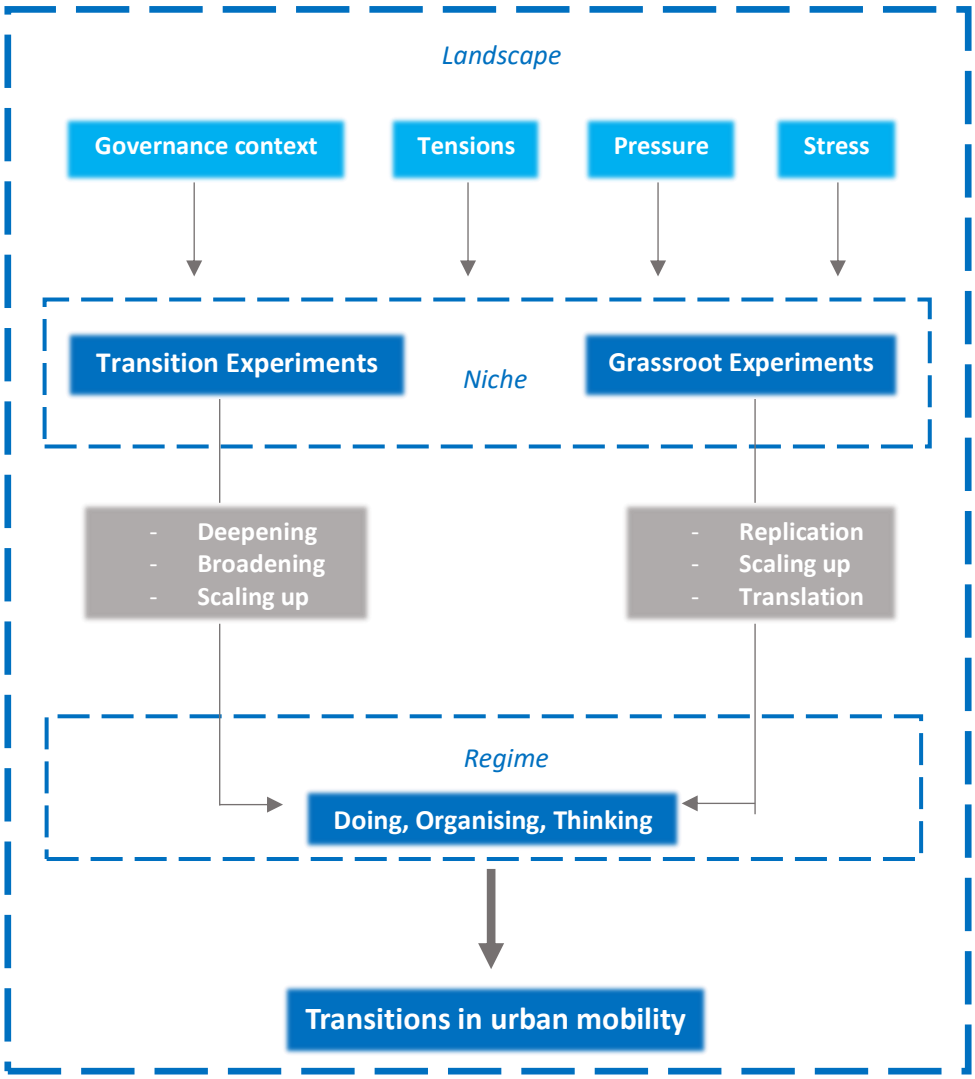

FIGURE 2 1: CONCEPTUAL FRAMEWORK

3. Methodology

This chapter elaborates on and explains the research design and research methods that were utilized to collect and analyse the data to answer the research question. This chapter begins by substantiating why a multiple case study approach was chosen, followed by a description of the cases, then an explanation of the method of collecting and analyzing data, and ending with ethical considerations that were made.

3.1 Research design

A qualitative approach

A quantitative approach seeks to quantify a problem through measuring and counting, using large samples to generalize findings to larger populations (Hennink et al., 2020, p. 17). On the other hand, qualitative research aims for "a contextualized understanding of phenomena, explain behaviour, and beliefs, identify processes and understand the context of people's experiences" (Hennink et al., 2020, p. 17). This explorative thesis is aims to uncover how street experiments can contribute to transitions in urban mobility, which is still a largely unknown phenomenon. The how implies a focus on processes which are largely unknown, which is focused on "processes and meanings that are not experimentally examined or measured in terms of quantity, amount, intensity or frequency" (Denzin and Lincoln, 2011, pg. 8). The aim is to gain in-depth understanding of possible processes experiments that allow experiments to have a wider influence on society, particularly mobility. Furthermore, these processes are heavily dependent on their wider urban context. This disqualifies a quantitative approach and thus calls for a qualitative approach.

Case study research

Within a qualitative research approach, this study embraced a case study research method. This allows the street experiments (i.e., the cases) to be analyzed in depth within their context, making it an appropriate choice for this thesis (Yin, 2014). A case study research method is also a suitable when the case under investigation is a contemporary phenomenon, when it can be studied from outside of its natural environment, and when its theoretical underpinning is yinestablished (Gagnon, 2010). The cases fulfill the three conditions as they are relatively novel within the sphere of urban planning and design and its theoretical base has been established from transition studies. This thesis uses a multiple case study approach so that different types of

street experiments and their respective diffusion mechanisms can be uncovered. Using multiple cases ensures higher methodological rigor and robustness and is also useful when exploring a largely unknown phenomenon (Yin, 1994).

Validity and reliability

Constructing validity and reliability are crucial in ensuring a quality and rigorous research, which means that a systematic procedure needs to be followed (Yin, 2014). Reliability alludes to repeatability and consistency of the results (Yin, 2014). Essentially, if another researcher was to use the same methodology to study the same phenomenon, they should obtain similar findings. To ensure this, the researcher carefully choose the participants and explain that process, provided details on the participants as well as any other pieces of evidence used to gather results (Gagnon, 2010). External validity refers to the confidence that the findings could be applied to other settings outside of this study scope (Yin, 2014). In this case, the results can only be applied to the same cases in a North American context (i.e., city). However, with case study research, it is possible to generalize theoretical debates (Yin, 2018). Thus, the aim is to expand conceptual knowledge analytically, specifically about transition experiments and sustainability transitions. Nonetheless, the findings from these cases may inspire research on similar cases in a different context.

3.2 Case Selection

Choosing the right cases is imperative in achieving a sound case study research, and cases should be chosen based on which can provide the most information. Specifically, cases should be selected based off having specific features that are of interest to the research (Gagnon, 2010). The success of case study research also depends on data availability. Since the researcher was limited in time and capacity, three cases were chosen. The cases were taken from Bertolini's (2020) classification of street experiments. Out of five types of experiments, three created fundamentally different arrangements of urban mobility, namely Parklets, Pavements to Plazas, and Open streets. As these types of experiments are what this thesis is interested in, they were chosen to study. Cases in North America were chosen since American cities generally have a higher automobility rate than European cities (Henderson, 2009). There is thus more potential to make a higher impact on sustainable mobility or there is more scope for improvement.

Defining the cases is imperative to case study research, and the unit of analysis sets the boundaries of what is analyzed within the case (Yin, 2014). Through setting theoretical, temporal, and spatial boundaries the unit of analysis can be determined. The theoretical boundaries were set via the theoretical framework. The key concepts were transition experiments and grassroot experiments, and the cases had to fulfill their defining characteristics. Transition experiments must be initiated by the government, and their starting should be a complex societal problem. Grassroot experiments must be initiated by activists or civil society organizations, and their innovations should serve and address the interests of the local communities involved. The temporal boundary was set through the data collection period which occurred between October 2021 and January 2022. However, each experiment (i.e., the case) was studied in its entirety (i.e., one day events) that occurred in 2021 before data collection. The spatial boundary is the city that each experiment is located in, as this research aims to find out how experiments can influence mobility on an urban scale.

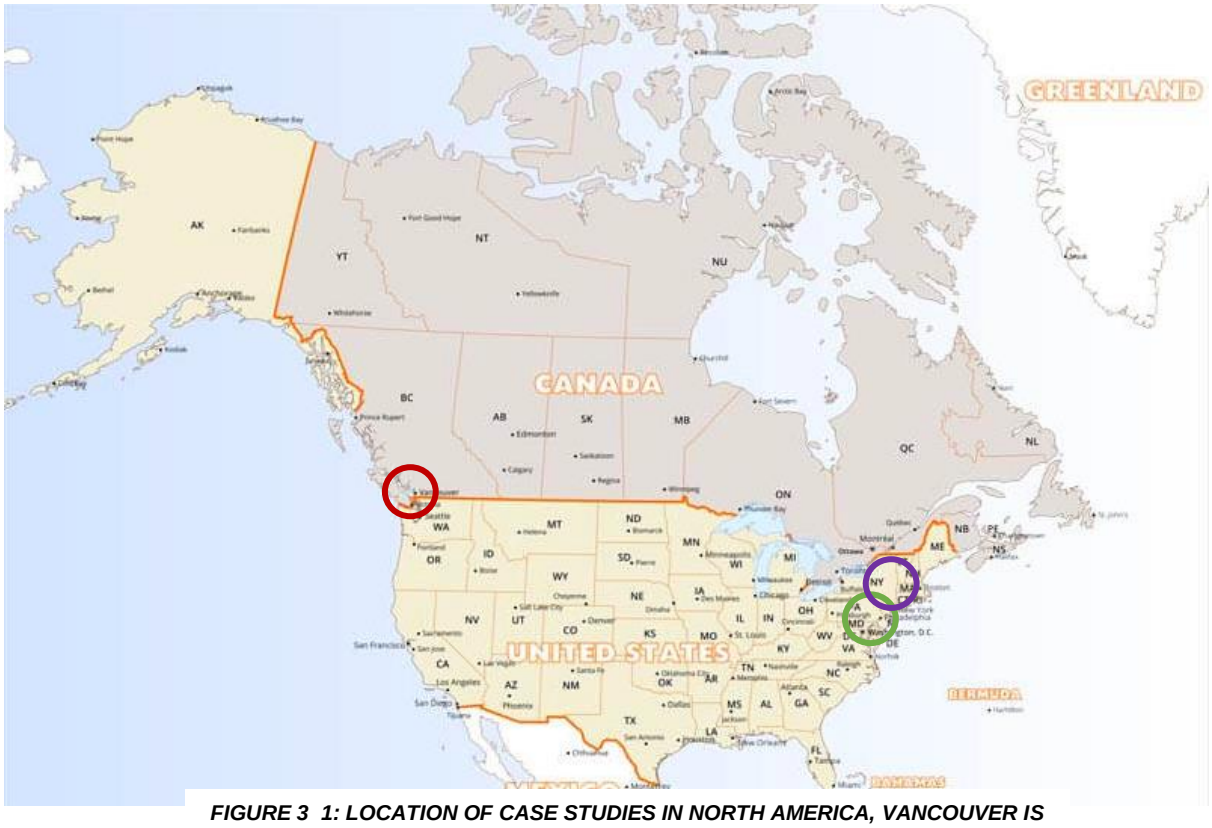

FIGURE 3 1: LOCATION OF CASE STUDIES IN NORTH AMERICA, VANCOUVER IS THE RED CIRCLE, WASHINGTON DC IS THE GREEN, AND PHILADELPHIA IS THE PURPLE (FREE WORLD MAPS)

Based on the unit of analysis as well as the theoretical framework, the following selection criteria were used to select the cases (Table 1).

Selection criteria	Description

Radically different arrangements of urban mobility	The experiments should result in streets as public spaces that prioritize people over cars
North America	All cases should be in North America
Grassroot & transition experiment	At least one case should be a grassroot and one case a transition experiment to see if there is a difference in level of influence.
Enough information	Ensure sufficient information is available for analysis
Contemporary phenomenon	All cases should have started not more than 15 years ago.

TABLE 1: SELECTION CRITERIA FOR CASE STUDIES

3.3 Introduction of the cases

An overview of the cases is depicted in table 2. They are then introduced below.

Case	What	Where
Parking day	Transforming parking space(s) into public space.	Philadelphia
Pavements to Plazas	Transforming a section of a street into a public plaza.	Vancouver
Open Streets	Transforming an entire street into public space.	Washington, DC

TABLE 2 1: OVERVIEW OF CASE STUDIES

3.3.1 Park(ing) Day

Inspired by the original creators of Park(ing) day and parklets in San Francisco, Park(ing) day is a civic initiative that was first organized in Philadelphia in 2008 by Zimmerman Studio who are a collective of Architects (Centre for Architecture, 2020). Every year since then, on the third Friday of September, citizens, activists, designers, and businesses collaborate to transform parking spaces into temporary public mini parks or 'parklets' (Centre for Architecture, 2020). This event aims to celebrate parks and other types of public spaces and raise awareness for the need of more pedestrian friendly public spaces in the city (Parking Day Philadelphia, 2021). All parklets

are self-funded and every year there are about 60 volunteer teams who design, build, and install the 170 square foot temporary installations throughout the city (Centre for Architecture, 2020). At the end of every Park(ing) day, the Centre of Architecture and Design hosts a party that is open to Park(ing) day participants as well as the public where an invited guest provides an inspiring vision of the future of the city's sidewalks and streets (Centre of Architecture and Design, 2020). The parklets take on a variety of shapes and forms that depend on the goals and aims of the groups who install them.

FIGURE 4 1: A PARKLET IN PHILADELPHIA. EXAMPLE OF A SIMPLE DESIGN FOR LOUNGING (PPA STAFF, 2018)

FIGURE 5 1: ANOTHER PARKLET EXAMPLE FROM PHILADELPHIA. MORE COMPLEX DESIGN, AIMED AT ENCOURAGING COMMUNITY INTERACTION (KAMINSKI, 2019)

3.3.2 Pa

The city of Vancouver's Pavements to Plazas is a government program which was officially approved by Council in 2012 through the city's *Transportation 2040 Plan* (Corey and Dunn, 2019). The program is a collaboration between engineers, landscape architects, and community planners who work alongside local communities (i.e., businesses and residents) (Gordon, 2019). Plazas are not the same as parks as they are generally hardscapes, oftentimes with movable chairs and tables with opportunities for community programs and various social activities (Gordon, 2019). The Transportation 2040 Plan envisioned streets as not only important for movement but also for people to gather and enjoy public space (Gordon, 2019). This initiative aims to create "low-cost, high impact public spaces by transforming underused street rights of way" (Corey and Dunn, 2019, pg. 7).

FIGURE 6 1: JIM DEVA PLAZA IN VANCOUVER (HOLMES, 2017)

3.3.3 Open Streets

Open streets in Washington, DC is organized by a government body, namely the District Department of Transportation who started the program in 2019 (Open Streets, 2019). Open Streets temporarily closes a street to all motorized vehicles and traffic and opens it to residents and visitors for healthy and social activities, suitable for all ages and abilities (Open Streets, 2019). The program aims to encourage people to consider alternatives to car use by offering the opportunity to use a city street in a completely new way. Moreover, it aims to encourage local economic development through helping support businesses (Open Streets, 2019). In 2019, three miles of Georgia avenue was closed for one day which is a major corridor connecting diverse

neighbourhoods, historic sites, institutions, and businesses to each other and downtown (Goldsmith, 2021).

FIGURE 7 1: OPEN STREETS WASHINGTON DC (SAIMBRE, 2019)

3.4 Data Collection: framework & techniques

Yin (2009) claims that for case study research it is best to use a variety of evidence via different sources to ensure higher accuracy in analysis and explanation. Different methods have different strengths and weaknesses thus by converging them together, the possibility of coming to a more holistic and 'true' conclusion is higher. Therefore, this study has utilized multiple sources of evidence or data 'triangulation', namely a literature research, document analysis and interviews which will be elaborated on in the sections below.

3.4.1 Literature Research

1. How can street experiments be conceptualized within sustainability transitions?

A thorough literature research was conducted in chapter two which aimed to answer the first sub-question and consequently, set the theoretical foundation by outlining key concepts and theories which ultimately resulted in a conceptual framework (see figure X). It was important to understand the link between street experiments and sustainability transitions to understand possible pathways of diffusion or, in other words, how street experiments can contribute to transitions. All the literature came from English, academic peer-reviewed articles and a conscious effort was placed on using the most recently published papers. The literature was gathered via the search engine SmartCat which is provided by the University of Groningen. To find the papers, search terms such as 'sustainability transitions', 'urban experiments', 'transition

experiments', 'public space', and 'sustainable mobility' were used. In addition, a snowball method was used to conveniently find more related and relevant papers from the citation lists of papers (Wohlin, 2014).

3.4.2 Document analysis

2. How can the urban context facilitate or hinder the potential for experiments to diffuse their innovations beyond their immediate temporal and spatial boundaries?

This research scrutinized four documents to gain a better understanding of the urban context of each case, to understand what conditions may positively or negatively influence the street experiments. Documents could essentially be any piece of written text and can be used to support or counter evidence gathered from other data collection methods like interviews (Yin, 2018). If the information gathered from the documents contradicts data gathered from the interviews, it could be a sign that the topic needs to be explored more in depth. It must be noted that the documents were not made specifically for this research hence the research must keep in mind what information is required and focus on that (Yin, 2018).

With that in mind, the four documents that were chosen were city directives, stating the current state and future vision and goals for the cities. They are all government produced documents and address political, social, and environmental developments that the cities are experiencing. In addition, the documents contained information on the cities vision, goals and strategies for public space and transport because of those wider developments. This allowed the researcher to draw connections between landscape level developments and conditions for street experiments. The documents were publicly available on the internet (i.e., Google) and the following search terms were used to source them: *name of city* and plan/strategy. Park(ind) day has one more additional documents, since the general city plan (i.e., Philadelphia Climate Action Playbook) did not contain a section on public space, whereas the other one did. The analyzed documents are presented in table 3.

Case study	Document name
Park(ing) day	Philadelphia Climate Action Playbook (PCAP) (2021) Connect: Philadelphia's Strategic Transportation Plan (2021)
Pavements to Plazas	Vancouver Plan 2050 (2022)
Open Streets	Sustainable DC 2.0 (2018)

TABLE 3 1: *DOCUMENTS ANALYSED FOR EACH CASE*

3.4.3 Semi- structured interviews

"Through what practices can experiments themselves diffuse their innovations beyond their immediate temporal and spatial boundaries?"

To answer the third research question, empirical data was collected via four semi-structured interviews with the organizers and coordinators of each experiment type.

The interviews allowed the researcher to gain deeper and practical insights into the development, execution, and diffusion processes of street experiments. The theoretical foundation formed in chapter 2 provided the key concepts used to guide the interview process, such as the three mechanisms respective to each type of experiments. A semi-semi-structured interview technique was used meaning the interviewer had an interview guide prepared in advance with specific questions that would ensure key topics were covered. At the same time, significant leeway was given to participants to talk and express other potentially important opinions (Clifford et al., 2016). This allows for interesting topics to come up and follow up questions to be asked that would not adhere to the conceptual framework but may nonetheless be crucial data for the research. However, if the interviewees strayed too much from the topic prompts from the interviewer directed them back to the right direction (Clifford et al., 2016). An interview guide could be found in Annex A. Each interview guide was slightly adapted to the specific experiment.

Interviewees were purposefully selected based on a criterion, otherwise known as 'criterion sampling' (Bryman, 2012). Selecting participants based on a criterion was necessary to ensure an appropriate sample for the research question. The criterion was that the participants had to be involved in the organization and execution of the experiment. Google search allowed the researcher to find relevant street experiments and through their official websites and social media pages such as Instagram find and reach out to corresponding contacts. Since all the interviewees lived and worked in North America, interviews were conducted via video call using the Google Meet service. At the start of each interview, the interviewer introduced herself and her research, explained what the purpose of the interview was and asked for consent to use what they say as data for the thesis. All interviews were recorded and transcribed into a written text that would be ready for analysis. An overview of the interviews can be found in table 4.

Interviewee	Date	Interview duration	Type of Interview
Erike	20/01/22	1h	Video call

Krisztina	11/11/21	1h 20 min	Video call
Kimberly	10/11/21	1h	Video call

TABLE 4 1: INTERVIEW INFORMATION

3.6 Data Analysis

To analyse the data, Gagnon (2010) suggests a three-step process: data purging, data coding, and data analysis.

Data purging

As previously mentioned, interview recordings were transcribed using the software Otter.ai into readable texts to create an appropriate format for analysis. Some of the text that was irrelevant for analysis was removed, such as farewells or discussion about matters not related to the research topic. This process refers to data cleaning or purging.

Deductive and inductive coding

The next step is coding the interview transcripts using the coding software Atlas.ti. Data coding refers to identifying and marking passages in a text that are related to the themes, categories or concepts connected to the phenomenon being studied (Gagnon, 2010). It is therefore possible to categorize the data by grouping together parts and sections that belong to the same category or code. Prior to the interviews and document analyses, a set of theory based deductive codes were formulated based on the theories and conceptual framework in chapter 2. Whilst coding the documents, data-driven inductive codes were made (Cope, 2016). The coding scheme can be found in Annex B.

Data analysis

To analyze the data, the researcher should get immersed in the data and see if any patterns emerge (Gagnon, 2010). Essentially, they are looking at whether the different pieces of evidence converge into similar conclusions (Yin, 2014). During the data collection process, preliminary results have already begun forming through observing patterns and themes which guided the in depth, within case analysis.

3.7 Data interpretation

To interpret the data collected, researchers should use their intuition, creativity, and imagination (Gagnon, 2010). This could mean taking a step back from the evidence, re-reading it a few times, identifying patterns and interpreting means (Yin, 2014). According to Gagnon (2010), three steps

should be followed to interpret data: generating ideas, examining them against collected data, and consolidation with literature.

Generating ideas refers to brainstorming possible explanations for what is observed. The theoretical framework was of great use for this, in combination with personal intuition and creativity. The ideas were then consolidated with the gathered data, and if the evidence was absent then the ideas was rejected. This allows for a contribution to theory by either supporting it or identifying differences between it and the explanations.

3.8 Ethical considerations

To ensure ethical research, preventing biases is paramount. For example, the cases were chosen after the theory to ensure they fit the purpose of the study. However, the research should avoid choosing a case just to support the theoretical debates, concepts, or ideas (Yin, 2018). It is also important for the researcher to remain subjective while conducting the interview to ensure reliable data. In this respect, conclusions were drawn only after all results were gathered and analyzed.

Other ethical issues relate to consent, safety, withdrawal, and confidentiality (Tight, 2017). Consent refers to gaining explicit approval from the interviewees to participate in the interview, considering they knew exactly what they were consenting to. Consent was obtained through receiving a confirmation email from all the participants to an email where the researcher explained the nature, purpose, and other details of the research. Safety implies the interviewees did not incur any harm during the interview process. The concepts of street experiments and urban mobility did not seem harmful or offensive, so safety was not a concern. Withdrawal meant the participants could back out of the research at any given point for any reason, and the researcher made sure to explain this to them at the start of the interview. Finally, confidentiality and anonymity were guaranteed for all the interviewees.

4. Research findings & discussion

This chapter presents the findings gathered from document analysis and interviews to answer sub-questions 2 and 3:

2. *How can the urban context facilitate or hinder the potential for experiments to diffuse their innovations beyond their immediate temporal and spatial boundaries?*
3. *Through which practices do street experiments diffuse their innovations beyond their narrow spatial and temporal boundaries?*

All sub-questions are answered in chapter 5. Based on these results, as well as the literature review from chapter 2, the main research question will also be addressed in chapter 5. Chapter 4 precedes by presenting the findings for the second sub-question and is structured by each condition. This is due to multiple crossovers in the findings between the three cities, and any findings specific to a city will be highlighted. Section 4.2 presents the findings for the third sub-question and is structured per case study since the theoretical mechanisms and respective findings vary. At the end of every section, a discussion of the results in relation to theory is provided.

4.1 Conditions

4.1.1 Tensions

As mentioned in section 2.3.1, tensions are problems within the landscape level which are the wider social, and environmental developments at the city level that may compromise the functioning of the mobility regime and thus, influence the ability fir experiments to diffuse their innovations beyond their immediate spatial and temporal boundaries. Three tensions were identified that resulted in a favourable urban context for street experimentation, namely climate change, population growth and the Covid-19 pandemic.

Climate change: results

All three cities are experiencing climate change related tensions, such as increasing severity and frequency of extreme weather events, rising temperatures and sea levels, and more precipitation (Sustainable DC 2.0, 2018; PCAPB, 2018, Vancouver Plan 2050, 2022). Mayor Kenney of the city of Philadelphia claimed, “climate change to be one of the most pressing issues of our time” (PCAPB, 2018, pg. 21). The city of Vancouver has declared itself to be in a “climate emergency” and consequently expects “significant impacts on residents, businesses, buildings, and infrastructure alike and require new municipal responses and investments not previously contemplated” (Vancouver Plan 2050, 2022, pg.9). Climate change consequences like changing weather patterns are having adverse impacts on infrastructural systems such as roads as concrete and asphalt fail to cope with flooding and extreme heat which leads to flooding events and cracking in the pavement (PCAPB, 2018). The damaged infrastructure makes moving around unsafe and unappealing for pedestrians and cyclists (Sustainable DC 2.0, 2018; PCAPB, 2018). The city of Washington reinstates this notion by claiming rising temperatures to be a growing hazard for roads and urban infrastructure. For example, “these climate change impacts can cause property damage and harm critical infrastructure, the infrastructure we depend on daily, including transportation” (Sustainable DC 2.0, 2018, pg. 43). Due to climate change, each city has formulated a plan with strategies to combat its effects and ensure sustainability. This will be expanded on in section 4.1.2 *Thinking*.

Climate change: discussion

It is apparent that climate change is placed at the top of the political agendas of the cities, through quotes like “one of the most pressing issues of our time” (PCAPB, 2018, pg. 21) and “climate emergency” (Vancouver Plan 2050, 2022, pg.9), as well as the formulation of climate change action directives by each city. This is an example of a destabilizing pressure being exerted on the regime which creates a window of opportunity for niche experiments to diffuse their innovations into the unstable environment, and thus restabilize it in a more sustainable way (van den Bosch and Rotmans, 2008). The “new municipal responses” (Vancouver Plan 2050, 2022, pg.9) suggests the city is embracing novel ways of dealing with climate change related impacts. More specifically, it implies a novel institutional *organizing* which opens windows of opportunity for experiments since they offer novel ways to plan urban spaces towards sustainability. Thus, they could be one solution to Vancouver’s need for a new institutional *organizing*. The damage caused to transport infrastructure implies problems with the dominant ways of physically *organizing* space which hinders the ability for people to move around, especially for pedestrians and cyclists (i.e., sustainable transport modes). In other words, it creates problems with *doing*.

Population growth: results

Whilst all cities reported experiencing population growth (Vancouver Plan 2050, 2022; Sustainable DC 2.0, 2018; PCAPB, 2021), Vancouver and Washington have reported particularly rapid rates of population growth. For example, “Vancouver is a rapidly growing region, anticipated to grow by about half a million by 2050” (Vancouver Plan 2050, 2022, pg. 13) and “the districts population is rapidly growing” (Sustainable DC 2.0, 2018, pg. 105). Furthermore, Washington reports its population to grow by about 80% during weekdays which will only get increasingly severe as the general population grows (Vancouver Plan, 2022, pg. 117). These population developments are creating strains on public space since more people means more demand cars, which in turn means more space will have to be made to park vehicles (Vancouver Plan, 2022, pg. 114). It is also contributing to severe traffic congestion (Sustainable DC 2.0, 2018, pg. 35). Traffic congestions leads to adverse social and environmental problems, and thus should be mitigated (Sustainable DC 2.0, 2018). For example, Washington has one of the worst cases of air pollution in North America which a part of is attributed to cars (Sustainable DC 2.0, 2018). Within the public space strategy, Vancouver posited:

“Over 80% of Vancouver’s street space is dedicated to vehicles. As the city grows, we can transform this valuable public asset to make space for people to gather, walk and bike, and for reliable transit, water management and habitat corridors. This will require a flexible and adaptable approach, balancing core needs of the street and supporting those that need to travel by car” (Vancouver Plan, 2022, pg. 114).

This quote exemplifies Vancouver's recognition of the problematic clash between population growth and the number of vehicles. Furthermore, it shows recognition to 'transform' or completely change what streets look like to accommodate population growth.

Population growth: discussion

It is apparent that rapid population growth is causing strains on the current design of public space, or the dominant way of *organizing*, as well as exacerbating climate change effects. That is due to cities recognizing the link between population growth and car use/commuting (dominant way of *doing*). Thus, this is a sign that population dynamics as such are inducing destabilizing pressures on the regime and its way of *organizing* and *doing*. Furthermore, Vancouver's (2022) notion of "transforming' streets and using 'flexible and adaptable approaches" (pg. 114) coincides with the mission and organization of street experiments (Lydon and Garcia, 2015).

Covid-19 Pandemic: results

Document analysis did not contain any mention of the Covid-19 pandemic however, interview analyses revealed some relevant insights. Covid-19 could be understood as a crisis, since it happened without anyone anticipating or preparing for it, and it was perceived to create particularly favorable conditions for Park(ing) day and Pavements to Plazas. For example, the organizer of Park(ing) day claimed:

"*Since the pandemic, everyone is looking at street parking as a place for outdoor dining. Like yeah, we've only been thinking about that since 2008 but suddenly everyone is jumping up and down for us" (Erike, 2021).*

"Since Corona, businesses embraced parklets more, and a lot more people took it more seriously" (Erike, 2021).

The first quote exemplifies a shift in public perception of what parking spaces could be used for and depicts and increase in support for turning them into different uses such as eating. The second quote shows that the concept of parklets has been taken up by the private sector for business activation purposes. This also implies that businesses are now included in the design of public space. The organizer also exemplified a shift in thinking about what the new 'normal' should be, suggesting Covid-19 is an opportunity to embrace the changes that have been brought about. For example:

"…why go back to the way things were?" (Erike, 2021).

In Philadelphia, Covid-19 also induced the creation of a committee composed of various actors outside the organization of the grassroot initiative, which implies a formalization of the event.

"When Corona died down, we began putting together a committee of people who are in the public space realm to talk about what policies could be made" (Erike, 2021).

The pandemic also inspired the creation of my parklets that are used as outdoor dining spaces for restaurants (i.e., streeteries) tapping into the potential of using the private sector to successfully activate space. Such space activations also may be a way for the city to continue thriving and adapt in times of crisis. For example:

"The number of streeteries boomed after the pandemic, and now you can see them in most neighbourhoods in the city. I remember some of them used to be just parklets but a lot of restaurants decided to turn them into streeteries" (Erike, 2021).
" I think it was a way for those businesses to cope and survive during a time when the economy was plummeting and public health was paramount…" (Erike, 2021).

Covid-19 was also beneficial for the Pavements to Plazas project, for example:

"Covid has brought more Plazas, more pop up, more demand for public space. It sounds terrible to say. But Covid was a very exciting time for public space in Vancouver" (Krizstina, 2021).

Covid-19 Pandemic: discussion

Covid-19 created favorable conditions for street experiments in Vancouver and Philadelphia through inducing more *demand* for public space activation, higher public *acceptance* for such space activations, and attracting a larger variety of *actors* (i.e., businesses). Demand and acceptance could be attributed to the pandemic changing ways of *thinking* amongst the general population in terms of what public space means and what streets can look like or be used for. Businesses embracing parklets for business activation implies shifting ways of *doing*, as restaurants experiment with new practices and routines previously seen as just for 'activists'.

4.1.2 Stress

Signs of stress appear when the regime does not provide what it initially intended to provide, or when its provision of meeting a societal need is inadequate. This was examined through *doing, organizing, and thinking* related to the mobility regime. Regarding *organizing*, climate change related tensions were found to cause a stress on infrastructure (i.e., physical organizing) which was expanded on in section 4.1.1.

Signs of stress were also apparent through the presence of climate change directives and strategies that each city government formulated. These action plans exemplify novel strategies, actions, and visions for urban environments to be able to cope with climate change related

consequences. Each plan is divided into categories of strategies for which *built environment/public space* and *transport* were of interest for this research since they address the key components of sustainable mobility. A vision for the city that is shared amongst all three plans is to become carbon neutral by 2050 (Sustainable DC 2.0, 2018; PCAPB, 2018, Vancouver Plan 2050, 2022). This further implies that the cities will have to change their ways of doing, organizing, and thinking to achieve this goal. These changes will be explored through each plan's section on public space/environment and transport.

Philadelphia's Connect Plan section on 'Great Streets' posits that "streets are not merely a transportation facility, they are a civic space where neighbors interact" and that "streets are public spaces" (2018, pg. 38). The goal is to achieve streets that safely accommodate all road users, that have sidewalks with trees and street furniture, that can accommodate multiple modes, and that are "civic spaces where neighbors can meet" (PCAPB, 2018, pg. 40). Strategies to create such streets include creating walkable streets through planting greenery and street furniture and developing a high-quality bicycle network to encourage people to commute by cycling. Tactical urbanism projects are not included as an official strategy to achieve 'great streets'. In terms of transport, Philadelphia is a part the Vision Zero alliance which aims to eliminate all deaths from traffic by 2030. To create safer streets, engineering approaches have been chosen like timed traffic lights and protected bike lanes. Public education about traffic safety is another important tool, as well as increasing transit use. Regarding cars, the city has determined that many people still rely on cars and that this should be supported (as long as other road users are respected) instead of reducing cars. Tactical urbanist interventions are not included in the official transport strategy.

Washington's strategy on the built environment predominantly focuses on ensuring green and energy efficient buildings rather than public spaces or streets. However, a strategy to incorporate sustainability into neighborhood planning is included to create spaces that "are pedestrian-friendly, healthy places to live, with green spaces, amenities, mixed-use building options" (Sustainable DC 2.0, 2018, pg. 41). Exactly how that will be achieved is not outlined. Tactical urbanism projects are not included in the plan as an official strategy. Regarding the transport strategy, Washington has also committed to Vision Zero for which public education about traffic safety is a priority. The other focus areas are improving and increasing transit use and expanding safe infrastructure for cyclists and pedestrians through engineering measures like timed traffic signals, paving better streets and gathering data. Regarding cars, the local government will be required to purchase green vehicles however there is no mention of a plan to reduce the number of cars in the city. Tactical urbanism projects are not included in the plan as an official strategy.

Similarly to Philadelphia, Vancouver has recognized streets and public spaces to be of vital importance to a variety of actors for a variety of purposes, and are critical in advancing the city's sustainability vision. For example, "the City will build a public space green network that plays a key role in addressing major challenges: responding to climate change" (Vancouver Plan 2050, 2022, pg. 132). This is further supported by their strategy for climate protection which includes "creating people first streets that are safe and attractive, and support walking and biking", "make space for nature" and "design infrastructure with nature in mind" (Vancouver Plan 2050, 2022, pg. 45). Additionally, the city recognizes that urban spaces should accommodate a wide variety of uses and activities like gathering and social interaction, cultural celebration, physical activity, civic action, connection to nature etc. The government recognizes its inability to deliver all that on its own. Thus, the strategy includes "creative and flexible approaches to grow and protect public space…including the creative reuse of streets" (Vancouver Plan 2050, 2022, pg. 135). Finally, community involvement is another strategy outlined to successfully redesign public spaces, including "building partnerships and empowering community stewards to co-manage public spaces" (Vancouver Plan 2050, 2022, pg. 137). This is not an explicit mention of tactical urbanism as a strategy but implies empowering communities to shape their own neighborhoods which is similar. Regarding transport, the strategy outlines its commitment to align land use with transportation to encourage healthy modes of transport (i.e., walking, cycling). For example, "we will transform road space from spaces for vehicles to spaces for people" (Vancouver Plan 2050, 2022, pg. 110). Currently 80% of the city's streets are dedicated to vehicles and the plan aims to transform that space into public space for people (Vancouver Plan 2050, 2022). Furthermore, policies will focus on disincentivizing car use, improving transit connection and use and creating walkable neighborhoods. Tactical urbanist interventions are included an official strategy for achieving sustainable transport.

Stress: discussion

Firstly, the public space and transport directive chapter within each directive represents city governments taking initiative to *think* differently about how to adapt those two aspects to climate change related consequences. In theory, this implies that the old, dominant ways of *doing* or *thinking* are no longer suitable in pursuit of urban sustainability. This also means that the regime is in stress or a moment of instability. Regarding the re-established way of thinking about public space and transport, the visions and strategies largely coincide with what street experiments aim to do. For example, Philadelphia's government acknowledges that streets are also "civic spaces" and not solely for the purpose of transport, and its related strategies such as "creating walkable neighborhoods" and "adding street furniture" all coincide with the aims of Parklets. However, tactical urbanist interventions are not included as a potential strategy to achieve the re-established vision of urban street even though the aims match up. It's re-established vision of using education to creating safer streets also coincides well with street experiments that

emphasize learning as an important tool in advancing more sustainable ways of doing (Seyfang and Haxeltine, 2012; Rosenbloom et al., 2018).

The Washington government failed to outline a strategy for create “pedestrian friendly” spaces and its re-established vision for spaces focused on technological improvements (i.e., greening of buildings). Thus, it does not seem to share the same aims as street experiments of streets first and foremost being civic spaces which, in that sense, does not create very favorable conditions for street experiments. Washington also stresses education to improve traffic safety, which links to street experiments and learning (Seyfang and Haxeltine, 2012; Rosenbloom et al., 2018). This is further supported through the interviewee claiming that Open Streets is a “toolkit of Vision 0” (Kimberly, 2021). Thus, the city’s re-established vision of public space and transport positions Open Streets as a vehicle in achieving safe streets, rather than re-structuring urban streets to function as public spaces.

Vancouver explicitly recognizes streets as vehicles in achieving sustainability, for example: “streets…are critical in advancing the city’s sustainability vision” which opens a window of opportunity to experiment with streets. This is supported by its goal to use “creative and flexible approaches to grow and protect public space…including the creative reuse of streets” as it suggests a new way of institutionally *organizing*, that directly coincides with how street experiments operate. Its re-established vision of accommodating “a wide variety of uses” further coincides with what street experiments aim to do. Tactical urbanism is included as an official strategy which suggests the city has adopted the same philosophy on public space as that tactical urbanism, creating extremely beneficial conditions for street experiments.

4.2 Mechanisms

Grassroot: Park(ing) day

Replication

Replication refers to the spread of the experiments in a niche through a dedicated network of activists and niche players (Boyer, 2015). Replication was identified through the geographical scaling of experiment, meaning that it grew in terms of number of the participants as well as the number of parking spots that were converted into parks of various forms. Even though the precise number of participants is not recorded by the event, the organizer estimated that in 2008 there were about 29 participants in total whereas in 2019 there were about 70 organizations in total, with each organization being composed of multiple people. This implies an increase in participants. There is no official documentation to record the number of participants. According to the organizer, new members were recruited through word of mouth as little effort has been put

into the marketing of the event through social media channels. An identified strategy to spread awareness and attract participants is through promoting the event on magazines.

"Like there's an environmentally conscious publication that comes out if I'm able to get onto their schedule…

In addition, local governments from other states and countries as far as Brazil have contacted Park(ing) day organizers in Philadelphia for advice on how to start the event in their localities. For example:

"The farthest call I've received was from Brazil who were seeking for advice on the best way to execute the event. I've gotten calls from DC, Chicago…" – Erike (2021)

"I've had Alaska, and that was because they had participated in Parking day here and was now like a parks and recs person in Alaska, trying to figure out how they can get started…. And between all of those different entities, they all came from local government side" – Erike (2021)

Thus, the event has not only attracted other cities and governments to take part in their Park(ing) day event, but also inspired them to start park(ing) day in their cities. Getting government bodies on board also links in with scaling up. New Jersey, a city across Philadelphia's waterfront asked to affiliate with their Park(ing) day event which highlights how a large network of Park(ing) day activists and supporters has been garnered through the event in Philadelphia. Thus, replication can be identified through a growth in number of participants, geographical growth in terms of number of parking spots used and spread of the event idea to other countries.

Scaling up

Scaling up refers to the expansion of experiment activities beyond the grassroot activists towards other actors and domains, beyond the niche environment (Boyer, 2015). Scaling up was identified through governments from other cities and countries reaching out to Park(ing) day Philadelphia for advice. This type of scaling up could be interpreted as scaling up through inspiring and leading by example, as no strategies were put in place. Scaling up was also identified through the fact that Park(ing) day went from being organised solely by a group of architects in 2008 to now being a collaboration between non-profit organisations, educational, and public institutions. For example:

"The center for Architecture and Design and the American Institute for Architects helps provide us with event insurance, we then we also partnered up with the Philadelphia parking authority, as well as the Community Design Collaborative because their background is in community design and they always review the applications. Oh and of course the Charter Highschool for Architecture + Design" – Erike (2021).

"The government only provides the permits and guidelines" – Erike (2021)

This type of scaling up could be interpreted as scaling up through partnerships or organisational capacity. Another example of scaling up was identified through cafés and various eateries adopting the parklet concept by installing temporary or permanent ones for dining, which showcases parklets being scaled up by private businesses for business activation purposes. These parklets are termed as 'streeteries' (Erike, 2021). As mentioned before, the number of streeteries drastically increased during the pandemic, which would be attributed to restaurants wanting to keep their businesses going during hard times. However, it was also incentivized through a change in the application process. For example:

"It's probably because during the pandemic, the government reduced the application process from about 25 to one page, which obviously makes applying for a streeterie a much easier and quicker process" (Erike, 2021).

This shows how streamlining the application process can encourage the private sector to partake in public space activation. Another example of scaling up is various hospitality companies and non-profit organizations creating seasonal pop-up beer gardens or 'parks and tap' by waterfronts. For example:

"There is this boom of beer gardens and seasonal pop-up parks in the city, which come from Parking day" – Erike (2021)

She claims other tactical urbanist interventions were inspired by the Park(ing) day event for two reasons. She has lived in Philadelphia since 2000 and public space was not seen as attractive or appealing and thus nothing creative was done to it before Park(ing) day. The second reason was the fact that the people who created the pop-up beer gardens used to design parklets for Park(ing) day and have thus shifted their focus and used lessons and experiences from park(ing) day to activate more space in the city. This implies scaling through activists who move into other domains. Another observation of scaling up through example and inspiration was that Universities in Philadelphia adopted the concept of parklets to activate and beautify public space around the campus and train station, as well as the Independence Green Festival (i.e., a national holiday event) using parklets as part of their programming. For example:

"The university city district who takes care of all the public spaces activated a prominent area outside the train station by putting swings, picnic tables, and lawn chairs" – Erike (2021)

Lastly, scaling up was identified through actors embracing the idea of parklets for various purposes, such as for playing instruments and showing off talent, for neighborhoods groups to engage their community, as a way for architects to test out structures the have been building, and for educational purposes (Erike, 2021).

Translation

Translation is the adoption of experimental activities into wider society, namely doing, organizing, and thinking (Boyer, 2015). Translation has been the least observed diffusion mechanism which coincides with literature on grassroot innovations. However, some elements of translation have nonetheless been observed. For example, parklets in some parts of the city have become permanent structures for eating (i.e., streeteries).The local government also created guidelines for making parklets into permanent structures, thus showing support for people to activate space. For example:

"The mayor's office of utilities, transportation, and infrastructure created guidelines to have permanent parklets in your neighborhood" – Erike (2021)

Policy and legislation have been created for parklets that are made my cafés and restaurants. Park(ing) day had an opportunity to become a formalized government program however the government official who was pushing for it changed departments and the new government stopped pushing for it (Erike, 2021).

Park(ing) day: Discussion

All three mechanisms were identified for Park(ing) day, however concrete strategies to achieve replication, scaling up, and translation were not obvious. Replication was apparent through growth in number of participants and number of parking spots used for Park(ing) day since its inception in 2008. The lack of official evaluation and monitoring of the experiment also indicates that assessing growth is not important to the organiser. This notion is further supported by the fact that there was no real strategy put in place to attract more people and that it happened mainly through word of mouth. This implies that the initiative was operating for intrinsic benefit with no explicit intention of inducing systemic change (Smith and Seyfang, 2007). Despite a lack of strategy to grow the event, the fact that it attracted the attention of other governments, cities and countries suggests *word of mouth* effectively spreads grassroot ideas to create a network of activist. One thing to remember here is that street experiments operate in public space which means they are visible to all passersby who are all welcome to join. It suggests that if people like what they see or experience then they may be more likely to talk about it.

Scaling up was identified through changes in partnership models, as the event is now a collaborative effort between a variety of actors. It was also identified through the private sector using it for business activation purposes, which how businesses could successfully be used to create more people friendly public spaces. This was encouraged by the streamlining of the application process as well as Covid-19. Scaling up was also apparent through other organizations activating public space around the city which could exemplify that Park(ing) day

shifting dominant way of *thinking* of what public space could be and how to use it, thus inspiring more people to experiment with it. Dedicated activists also proved important for the spread of experiment ideas into other domains (i.e., from parklets to pop-up parks).

Finally, translation was observed though parklets becoming permanent structures in some cases, which exemplifies a shift in *doing* and *organizing*. Government guidelines are another examples, as it also indicates a shift in *organising* space in the sense that anyone can create a permanent parklet and thus activate/design space. Furthermore, the proliferation of other tactical interventions in Philadelphia such as Beer Gardens and seasonal pop-up parks that have been inspired by Park(ing) day could also be an example of translation, since it indicates a shift in *thinking* about what public space is and how to use it, as well *doing* as activating public space is becoming an increasingly used approach.

Transition Experiment: Pavements to Plazas

Deepening

Deepening is a learning process whereby participants gain as much knowledge about novel practices (*doing*), different perspectives and values (*thinking*), and the way the physical and/or institutional environment is set up (*organizing*). Furthermore, deepening refers to identifying barriers and opportunities in making the experiment more permanent (van den Bosch and Rotmans, 2008). Deepening was identified through their extensive monitoring and evaluation systems in place as well as community outreach activities. For example:

> "We did a lot of data collection and monitoring. So we really had a good sense of pedestrian count, vehicle count. We also did a lot of behavioral mapping and found out how these spaces were being used by people when they're in the space and on maps" - Krisztina (2021)

While the program was in the pilot stage, the organizers continuously reassessed and evaluated design attributes, the width of road closure, scale, and programming of the plazas to understand what works best. Data was collected and evaluated regarding how people use space, where they carry out certain activities and interact with certain objects to further improve the design and implementation of the plazas which is an example of systems learning (Loeber et al., 2007). Furthermore, the evaluation and assessments were conducted with communities that the plazas touched. The organizers received and utilized the input from citizens about what works and what does not, as well as how to improve and change the plazas. Through community outreach, a lot of the initial opponents of the event like businesses and the engineering department became supporters.

Broadening

Broadening refers to repeating the experiment in different contexts with some variation (Rotmans and Loorbach, 2006). Each plaza that was temporarily and then permanently created was different in terms of design attributes, mainly due to different types of communities and businesses who were located there and who the plazas were designed with. For example:

> "WE WORKED WITH COMMUNITIES TO CREATE PLAZAS THAT FIT THEIR NEEDS, SO ALL PLAZAS LOOK DIFFERENT, WITH A DIFFERENT MIX OF FURNITURE AND GREENERY, SOME HAVE FUN ACTIVITIES LIKE A SKATEPARK AND SOME JUST HAVE SEATING, SOME HAVE A BIKE SHARING STATION… SO THEY ALL LOOK DIFFERENT AS THEY ADDRESS DIFFERENT NEEDS." – KRISZTINA (2021)"

Thus, broadening was achieved through working with different communities and groups to adapt each plaza to the local conditions and needs.

Scaling up

Scaling up is the embedding of the innovation into the regime context or influencing the ways of doing organizing and thinking. Frontrunners are crucial in this step (van den Bosch and Rotmans, 2008). Pavements to Plazas was a politically motivated initiative, created by the elected party Vision Vancouver which means that it was institutionally formalized from the start. However, *organizationally* it progressed from the initiative being the responsibility of the engineering and transportation department to a separate public space division created specifically for managing and activating public space. In that sense, it inspired the creation of a separate government divison. Furthermore, the program Viva Vancouver was also created as a part of that new division in government which encompassed all tactical urbanist interventions amongst which Pavements to Plazas was a part of. This new organizational structure emerged from the streamlining and process improvements made through continuous trial and error of setting up temporary plazas. The separate division also meant that a permanent budget was allocated to the project which gave it stability. Furthermore, the first permanent plaza was approved by council in 2016 due to continuous push from the organizing committee which highlights the importance of front runners.

Transition Experiment: Open Streets

Deepening

Education was an important element for Open Streets, especially given their mission to showcase what public space could be like when people are prioritized over cars. The learnings that were pushed for by the event organizers focused on traffic safety and sustainable transport options through, for example, installing curb extensions with painted ground murals to teach

people about what that is and how it helps pedestrians (i.e., shorter walking distances on roadways). Pop up traffic gardens were installed for children aged five and under to learn about road signs and how to safely ride a bicycle and scooter. Systems learning was observed as the event showcased participants how an alternatively designed roadway can positively influence healthy mobility choices. Evaluation and monitoring systems were also used such as receiving feedback from participants to know how to improve the event next year, what was learnt, and whether they participated in transport safety programs.

Broadening

Open streets has been running since 2019 and it was cancelled in 2020 due to the pandemic so variation has been limited however not absent. The programming in 2021 changed and increased from 2019 such as including local bands and performances, more frequent activation zones, hourly events, and hubs spread across the route with educational activities. In the second year, Open Streets partnered with a university and incorporated their marching band to kick off the event which indicates a new partnership. Another partnership was created with micro mobility companies like Uber and Lyft who participated in the event by showcasing their products and teaching people how to use them safely. This partnership was a tool to garner interest in alternative transport modes in hopes to encourage their use after the event. In addition, other groups like the Cycling Advocacy Group were invited to showcase protective bike lanes and encourage people to use bicycles. The programming for 2022 has been further altered by plans to host the event in different neighbourhoods with different demographics and businesses.

Scaling Up

The program has been scaled through three new staff being hired for the 2022 event which coincides with Douthwaite et al., (2003) understanding of scaling up as institutional expansion from front runners (i.e., the team who were initiated the event) to other key players within the regime context. A dedicated fund specifically for the Open Streets will be created for the 2022 event.

Transition experiments: discussion

In agreement with literature on the importance of learning to achieve *deepening*, education was an important component of Open Streets to push for traffic safety. In particular, the education focused on new ways of *doing*, such as how to safely use sustainable transport option and how a street that is designed for people can make using sustainable transport options more appealing (van den Bosch and Rotmans, 2008). Education was also present in Pavements to Plazas whereby the organizers of the plazas, through monitoring and evaluation, learnt about the opportunities and barriers to make the plazas more permanent. Evaluation and monitoring systems in Open Streets focused on the experiment itself rather than on identifying barriers to

making the experiment more permanent. However, making the event permanent was not their primary goal, rather it was to increase traffic safety by education people about transport options. Thus, improving the event in the following year could help them achieve their goal and thus, their monitoring is also valid. Broadening was achieved in Vancouver by working with different communities in different locations to create plazas that responded to local needed. In Washington, broadening was observed via a change in the program from the first year to the next, as well as through new partnerships. Finally, scaling up was observed in both cities. Pavements to Plazas achieved scaling up through institutionalizing the management of public space, making it a separate government division. That also represented a shift in the dominant way of thinking about public space, as the government accepted tactical urbanist interventions as a strategy. Scaling up for Open Streets was not as prominent, which could be attributed to the fac that they are a relatively new program. Thus, there is still room to scale in the upcoming years.

5. Conclusion

5.1 Conclusion

This chapter answers the main research question: *How can street experiments contribute to urban mobility transitions?* The answer to this question will be drawn from the answers to three sub-questions which will be elaborated on below.

5.1.1 SQ 1

How can street experiments be conceptualized within sustainability transitions literature?

Understanding how street experiments can be conceptualised within sustainability transition literature is important to when positioning them as potential drivers for transitional change. In this case, mobility transitions towards sustainability. Based on the literature review in chapter 2, street experimentation could be considered a small but nevertheless an important component of a portfolio of instruments used to stimulate transitions (van den Bosch and Rotmans, 2008). Literature posits that experimentation is only truly successful in realizing a transition if it is combined with the other instruments, which insinuates that an experiment by itself would not lead to any significant change. However, that does not deny that experiments by themselves may still have some impacts beyond their immediate spatial and temporal boundaries, and thus are worth studying. Street experiments can also be understood as embodying a novel and sustainable configuration of ways of doing, organizing, and thinking. These three components represent the social innovation of the experiment. Literature states that if that new configuration is successful, it

should be scaled up (i.e., become the norm). By the social innovation becoming a societal norm, the societal system (i.e., mobility) would be closer in realizing a transition of itself. A full transition of the system through street experiments is also unlikely given that mobility is a system which is configured of social as well as technological components (hence *socio-technical* system). Thus, technological innovations are still important and should not be discarded.

The multi-level framework from transition studies was applied as a descriptive model to showcase where street experiments are positioned within wider society, and how they relate to the urban context that they are in and are influencing. The urban context was divided into three levels of influence, namely niche, regime and landscape with street experiments being positioned within the niche environment. This implies that they operate outside and are shielded from the dominant ways of doing, organizing, and thinking (i.e., mobility regime) and thus are the source of radical innovation (van den Bosch and Rotmans, 2008). Both the niche and regime are surrounded by a landscape environment which represents the wider social, environmental, and political developments that are beyond the control of the regime or niche, yet which nonetheless can create favorable or hostile conditions for the experiments. All three levels are mutually dependent on each other for a transition to occur and thus, the innovative potential of street experiments cannot be studied through a vacuum but in relation to the environment it aims to change and wider societal developments.

Finally, the transition field has delineated various categories of experiments based on their normative orientation, analytical emphasis and the types of actors that initiate them. Based off this, Parklets were categorised as a grassroot experiments whereas Open Streets and Pavements to Plazas were categorised as transition experiments. This implies a different analytical analysis (different mechanisms).

5.1.2 SQ 2

How can the urban context facilitate or hinder the potential for experiments to diffuse their innovations beyond their immediate temporal and spatial boundaries?

The urban context was examined through two conditions, namely tensions and stress (de Haan and Rotmans, 2008). Addressing the conditions allowed the exploration of any landscape development and cracks in the regime that may open-up windows of opportunity for the experiment innovations to diffuse beyond their immediate spatial and temporal boundaries. How each condition can open a window of opportunity is explained in the following sections, based on the delineation of grassroot and transition experiments in chapter 2.

Tensions

Three landscape developments were identified that made experimental conditions more favourable for influencing wider change, namely climate change, rapid population growth and the Covid-19 pandemic.

Climate change consequences such as more extreme and frequent weather events was found to cause stress on mobility infrastructure like roads and sidewalks. In terms of socio-technical transitions, the infrastructure could be understood as the dominant mode of (physically) *organising*, which due to being unable to cope with changing weather patterns was also no longer suitable for ensuring safe and efficient mobility. Deteriorating infrastructure implies that moving around is more difficult and thus it needs to be changed or improved. This moment of instability poses a fruitful opportunity for the city's to completely re-think their infrastructural systems and related urban space, and to question whether adding more concrete and impermeable paving is the best solution for more sustainable cities. Street experiments offer the opportunity to re-think how streets and public spaces could be used through offering creative solutions that are tested on the ground by citizens who can collectively decide whether it works or not. In this regard, grassroot street experiments such as Parklets would have a lot of potential of generating creative ideas for what public space could look like since it is conducted through a variety of different actors which means higher chance for creative solutions. On the other hand, the transition experiment Open Streets is run fully by a government body which may limit its creative potential or will to truly think differently about what streets could look like. Thus, Pavements to Plazas in Vancouver could be deemed as optimal experiment. The city works with citizens to create the Plazas, as well as provides various resources to communities and neighbourhoods so they could shape their streets and public spaces how they see fit. Thus, the creative potential from communities is unleashed and the city is receptive and accepting of those solutions. Furthermore, climate change has led the city of Vancouver (i.e., regime actors like the government) to officially adopt tactical urbanism as an official strategy to mitigate its negative effects and embraces the philosophy of street experiments where streets are seen as first and foremost as places for people.

Rapid population growth was found to create significant tensions on public space and transportation through contributing to traffic congestion (Vancouver Plan, 2022; Sustainable DC 2.0, 2018). More people mean more vehicles, which in turn means more congestion and air pollution as well as more space needed to park them. This opens a window of opportunity for the cities to actively reduce the number of cars. This could be done through policy change or through creating urban spaces that would encourage people to use active forms of travel. This creates a window of opportunity for all street experiments since they create safe and attractive spaces for

people to move through. Open Streets is especially well positioned in this respect since it is used as a tool to encourage and educate about active forms of travel (Kimberly, 2021). Vancouver embraced this notion by stating that street space should be “transformed” to “make space for people”, and which will require “flexible and adaptable approaches” (Vancouver Plan, 2022, pg. 22). This new way of *thinking* about streets embraces the philosophy of street experiments, making them the ideal vehicle to achieve the transformation. If these experiments are scaled to becoming more frequent events, or encompassing more urban streets, the problem of congestion and air pollution could be mitigated, and thus for population growth to not be a tension.

Lastly, the Covid-19 pandemic was also found to create favourable landscape tensions. The pandemic could be understood as a crisis as it happened extremely suddenly without anyone anticipating it. The pandemic created a window of opportunity in Philadelphia since it influenced public perception and *thinking* of what public streets could be used for and increased public acceptance of Parklets. More actors embraced the idea of a Parklet to activate space, like businesses using it for dining purposes. This implies a growing support for the experiment which coincides with the notion of *scaling up*, meaning the power and influence of the experiment is growing. In addition, the increase in demand for parklets that Covid-19 induced has prompted the organiser in cooperation with other actors to create an official committee to ensure better guidelines for safety. This is an example of the experiment becoming a more formalized event which has a higher potential to attract the attention of government actors. Vancouver has experienced the pandemic to influence their experiments in a similar (i.e., positive) way to Philadelphia. On the other hand, the event organiser from Washington DC could not identify an increase in demand for or acceptance of the experiment.

To sum up, these three tensions induced negative consequences on the dominant way of doing, organizing, and/or thinking in the realm of mobility. For example, climate change negatively impacted the city’s infrastructure and mode of planning/intervening in urban space (*organizing*). Rapid population growth negatively impacted the way of *organizing* and *doing*. The Covid-19 pandemic negatively influenced the dominant mode of *doing* (i.e., people were forced to stay at home and not gather in closed spaces) which may have created more demand and a higher acceptance of parklets. It also shifted *thinking* as more people accepted that public space could be used successfully in various ways.

Stress

Stress was identified through changing ways of government *thinking* about public space and transport. These changing new of thinking implied that the dominant ways of thinking were inadequate and thus, the regime was in stress. Realising these new ways of thinking about public

space and transport requires new ways of *doing* and *organising* which opens windows of opportunity for street experiments. The city of Vancouver's re-established way of thinking about what urban streets and urban transport should look and function like created the most favorable conditions for street experiments. Vancouver's vision directly complemented the vision of street experiments such as creating "people first streets" and recognizing that "urban spaces should accommodate a wide variety of uses". It also made a commitment to utilizing "creative and flexible approaches to grow and protect public space…including the creative reuse of streets" (Vancouver Plan, 2022). Furthermore, the city explicitly aims to reduce car use and use tactical urbanist interventions as an official government strategy. Washington also embraced Open Streets as an educational tool for Vision Zero, with the assumption that education about sustainable transport modes would encourage more people to use them on the regular. Thus, when the experiments are aligned with a wider vision for the city and are thus used as strategic governance tools to shape space and/or transport towards sustainability, the conditions for the experiment to diffuse their innovations into wider society are very favorable.

5.1.3 SQ 3

Through which practices do street experiments diffuse their innovations beyond their narrow spatial and temporal boundaries?

Grassroot experiments: Park(ing) Day

Three mechanisms were used to explore and uncover practices that experiments employed to diffuse their innovations beyond their immediate spatial and temporal boundaries. All mechanisms were apparent, which indicates that the experiment was able to diffuse its innovation beyond its immediate temporal and spatial boundary. However, concrete practices to achieve each of them were not so obvious. More specifically, there were no explicit strategies put in place by the organizers of the event to grow it, and growth and influence occurred organically with time. Broadening of the event was observed through an increase in the number of parklets the number of participants, as well as its adoption in other cities and countries. The practice that was identified here was that of *word of mouth*. Advertising itself in local media was also mentioned, but it was not positioned as the main strategy to spread the event within the niche. Scaling up of the experiment was identified through a large variety of actors adopting the concept of parklets for their own purposes, which showed how the grassroot experiment successfully spread beyond the group of committed activists to attract a broader group of actors (Boyer, 2015). Four practices were identified that helped achieve this:

Collaboration

The event went from being run by a few architects to being run through a partnership/collaboration between an architect, non-profit organizations, an educational institution, and a public body who all contribute to realizing the event in different ways. This was a necessary step considering the event grew in scale (i.e., replication) so more organizational capacity was needed. This coincides with the literature which states that grassroot "initiatives often work alongside of official or semi-official groups in a complementary or competitive relationship" (Chanan, 2004).

Streamlining of application process

Making the process of setting up a parklet easier encouraged eateries to utilize the concept for business activation purposes.

Activists

This practice refers to actors who originally partook in the creation of Park(ing) day to be inspired by Park(ing) day to activate space in other ways.

Finally, the mechanism of translation was observed through some parklets in the city becoming permanent structures, such as streeteries. This was made possible by the local guidelines from the government for making them permanent. Thus, collaboration with the local government was necessary in making temporary changes permanent.

Transition experiments: Pavements to Plazas and Open Streets

Three mechanisms, namely deepening, broadening, and scaling were used to explore the practices through which transition experiments could diffuse their innovations. Regarding deepening, the following practices were observed:

Monitoring & evaluation

The city of Vancouver collected large amounts of data during the creation of the plazas to understand what design attributes worked the best for people using them, and thus it was a way to assess the opportunities and barriers to make the plazas more permanent. Monitoring and evaluation was also used by Open Streets, however for different purposes as the evaluation was focused on the event itself, and how to improve it for next year.

Education

Deepening was also achieved through education, which was realised in different ways between the two experiments. Nonetheless, both are valid in terms of deepening the experiment. For example, learning process in Vancouver included learning about how the intervention affects mobility patterns, and how people interact with the intervention to come up with an optimal design form, which would in turn allow for it to be more permanent.

The practices to achieve broadening differed per transition experiment, for example Open Streets changed their programming and created new partnerships whereas Vancouver utilized community outreach tactics. Thus, if the aim of the transition experiment is to create a space that fits in with the needs of people using it, then community outreach is appropriate. If the aim is to create an educational and informative space, then adapting programming and partnerships would be more valuable.

5.1 Contribution to literature & society

First and foremost, this study unravels the concrete practices and strategies that street experiments employ to diffuse their innovations beyond their immediate spatial and temporal boundaries. These processes remained largely unknown prior to this research. Also, this study shows that applying the transition and grassroot experiment framework is a useful approach in studying the wider impacts of street experiments. Regarding wider society, this could be useful for any actor planning on conducting street experiments with the goal of achieving urban sustainability, in that it delineates concrete strategies, what is important to consider in experiment design, and what conditions could be favorable.

7. Reflection & Recommendations for future research

This research topic proved to be complex and multi-faceted, and the researcher could have allocated more time to gathering more data, such as through interviewing more participants, analysing more documents, and particularly using more case studies to increase the robustness of results. Three case studies resulted in a satisfactory piece research but more case studies, especially from different geographical contexts, would create results that are more powerful and generalizable (to an extent). Cities in different geographical contexts would reveal different urban dynamics such as demographics, social problems, and politics.

In terms of interview participants, it would also be extremely interesting to have included experiment participants such as the citizens to understand street experiments from their perspective. Afterall, urban mobility is largely dominated by the movement of regular citizens. Thus, their input would be relevant when exploring the potential of street experiments as vehicles for transitions in urban mobility. Considering this is the first study examining the transitional potential of street experiments using the framework from transition and grassroot literature, this research could serve as a steppingstone and inspiration for future research when analysing different street experiments.

This research also did not address the last condition (pressure) as it interpreted the three street experiments as the sources of pressure. This was a fitting approach for this thesis however, future research could go a step further and delve into the complexities of niche management and emergence which is a separate body of transition literature that this thesis did not have time for. This would allow for the exploration of other tactical urbanist projects in the cities and how they interact to create a 'powerful' niche environment. This would be a relevant study for the exploration of street experiments in relation to sustainability transitions.

The socio-technical transitions field is also extremely broad, with a wide array of concepts. Due to the limited time of this thesis, not all relevant concepts could be included such as the S-curve or the different instruments in the Transition Management cycle. They are important in gaining a more holistic understanding of the transformative potential of street experiments, and future research could consider that. Regarding the theoretical model, it was a struggle for the researcher to narrow it down to only keep the information and concepts that were relevant for this research specifically.

Finally, considering the long-time span of sustainability transitions, future research could embrace a longitudinal perspective such as ten or more years. This would uncover how the mechanisms develop over time and yield empirical insights into transformative change.

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Annex

Annex A: Interview guide

Introduction (hello, how are you, thank you for being here…)

Introduce my thesis…

Withdrawal at any time for any reason

Background information

1. What inspired the creation of the event?
2. What is the purpose/goal of such an event?
3. Is the event linked to an established long-term vision/plan/program for the city?
4. What would you say are the main challenges and or unexpected issues that emerged?
5. How has the event changed/progressed since inauguration?
6. Why was that particular street/parking space chosen for the event?

Actor involved

1. Who are the main organizers/partners of the event?
2. How do the different partners contribute to the event?
3. How do businesses generally react to these events?

Funding

1. How is the event funded? Main sources of funding (local government or foreign for e.g.,)
2. Have there ever been any problems in sourcing enough funds? How important is funding for the success of the event?
3. What is the funding used for specifically?

Civil Society

1. How do participants generally react to this event?
    a. Did they want to learn more about the event? During or afterwards?
2. Have you ever met resistance? If so, where did it come from and how was it dealt with?
3. Do the event organizers anticipate or hope that people will react to this event in a certain way? How is the event presented to them?
4. Have you perceived/noticed citizen behavior to have changed in the days, weeks following the experiment?

Learning

1. Is there an evaluation stage after each of these events?
    a. If so, what gets evaluated? What factors are taken into consideration and for what purposes?
2. Are there any opportunities for participants to provide feedback on the event?

3. Have you noticed/perceived an increase in demand for such an event to be repeated, replicated in another location by other actors?

Local government and institutions

1. How does the local government and government officials perceive the event?
2. Are there any aspects of the event that have become formalized/institutionalized?
    a. Have any aspects of the event become permanent in the city? Bike lanes…
3. Has it inspired or been combined with any structural transport policy interventions?
4. Does the city host other events/street experiments as such in conjunction with Open Streets?

Annex B: Coding Scheme

Theme	Deductive code	Inductive codes
Tensions	Crises Environmental conditions Demographic trends	Crisis (Covid-19) Climate change Population growth
Stress	Doing Organising Thinking	 Infrastructure; strategy Government
Replication	Spread of experiment Niche players/activists Network	
Scaling up (G.E.)	Actors	
Translation	Regime adoption	
Deepening	Learning Barriers/opportunities Monitoring & Evaluation	
Broadening	Replication Context Variation Network Sharing learnings	
Scaling up (T.E.)	Front runners Translation	

	Niche community	

Annex C: Preliminary results

	Philadelphia - Park(ing) Day	Washington DC – Open Streets	Vancouver – Pavements to Plazas
Tensions	Climate change Hotter temperatures and more precipitation is already being experienced and expected to get worse. Extreme weather + environmental harm impacts poor communities and neighbourhoods more => where space is especially important to activate via street experiments “One of the most pressing issues of our time” – Mayor of Philly Government City is determined to achieve climate justice. Apparent through various projects, polices and plans. City wants to achieve carbon neutrality by 2050. Vision Zero alliance and plan to eliminate all deaths from traffic by 2050. “City will continue to promote low and no carbon transport options by installing and protecting high quality bike lanes, expanding Equitable Indego bike sharing program, re-envisioning our transit system “it will take action and cooperation at every level, from grassroots to large institutions, to achieve climate goals”	Climate change Air pollution => Washington one of the worst in country. Rising temperature on roads and infrastructure => growing hazard for mobility Government “we’re in a crisis” situation => government official Tommy Wells Sustainable DC => Climate change is on top of political agenda. Government is dedicated in making the city the most sustainable in the country => goal of making the city carbon neutral by 2050 City resident wishes and concerns were a critical consideration for the development of this plan, including their desire for more accessible and walkable neighborhoods, equitable access to green space and parks, and clean and unlettered streets (IBID). Essentially, half of their concerns were related to sustainable and people friendly urban design Covers built environment and transportation but tactical urbanist projects not a part of official plan Sustainable transport => city has 3 different plans including Vision Zero	Climate change Climate emergency => climate is rapidly changing and by 2050 Vancouver can expect to experience longer, hotter, drier summers, sea level rise, and heavier rainstorms with increased flooding. These changes in climate will have significant impacts on residents, businesses, buildings, and infrastructure alike and require new municipal responses and investments not previously contemplated. **CLIMATE PROTECTION & 3 RESTORED ECOSYSTEMS** • Create people-first streets that are safe, attractive, and support people walking, rolling, biking, and taking transit • Support construction and building methods that reduce energy consumption to progress towards a zero carbon city • Support Indigenous, land-based cultural practices, stewardship, and learning • Protect waterfronts and waterways • Make space for nature, protect habitat, and ensure healthy, thriving ecosystems • Design infrastructure with nature in mind • Plant more trees in areas with limited tree canopy to take advantage of all the natural benefits trees provide.

	Strategies in the Climate Action Playbook emphasise: *More green landcover such as parks and gardens provides shading and cooling during extreme heat.* *An efficient public transit network helps improve air quality and decrease commute times.* City plans emphasize cutting emissions from 3 sources: buildings, transport, waste. No explicit focus on built environment. In transport section, no explicit focus on car reduction => increase transit ridership etc. Even in Vision Zero Plan, no focus on reducing number of cars but making streets safter through data, technology and engineering. CONNECT Plan: outlined efforts to reduce carbon emissions by 2025; has a chapter on streets – shows the government has drawn a connection between built environment and sustainable transport; The focus areas are on reducing traffic fatalities through cameras, installment of new and improved bus lanes, installment of protected bike lanes, and transitioning the city's fleet to clean and electric vehicles => indicates the city governments focus on technological and infrastructural efforts to reduce carbon emissions and increase transport sustainability, as opposed to thinking completely differently about how people move (contradicts to what government stated on climate action plan)	Built environment focuses mainly on green buildings and affordable housing, but also includes creating pedestrian-friendly, healthy places with green spaces and amenities…reducing driving times (BE 4.3) Government will take "holistic approach" to neighbourhood planning… City has adopted multiple programs related to sustainable transport: Beyond Sustainable DC, move DC Plan, Vision 0, clean energy DC Walkable neighbourhoods =>sustainable urban design tactic *"Open Streets is part of the toolkit of vision 0"* City officials attended a workshop on conducting tactical urbanisms projects, how to design them and include the community better Government developed official tactical urbanist guide Corona virus (interview data) Couldn't say if covid had an influence on attendance or enjoyment of the event, or if the increase in demand for future events could be attributed to the pandemic. If anything Covid prevent the event from taking place in 2020. Due to fast population growth (grows by 80% during weekday)=> enormous strain on mobility systems; serious traffic congestion (6th worst in the country)	**Vision:** Vancouver produces zero greenhouse gas emissions, while improving our resilience to the changing climate, capturing carbon and promoting sustainable consumption. Government Vancouver plan: Land use strategy, how urban development can advance sustainability; strategy will "Create an integrated network of public spaces, ecological corridors, greenways and active modes of travel (walking, rolling, and biking)"; transport is a part of land use strategy => High quality walking, biking and transit networks and connections shape the urban environment and form the backbone of complete neighbourhoods. "Through the Vancouver Plan, we will continue to align land use and transportation to build neighbourhoods that help people meet their daily needs without having to drive" Transport => "We will transform road space from spaces for vehicles to places for people" With the general city plan, Vancouver has 3 other specifically sustainable transport plans Explicit focus on greenery => creating a network of greenways that are connected throughout the city

	Streets should be designed to safely accommodate all users. “great streets is not merely a transportation facility, it is a civic space where neighbors interact”; “Streets are public spaces”=> making all streets in Philly ‘great’ is the city’s goal Philadelphia City Planning Commission (government organisation) updated zoning rules which mandate increasing parking minimums, reversing progress made to eliminate such minimums. Increasing pavements and concrete will not help climate emergency. Not an example of thinking entirely different about how we move or how we plan. Street experiments not an official strategy. Philly Free Streets is now an official government event Pavements to Plaza’s – official government program Philly Free Streets – Open Streets program that was originally initiated by advocacy group now taken up as an official event by the mayor (local government), encourages new thinking about public space. Feet first Philly – nonprofit advocacy group striving for safer streets Corona virus (interview data) *“Since the pandemic, now everyone is looking at street parking as a place*	The most important thing is to reduce the number of cars that commute into the city, no matter what the fuel source is,” says Tommy Wells, director of D.C.’s Department of Energy and Environment. “It’s much better to get people in public transportation…we are looking at ways to make public transport be the first choice in transit in our city.”	Walkable neighborhoods => sustainable urban design tactic Public Space => “people first streets” => Over 80% of Vancouver’s street space is dedicated to vehicles. As the city grows, we can **transform** this valuable public asset to make space for people to gather, walk and bike, and for reliable transit, water management and habitat corridors. This will require a flexible and adaptable approach, balancing core needs of the street and supporting those that need to travel by car. **Reimagine** arterials to be safe and livable while efficiently moving people and goods Amplify and intensify the greenways network as car-light to car-free corridors for active transportation and recreation, providing a high-quality continuous experience with public spaces, ecological and green infrastructure functions. Provide a network of car-free retail streets in the city centre, supporting public life and the local economy, while considering required services, deliveries, and general vehicle access. Leverage street improvement projects to deliver co-benefits for transportation, public space, water and natural systems. Develop strategies that prioritize walking, biking, transit and public space on streets over parking, while considering persons

	for outdoor dining. Like yeah, we've only been thinking about that since 2008 but all of a sudden everyone is jumping up and down for us" *"Notion spreading of why go back to the way things were?"* *"Putting together a committee of people who are in the public space realm to talk about what policies could be made"* *"(due to corona) Businesses embraced parklets more, and a larger range of people took it more seriously"* => *people are creating more complex parklets which require more policies (government ones aren't enough)*		with disabilities and others with essential parking needs Building on current plans, the City will work with the community, the Nations and regional partners to respond to urgent challenges (such as climate change, growing inequities) = city has a long history with participatory planning and community engagement **Vancouver Plan the only plan in the city that incorporates tactical urbanism as an official strategy to improve its streets and public spaces! =>** "Creating people first streets by changing how we use road space ➔We will change our streets to improve i walking, biking, and transit and create more space to manage water, create ecological corridors, and for people to gather and enjoy the outdoors. ➔ Working with communities, we will redesign streets through pilot projects and street reconstruction, creating new and expanded plazas, parks, and paths. ➔ These streets will: • Create people-first streets • Connect and amplify surrounding land uses • Meet the changing needs of residents and businesses • Create an integrated network of public spaces, ecological corridors, greenways and space for walking and biking • Strengthen resilience and climate responsiveness through the integration of natural assets • Make walking, biking, rolling and taking

			transit safer and more comfortable • Integrate universal accessibility Note: For some uses like plazas or bikeways, trial or pilot projects may be undertaken prior to permanent installation, allowing more opportunities for public input. ➔ Main Street plaza (Source: City of Vancouver) Bute Street pedestrian walkway, West End (Source: Paul Krueger, Flickr) Public seating, 21st and Main Street (Source: City of Vancouver) Tree canopy, downtown Vancouver (Source: Alison Boulier) Bumble bee, Jericho Park (Source: Vancouver Park board) Greenway biking (Source: Paul Krueger) S. Vancouver Growing Eden Garden Program (Source: City of Vancouver) Sunset Beach Park (Source: Aaron Lao) Public washrooms, downtown Portland (Source: iStock photos) Green infrastructure, Sunset Park (Source: Shannon Mendes) Family: Five Figures for a Triangle by Lyse Lemieux (Source: Rachel Topham) 800 Robson Plaza (Source: Jaspal Marwah) Pedestrian crossing (Source: Paul Krueger) **VIVA Vancouver** => the City of Vancouver's tactical urbanism and public space innovation platform that delivers short-term action to inspire and enable long-term change. Public spaces that are welcoming and inclusive fulfill an important role in connecting social

			interactions and building community health. VIVA's Vancouver's mandate is to support public space innovation; VIVA piloted the City's first parklet and the first pavement-to-plaza project. Covid Covid has brought more Plazas, more pop up, more demand for more demand for public space, I guess. Yeah. It sounds terrible to say. But Covet was like a very exciting time for public space in Vancouver. But not just in Vancouver.
Pressure	Proliferation of tactical urbanist interventions. Beer gardens and Spruce Street Harbour Park are also highly successful tactical urbanist projects initiated by non-profits and businesses, highly successful. Shows more demand for activating public space. Innovation from the realm of community engagement => Indego Bike Share system in 2015 gave the City of Philadelphia an opportunity to pilot new ways of engaging with communities to better understand transportation needs and perspectives. Philly Free Streets – Open Streets program that was originally initiated by advocacy group now taken up as an official event by the mayor (local government), encourages new thinking about public space.	DCDOTRA => grassroot tactical urbanist group active in city	Steady population growth => limited space to incorporate project number of vehicles in the city, would need more road space

	Feet first Philly – nonprofit advocacy group striving for safer streets Other tactical urbanist interventins INDEGO bike sharing program The launch of the Indego Bike Share system in 2015 gave the City of Philadelphia an opportunity to pilot new ways of engaging with communities to better understand transportation needs and perspectives. Based on that engagement, Indego has piloted numerous innovations that make it the most equitable and inclusive bike share system in the North America,		
Stress	Ageing infrastructure => city needs to rebuild its road infrastructure (underground as well as above) as it can't handle extreme weather events, causing flooding => opportunity to rethink city's infrastructure, whether more impermeable paving is necessary. However the city's official strategic transportation plan emphasises paving and improving city roads, asphalt over green space. According to the Connect plan, past generations have equipped the city with a robust transit network and dense street grid that promotes walking but these have not been examined or maintained for many decades => climate emergency turning attention to this now		Road congestion, ageing infrastructure that is operating above capacity, For businesses, congestion means higher transport costs, lost productivity, and reduced competitiveness; for consumers, congestion means higher prices; for citizens, it means more air and noise pollution, wasted time sitting in traffic, less flexibility and more greenhouse gases.
Broadening	Broadening can be prohibited due to wealth inequalities => some		

	neighbourhoods and communities do not have the resources or capacity to initiate such events, or capacity to maintain the city helps by providing elements of public space like plants, outdoor seating etc. A study by University City District showed that businesses that removed a parking space for a parklet saw a 20% increase in sales.43 Additionally, while each parking space might turn over up to 15 times per day, it was found that parklets serve up to 150 customers per day => parklets serve strong business/commercial incentives. But demand for free on street carparking exceeds supply… official plan states cars need access too.		