

Understanding the place-specific formation processes of sustainable urban experiments

A mixed method comparative case study of Formula E



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Abstract

Cities are increasingly recognized as frontrunners in the transition to a more sustainable society due to their assembly of technology, resources, population, culture, and economics. This is, amongst others, visible from a global increase in urban actors collaborating to *experiment* with new sustainable configurations. These so-called sustainable urban experiments, embedded in a broader niche, are not confined to a specific spatial context but will rather emerge in complex 'place bundles', forming a global niche. However, the formation of a global niche is interrelated with local experimentation and is thereby locally rooted. A prime example is sustainable motorsports experiment Formula E. Formula E operates on a global scale with numerous multinational companies involved but is set in urban environments and the local regional context arguably influences the formation of such events. In other words, Formula E is a global sustainable urban experiment which is locally embedded. Considerable variation in the way a sustainable urban experiment is formed locally is likely to exist. The objective of this study was to complement strategic niche management and sustainable transitions literature by understanding the specific place-specific factors under which global sustainable urban experiments are formed.

For understanding the local variation in the formation of a global sustainable urban experiment, this study builds on the frameworks by Torrens et. al. (2019) and Hansen & Coenen (2015). Torrens et. al. (2019), described different processes under which sustainable urban experiments are formed: protection, connectivity, and conflict. Each process provides a different perspective on the learning, intermediation, and politics of experimentation. Hansen & Coenen (2019) identified place-specific factors influencing experiment formation. This study suggested the specific formation processes under which an experiment is formed are shaped by these place-specific factors (e.g., urban policies and informal institutions). This led to the following research question: "How do place-specific factors shape the processes of protection, connectivity and conflict in the formation of Formula E?".

To understand the role these place-specific factors play in shaping the formation process of a sustainable urban experiment, a mixed method comparative case study of Formula E, an all-electric race car championship, was conducted. Sixteen cities, which hosted multiple Formula E events, were included in the sample. The results were obtained through a combination of qualitative desk research to understand the local formation process and quantitative indicators to discern the shape of the place-specific factors.

Findings empirically show considerable local variation in the formation of a global experiment and this variation could be characterized along three processes: protection, connectivity, and conflict. The results furthermore confirm the notion that place-specific factors shape the local formation process of a sustainable urban experiment. A formation process with a relative emphasis on connectivity dynamics is more likely to be present in cities which are strongly embedded in global networks. Cities which have formal and informal institutions representing a high degree of sustainability orientation tend to form experiments under contestation mechanisms (conflict process). Contrarily, protection mechanisms are more likely to occur in cities which have a limited orientation on sustainability. These results provide new theoretical insights on the influence of the local context on the formation and realisation of global sustainable urban experiments.

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1. Introduction

Cities are increasingly recognized as frontrunners in the transition to a more sustainable society due to their assembly of technology, resources, population, culture, and economics (Caprotti & Cowley, 2017; Chini et. al., 2017). This is, amongst others, visible from a global increase in urban actors collaborating to *experiment* with new sustainable configurations (Raven et. al., 2019). These urban experiments are a driver for transforming cities. They govern and steer processes of urban change into specific directions (Evans, 2016; Karvonen & van Heur, 2014; Caprotti & Cowley, 2017).

Especially promoting and developing more sustainable mobility means and habits is of increasing importance for cities across the globe (Cellina et. al., 2019). A promising avenue of sustainable (urban) mobility experimentation lies in the development of sustainable motorsports, such as Formula E (FE), an electric single-seater race car championship. Formula E challenges the mobility regime by developing electric vehicles designed to combine technology and sustainability as well as to facilitate the transition of cities to a more sustainable society (Del Pero et. al., 2021). For instance, technological advancements in professional motorsports often spill over to consumer markets (Skeete et. al., 2019). Formula E is therefore suggested as an incubator for developing low-carbon innovation within the mobility sector. Furthermore, FE has the potential to help electric vehicle public expansion by improving the electric vehicle's image and improving motorsport sustainability (Webster, 2016).

Sustainable mobility experiments, such as Formula E, are however not necessarily limited to one specific spatial context but will rather emerge in complex 'place bundles', dynamically evolving over time, forming a global niche (Fuenfschilling & Truffer, 2018). Transnational relationships are often found in these experiments and seldom can be described as domestic (Wieczorek et. al., 2015). However, despite transnational linkages, the formation of global niches is interrelated with local experimentation (Loorbach et. al., 2020). A range of local experiments across various spaces influence the emergence of these 'global niches. Thus, experiments are globally connected but locally rooted.

Local variation in global niches also holds true for urban experiments related to sustainable mobility experiments, such as Formula E. Formula E operates on a global scale with numerous multinational companies involved but is set in urban environments and the local regional context arguably influences the formation of such events. For instance, a group of London residents succeeded in banning the FE race from racing through London's Battersea Park, while the event in Riyadh attracted multi-million investments by public authorities (Ahmed, 2016; F1-Insider, 2019). Additionally, urban experiments are often formed through particular interests and strategic purposes (Bulkeley & Castán Broto, 2013). Although FE is considered to contribute to advancing sustainable sports and mobility on a global scale, the local orientation and reason for hosting the event is not required to be a sustainable one. Other aspects such as financial incentives, city branding or leisure, could be local orientations for hosting FE events. Different parties might as well have different (non-sustainable) reasons for being involved in the formation of an FE event. Therefore, this study argued the local sustainability orientation of FE events will likely differ across places as well. Combining, questions arise how Formula E is formed differently in spatially different places and what the role of sustainability is in this process. The objective of this study

was therefore to complement strategic niche management and sustainable transitions literature by understanding the specific local contextualities under which global sustainable urban experiments are formed.

Traditionally, strategic niche management (SNM) literature considers cities to act as protective spaces to foster and support urban experimentation (Turnheim & Geels, 2019). More recently, Torrens et. al. (2019) has criticized this tendency of presuming cities act as 'seedbeds' through providing protection and resources to sustainable urban experiments (SUE). Based on a literature review, Torrens et. al. (2019) argue that the formation of urban experimentation thrives under different processes, rather than functioning solely via protection mechanisms. The authors identify three processes through which urban experiments are formed: protection (seedbeds), connectivity (harbours) or conflict (battlegrounds). Seedbeds describe a process similar to the traditional SNM protection dynamics of shielding experiments from the mainstream selection environment, nurturing internal experiment development and empowering their up-scaling. Experimentation in harbours advances through being embedded in a larger transregional network, fostering various place-specific but connected experiments. Lastly, the process of conflict sees urban regions as 'battlegrounds' where political contestation, struggle and cooperation takes place for the formation of urban experiments. Although the framework by Torrens et. al. (2019) was originally developed to understand favourable urban environments for SUE formation, arguably the concepts of the framework can be adapted to characterize the specific formation process of an experiment. The concepts of the framework were therefore used in this study to understand the process specific characteristics of experiment formation.

Academic work by Hansen & Coenen (2015), who identified place-specific factors influencing the formation of experiments, might provide a better understanding why experiments vary in their formation processes across urban regions. These place-specific factors may play a role in shaping the specific local formation process of sustainable urban experiments (SUE). For instance, place-specific factors hold different shapes and importance depending on the novelty of the experiment (radical or incremental) (Dignum et. al., 2020). Although literature confirms the influence of these place-specific factors on experiment formation, it remains unclear whether place-specific factors shape formation processes and what the role of those factors are in the different formation processes (protection, connectivity, and conflict). Following, this study analyses the local embeddedness of a global sustainable urban experiment and the influence of the local context on its formation process. Therefore, this thesis aims to answer the following research question:

“How do place-specific factors shape the processes of protection, connectivity and conflict in the local formation of Formula E?”

For answering the research question, a mixed method comparative case study of Formula E is conducted. Variation in local experimentation, in terms of protection, connectivity and conflict, of FE in specific urban regions were investigated. Additionally, the study examined how the place-specific factors for these urban regions played a role in these different processes. Methodologically, this thesis focused on the formation of the same sustainable urban experiment (in different cities), rather than multiple experiments. In doing

so, this study was able to control for the inherent differences in urban experiments and the potential clouding effect of this on identifying the role of place-specific factors in the formation of those experiments. The very nature and type of the urban experiment influences the general shape of place-specific factors in the formation of this experiment, regardless of the specific formation process. Therefore, this study was able to understand the variation in local experimentation within a global niche.

This research aimed to provide empirical rigour to the framework of Torrens et. al. (2019) as well as the place-specific factors of Hansen & Coenen (2015) by understanding the different processes of SUE formation and the role of place-specific factors in these processes. Combined, this research develops new theoretical insights about place-specificity of urban experimentation. This study contributes to the geography of sustainable transitions literature and our understanding of transition processes through providing an in-depth answer to the specific contextualities of the formation of SUE (e.g., Shove & Walker, 2007; Trutnevyte et. al., 2012). Furthermore, the study adds to strategic niche management literature by integrating geographically sensitive concepts in understanding SUE formation (e.g., Schot & Geels, 2008; Kemp et. al., 1998). Insights on place-specific factors and their role in the emergence of a sustainable sports niche contributes to society at large in the following ways. First, it provides practitioners with a contextual understanding of potential barriers and opportunities for facilitating the formation of regional sustainable (sports) experiments (Truffer et. al., 2015). Secondly, this study can function as a guideline and introduction to understanding how a sustainable sport becomes more sustainable and what influence the regional contextualities have on this transition.

2. Theoretical Framework

2.1 Urban Experimentation and Strategic Niche Management

There has been a global wave of urban experimentation in cities and recent academic work devoted attention to understanding this form of experimentation (Raven et. al., 2019). Experiments in this context are defined as *“inclusive, practice-based and challenge-led initiatives, which are designed to promote system innovation through social learning under conditions of uncertainty and ambiguity”* (Sengers et al., 2019, p. 153). This study considers FE as an experiment as by definition it’s FIA’s practice-based initiative for generating more sustainable transport through functioning as a platform for R&D, education, and promotion (Robeers & van den Bulck, 2018). FE takes furthermore place in urban environments, allowing for the conceptualization of being an urban experiment. However, this study questions whether FE could be considered as a *sustainable* urban experiment since the sustainability orientation FE could differ between places. Perhaps different place-specific factors facilitate a differing degree of sustainability in the local formation of FE.

Urban experimentation occurs in niches, which are protected technological spaces that facilitate sustainable socio-technical transitions towards sustainability (Schot & Geels, 2008; Gaziulusoy & Twomey, 2014). Urban experimentation is embedded in a broader stream of strategic niche management and (sustainable) transition literature. Strategic Niche Management (SNM) is described as *“the creation and management of protected spaces (niches) for promising technologies by means of experimentation with the aim of learning about the performance, effects, economic viability and social desirability of the*

technology and to use this knowledge to inform private and public (support and control) policies that are needed for the further development and rate of application of new technologies and technology systems.” (Kemp et. al., 2000, p 171). In other words, a niche can be considered as a space in which (sustainable urban) experiments are conducted (van den Heiligenberg et. al., 2017). Actors within a niche are minorly constrained by dominant institutions and status quo, allowing them to experiment with more radical solutions to solve societal problems (Whitmarsh, 2012). Niches are characterized as functioning as a protective space for the cultivation of experiments (Smith & Raven, 2012). Protective spaces are hereby conceptualized as shielding experiments from (regime) market pressures (Dignum et. al., 2010). As radical innovations initially fail to compete within the selection environment of the free market, initial protection is crucial. These protected spaces facilitate nurturing and learning processes for experiments (Smith & Raven, 2012). Effective protection consists of three dimensions, shielding, nurturing and empowerment. Shielding is the concept related to creating protected space by exempting an innovation from some mainstream selection environment (Verhees et. al., 2015). Nurturing is the cultivation and development of the niche internally. Lastly, empowering is the dimension aimed at the wider up-scaling of the niche. It can be understood as creating competing niche innovations in an unchanged regime or as a process contributing to changing the regime selection environments favourable to the niche innovation. The notion of niches being confined to a local spatial context is reiterated and recent academic work suggests niche development is an inherently global phenomena, following a non-linear process and involves interactions between local and global levels (Bauer & Fuenfschilling, 2019; Geels & Deuten, 2006).

Although SNM provides a better understanding of the internal niche mechanisms essential to sustainable transitions, sole niche development is not sufficient to trigger a regime shift (Berkhout et. al., 2017). SNM has over emphasized local experimentation in the cultivation of niches and other mechanisms through which niches contribute to regime reconfiguration is underdeveloped (Smith et. al., 2005; Bui et. al., 2016). Scholars recently suggest the important role of niche-regime interaction and incumbent regime actors themselves in driving transformations (Rosenbloom et. al., 2016; Geels, 2018). Empirical work by Skeete (2019), provides backing to this argument, showing incumbent automotive actors played a significant role in the transition to energy efficient and low carbon automotive technologies. Adding, incumbent internal combustion car manufacturers showed capable of introducing radical EV technologies (Wesseling, 2015). Thus, incumbent actors can be capable of addressing niche-oriented activities (Mylan et. al., 2019). Arguably this is especially relevant for sustainable sports experiments, such as FE, due to the inherent linkage to the traditional sports branch and the deep involvement of incumbent actors in the experiment (e.g., Mercedes, Nissan, Audi, BMW).

2.2 Geography of Sustainable Transitions

Although sustainable transition and SNM literature are effective for understanding sustainable transitions, it is criticized for the lack of geographically sensitive concepts (van den Heiligenberg et al., 2017; Torrens et. al., 2018). So far, the spatial contexts in which sustainable experiments are embedded received little attention in transition literature (Markard et. al., 2012). This is problematic as it does not account for identified place-specific distinctiveness to sustainability transitions or interdependencies between cities, regions, and countries (Binz et. al, 2020; van Waes & Raven, 2020). Not conceptualizing

places and spatial scale in sustainable transitions might lead to simplistic or incorrect analytical assumptions and empirical analysis (Raven et. al., 2012). The geography of transitions literature aims to understand how and why transitions are similar or different across locations by addressing questions about spatial difference, relations of positions and connection and the spatial configuration and scales of organisations (Köhler et. al., 2019, Bridge et. al., 2013).

The geography of transitions perspective holds important conceptual implications (Fuenfschilling & Truffer, 2018). For instance, experiments are locally embedded through local regulations, support schemes and local actors, but are globally distributed and transferred to other urban regions (Bakker et. al., 2008; Nykvist & Whitmarsh, 2008; Oke et. al., 2019; Susur et. al., 2019). As a result, the idea of niches as protective spaces will not be limited to one specific spatial context but will rather emerge in complex 'place bundles', dynamically evolving over time, forming a global niche (Fuenfschilling & Truffer, 2018). This reconsideration of the spatial context in which niches operate and the local-global interaction within these niches, pose questions on the way in which the local context influences experiments embedded in global niches. FE is a prime example of a SUE with a multi-scalar spanning. FE is organized by an international organisation, FE Holdings, which holds the license to host the championship. Furthermore, FE Holdings is accountable to the laws and regulations of the FIA, the international motorsport federation. However, cities and local communities are significantly involved in the local formation of the event (Næss, 2021). For instance, FE Holdings would need the approval of local public authorities, if raced on custom street circuits (using public roads). Concluding, the electric race car championship operates on a global scale with numerous multinational companies involved, but the events are obliged to fulfil the local requirements and conditions. Following, this study analysed the local embeddedness of a global sustainable urban experiment and the influence of the local context on its formation process.

2.3 Conceptual Framework

This thesis' conceptual framework (Figure 1) is built predominantly on the work of Hansen & Coenen (2015) and Torrens et. al. (2019). This section will first discuss the outcome variable, the formation processes of a sustainable urban experiment. Following, the place-specific factors are introduced that are expected to facilitate the formation of a sustainable urban experiment.

2.3.1 The formation of a sustainable urban experiment

The unit of analysis in this study is the formation process of a single sustainable urban experiment, in this case an FE E-prix in a specific city and with involvement of a municipal government. More formally, this study analysed the specific processes forming the development of a SUE. The formation of a sustainable urban experiment is a multiform and political process, involving mobilizing several cultural, economic, and political actors, creating networks and the (re)alignment of discourses and institutions (Savini & Bertolini, 2019; Bulkeley et. al., 2014). This process starts from the very initial city government plans on potentially hosting an FE event, to the actual realisation of the event. Typically, this process is expected to be one to three years. Although the framework by Torrens et. al. (2019) was originally developed to understand favourable urban environments for SUE formation, arguably the framework can be adapted to characterize the specific formation process of an experiment. The concepts of the framework, protection,

connectivity, and conflict were therefore used in this study to understand the way in which Formula E is formed locally.

2.3.2 Protection, connectivity, and conflict

The process through which SUE are formed can be described along three processes: protection, connectivity, and conflict (Torrens et. al., 2019). Each process provides a different perspective on the learning, intermediation, and politics of experimentation (Torrens, 2019). Although the different processes can coexist within the same formation, generally it is expected there will be one dominating this process. In other words, this study argues these processes are not mutually exclusive, but rather show a relative emphasis on a single process. The concepts by Torrens et. al. (2019) form the initial categories on the formation of FE. However, this study also follows an inductive element to develop new (sub)categories fitting to the data.

The protection process foregrounds the traditional SNM nurturing configuration of place-specific factors to contribute to a selection environment encouraging experimentation (Torrens et. al., 2019). Experiments are shielded from the prevalent socio-technical regime and processes are geared towards nurturing experiments and their growth (Smith & Raven, 2012). This process is characterized by the three key dynamics conceptualized in SNM: shielding, nurturing and empowerment. Furthermore, the protection process centres around the development of a protective space for experimentation, stipulating the development of tacit knowledge through 'learning by doing'. Processes are reconfigured through the accumulation of lessons learned from previous experiments. The political dimension of this process centres around creating policies for supporting protection and allocating resources to experiments. When translating this to FE experiments, protection characteristics might display exemptions from regulations to shield the experiment from the mainstream selection environment. Furthermore, nurturing, and empowering dynamics could be in the form of financial instruments such as private investments, public subsidies, or tax exemptions. Empowering dynamics might show actively reforming institutions of the incumbent regime or improving alignment with existing industrial structures. For instance, the CEO of Formula E framed the sound of the electric cars as spaceship-like to align the experiment with the incumbent institutional belief race cars should make 'noise' (Lambert, 2016).

The connectivity process sees cities as hubs for connections, passages, mobilities and flows (Torrens et. al., 2019). The urban space functions as a node in a larger transregional network of urban actors, discourses, and practices, fostering various place-specific connected initiatives (Blok & Tschötschel, 2016). The connectivity process is characterized by attracting, retaining, and facilitating the circulation of resources and human capital while encouraging the development of the experiment. Attracting human capital is facilitated through the reputation of local organizations such as distinguished universities, local think-tanks, and respected firms (Torrens et. al., 2018). Local actors share a global orientation, encouraging cooperation and competitions with other cities. This process is characterized by facilitating mobility through well-established infrastructure assets and historical developments. Transnational linkages, mobilities and flows furthermore effectuate power relationships (Torrens et. al., 2019). Learning in this process involves the *"de-embedding, translation and re-embedding of lessons and experiences across places and scales"* (Torrens et. al., 2019 p. 218). FE might resemble connectivity characteristics in

the form of significant collaborations, obtaining resources and human capital through interregional and local relationships. Niche-regime interactions to facilitate the formation could furthermore be more prominent in this process.

Lastly, the conflict process sees urban regions as 'battlegrounds' where political contestation, struggle and cooperation take place (Torrens et. al., 2019). This process focuses on how, for instance, social and political movements resist particular developments and clashes between distinct coalitions. Particular events and conflicts create openings for change, rather than the long-term development of stable structures (Jørgensen, 2012). This process implicates reconfiguring formal institutions as they can expedite or hinder sociotechnical change. Learning happens through privileged communication channels, migrates expertise, and emphasizes 'trans-local learning' (Torrens et. al., 2019). It furthermore centres around a process described by conflictive (political) dynamics. Experiment formation is triggered through acquiring knowledge on structural challenges and institutional barriers which fosters a 'taking-into-account' learning perspective. (Torrens et al., 2019). FE experiments might display conflict characteristics in the form of resident and/or political contestation to the event. A prime example of this is the case of London where residents prevented FE from racing through a local park in future events.

During exploratory meetings with FE stakeholders, to provide initial context and background information to the case, a new insight was brought to light. Urban experiments are often formed through particular interests and strategic purposes (Bulkeley & Castán Broto, 2013). Although FE frames itself as promoting sustainable sports and mobility, the local reason for hosting an FE event is not necessarily driven by sustainability issues. Other aspects such as financial incentives, city branding or leisure, could be local orientations for hosting FE events. Different parties might as well have different (non-sustainable) reasons for being involved in the formation of an FE event. Therefore, this study argues the local sustainability orientation of FE events will likely differ across places. As a result, besides understanding the specific formation process of FE in an urban space, this study aims to assess the sustainability orientation of this event as well.

2.3.4 Place-specific factors

Hansen & Coenen (2015) compiled several place-specific factors influencing the emergence of an experiment (Table 1). In this study, these factors are not confined to FE specifically, but encompass the broader sustainable mobility regime within a city. These place-specific factors are urban visions and related policies, localized informal institutions, local natural resource endowments, local technological and industrial specialization, local market and network formation and the existence of consumer demand.

| Place-specific Factors |
|---|
| Urban visions and policies |
| Localized informal institutions |
| Local natural resource endowments |
| local technological and industrial specialization |
| Network formation |
| Consumer demand and market formation |

Table 1: Place-specific factors influencing experiment formation

Urban and regional visions and policies

Urban and regional policies are central to facilitate the embedding and diffusion of experiments (Hansen & Coenen, 2015). ‘Guiding visions’ have a prominent role in transitions and experiment formation as a means of mobilizing social actors and the coordination of dispersed agency (Späth & Rohrer, 2010). In this context, a guiding vision is an instrument in agenda building for long-term policy goals and transformation strategies. Visions are influenced by the formation of regional and interregional relationships, different scales of governance and regional, national, and multinational capital (Hodson & Marvin, 2009). Strong urban policies have a high influence on experiment formation compared to national guidelines, as they are expected to take advantage of localized spill overs, the relative ease of mobilizing actors and place-specific regime configurations (Essletzbichler, 2012). Regime actors furthermore have strong political power and may attempt to reverse policy support for the experiment (Hess, 2016). These factors are likely to play an important role in the formation of a FE event. While FE is proposed as promoting sustainable mobility and renewable energy (FIA, 2021), cities which have aligned visions presumably will be more inclined to host such events. Adding supporting sustainable mobility policies as well as policies facilitating leisure/sports activities are likely contributing to FE formation.

Localized informal institutions

Experiment formation is embedded in localised institutions and its development is conditioned by those (Hansen & Coenen, 2015). The habitat framework provides insights to further understand the role of informal institutions (van den Heiligenberg et. al., 2017). A habitat is a configuration of contextual factors, which are mainly locally or regionally embedded. The core idea is that different habitats enable different sustainability experiments. For instance, an experiment described by scientific and codified knowledge and strong guidance by firms or governments, is best nurtured in a habitat defined by a technologically oriented science-based culture (Schipper, 2019). Regardless, pre-existing institutional structures may favour well-established regime solutions (Fuenfschilling & Truffer, 2018). A prime example of this is the current tendency of broadcasters to align FE with traditional motorsport values, instead of the environmental perspective promoted by the FIA (Robeers, 2019). Disrupting positive associations that support the regime and stabilise consumer purchasing could play a potential role in the formation of an

experiment (Mylan et. al., 2019). FE can be considered a global experiment as events and involved actors operate on a multinational scale. Therefore both, highly institutionalized local as well as global socio-technical configurations must be challenged (Bauer & Fuenfschilling, 2019).

Local natural resource endowments

According to Hansen & Coenen (2015), natural resource scarcity stimulates investments in renewable energy development and diffusion. Additionally, the endowment of natural resources influences the choices between renewable technologies. This factor is expected to be influenced by the global scale of both traditional and sustainable motorsports as well as the general context of sports. Technological advancements in FE do not rely on the specific individual region's natural resources. Furthermore, the necessity for regional transition due to resource scarcity, triggered by motorsports, is also limited. However, natural resources are being depleted by the hosting of sports events. FE is predominantly hosted on custom-built street circuits, requiring the closure of roads, city council approvals, and cooperation from local organizations (O'Kane, 2017).

Local technological and industrial specialization

Industrial specialization conditions the development of sustainable innovations since it affects the ability for regions to generate and nurture new development paths (Hansen & Coenen, 2015; Fløysand et. al., 2021). New experiment formation is rooted in related activities which have historically been present in the urban region (Neffke, 2009). However, this factor is expected to be of lesser importance in the context of FE. The global scale of the sport arguably reduces the need for local industrial and technological specialization in the formation of FE.

Network formation

A particular form of specialization which does seem to play an important role is the formation and capabilities of regional networks. Limited network formation and cooperation is found to have a negative impact on the formation and cultivation of experiments (Hansen & Nygaard, 2013; van den Heiligenberg et. al., 2017). Due to the inherent global nature of FE, the formation of networks will likely not be limited to regional scales but will also include national and international linkages.

Existence of consumer demand and market formation

Lastly, engaged consumers play an important role for local market creation (Hansen & Coenen, 2015). Apart from general demand, consumer demand in this case will likely also be taking the form of environmental awareness. Environmental awareness is positively correlated with likelihood of adoption of sustainable innovations (Dastrup et. al., 2012). The degree of regional environmental awareness is deemed a relatively important one for creating the incentive, for both the municipality and public, to host an FE event.

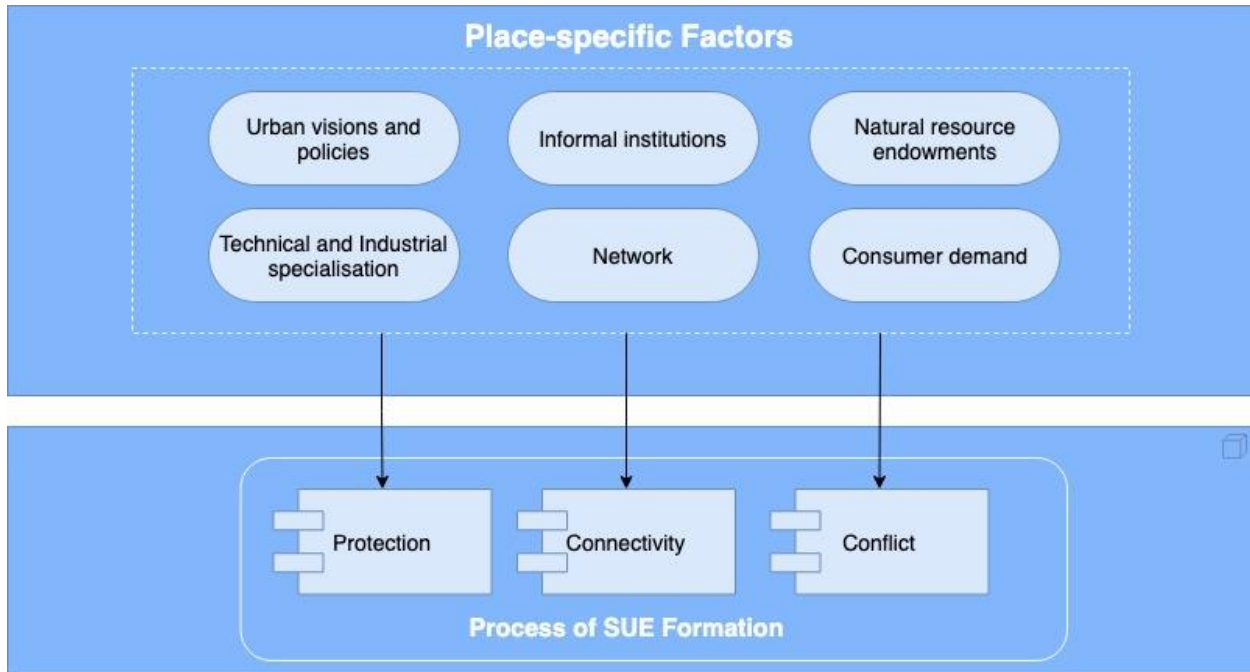


Figure 1: Conceptual framework

2.4 Expectations about the role of place-specific factors

This study expects that the place-specific factors shape the relative emphasis on a particular formation process of a sustainable urban experiment (e.g., connectivity vs conflict). This section aims to provide some initial expectations on the role of place-specific factors in shaping the process of SUE. First, for all three processes, it is expected that consumer demand and environmental awareness will form a rather homogenous picture across the three processes. The experiment being formed on a global scale, the expectation is that such experiments are likely to take place in regions where there is significant and similar consumer demand and environmental awareness, forming a homogenous picture across the different formation processes. If there is no significant local consumer demand nor environmental awareness, such experiments would likely not be formed in these regions at all. Policies and visions, natural resource endowments, technical and industrial specialization, network formation and informal institutions are expected to be important but different along the three different formation processes.

As protection processes are characterized by nurturing configurations, it is expected that such processes are more likely to be expressed by cities who are shaped by strong regional sustainable policies, targeted at stimulating and protecting SUE. Adding, it is suggested there will be an important shared regional vision in changing the urban context to a more sustainable environment. While these cities are expected to have a strong focus on sustainability this could potentially be a result of limited resource endowments since resource scarcity stimulates investments in sustainable developments (Hansen & Coenen, 2015). Thus, this study expects resource scarcity will be facilitative in Formula E being formed under protection dynamics. Existing local industrial and technical know-how might reinforce dynamics of protection for SUE as it provides evidence in the ability of the region to develop such experiments. Furthermore, general network formation in the city would likely be focussed on connecting local actors and building strong local

relationships. Finally, informal institutions are expected to place greater emphasis on valuing and supporting science and technology initiatives. Actors share a sense of agreement on changing the urban context but have an inward orientation (van Ewijk, 2013).

A process described by connectivity characteristics is likely influenced by policies and visions geared more towards supporting and coordinating the connectivity of the urban region with other places and thus places less emphasis on sustainability policies and visions. Complementary, network formation is expected to play a major role in this process with a strong focus on a wide transnational network of actors, leveraging these linkages to realise the formation of the experiment. Resource scarcity in these cities might be less pressing for the formation of experiments since experiments in these regions are developed through leveraging the region's connectivity rather than pressing local sustainability issues. Local technical and industrial specialization is expected to be of moderate influence in this process whereas this process leverages specialisation through interregional knowledge spill overs. Informal institutions might be characterised by a globalist perspective, supporting multiculturalism and tolerance to diversity as these traits aid interregional collaborations. Connectivity processes play a more important role in the formation of SUE in cities with international cooperation cultures and an attitude for cross regional knowledge sharing (van den Heiligenberg et. al., 2018).

Lastly, the conflict process is expected to be dominant in cities which have policies and visions in place which provide very little attention to sustainability, which in turn lead to urban conflict and tensions. Furthermore, there is likely an abundance of local natural resources available, reducing the urgency to transform a fossil fuel related mobility system. A lack of technical and industrial specialization might reinforce this mechanism since it conditions the necessary development to transition to a sustainable mobility system (Hansen & Coenen, 2015). As a result, contestation is needed to in fact transition the urban region. As battlegrounds are referring to urban conflict, informal institutions might also contest such dynamics. Generally dominant informal institutions might depict little orientation on sustainability. However, different institutional logics would battle for becoming the dominant local logic (Fuenfschilling & Truffer, 2014). Network formation is furthermore likely focused on building alliances with regional niche/experiment and regime actors to form agreements.

3. Methodology

3.1 Research design

As mentioned previously, the specific sustainable urban experiment in this context is the hosting of a Formula E (EPrix) championship in a city. Typically, E-Prix are hosted on custom-built street circuits within the city, but occasionally on regular racing circuits. This study does not differentiate between the two methodologically if they are organized by a host city. The argumentation for this specific case lies in the comparability of it. Previous literature grouped all SUE in one specific city and investigated the processes behind those formations (see Torrens et. al, 2019; Torrens, 2019). Arguably, grouping the wide range of SUE as one entity clouds the results for understanding the role of the place-specific factors in the different formation processes. Different experiments likely have differing shape of the place-specific factors, regardless of their formation process. For instance, a SUE of local renewable energy generation will require different technical and industrial specialization than an experiment tackling mobility issues. Instead of instigating conclusions driving from a range of experiments, this study took a closer look at the role of place-specific factors in shaping the process of one specific experiment. By limiting the number of experiments and taking a comparative stance, the characterisation of the characterisation of the formation of this experiment was mapped with more validity while there is no variance in the type of experiment.

For this study, the main analytical approach used is a mixed method multi-case comparative study. Generally, a case study can be seen as an intensive study of a single unit with the aim to generalize across a larger set of units (Gerring, 2004). A multi-case comparative study is specifically suitable for explanatory, descriptive and *exploratory* settings (Ritala et. al., 2013; Bickman & Rog, 1998). Since this study aimed to extend theory by exploring the local contextualities of the formation of SUE, a comparative case study suits well. Additionally, geography of transitions literature benefits from using comparative methods (Hansen & Coenen, 2015). A comparative case study involves the analysis of similarities, differences, and patterns across two or more cases which share a common focus (Goodrick, 2020). Contextually, a case in this study is regarded as the formation of an EPrix in a specific city. Comparative case studies allow for integration of both quantitative and qualitative variables and the examination of potential causal mechanisms within the cases (Goodrick, 2014). The formation process of FE is hereby qualitatively collected to understand the local formation process but is operationalized in a more quantitative manner to couple the place-specific factors to this process. The exact operationalization of both the formation of FE and the place-specific factors will be discussed in section 3.3.

Instead of validating predetermined relationships, such as hypothesis testing, as often used in case-study research, this study used an abductive approach for theory development (Dubois & Gadde, 2014). Abductive approaches generate theory through building new theories or modifying existing ones (Mitchell, 2018). While this study combines the two theoretical frameworks by Torrens et. al. (2019) and Hansen & Coenen (2015), to understand the relationship between them, an abductive approach was deemed fruitful. An abductive methodology is suited if the goal is to discover new things - other variables and other relationships (Dubois & Gadde, 2002). Although deviating from strictly validating hypotheses, abductive reasoning still allows for a provisional expectation on the relationship between variables and

pursuing this expectation through further investigation (Kennedy & Thornberg, 2018). One of the utilities of the abductive approach is the use of deductively and inductively sourced data in validating the preliminary expectations (Awuzie & McDermott, 2017). Due to an unforeseen difficulty in conducting qualitative interviews for data collection, this abductive approach allowed to adopt a more deductive stance for understanding the role of place-specific factors in the formation process of FE, which will be further explained in the operationalization.

3.2 Data collection

This section will dive into the specific cities selected for this study. For securing data availability and richness, only the cities who hosted races in multiple years were included in the sample. A higher degree of data richness ensures a higher degree of comparability between the cases. This leaves sixteen cities of which five are European. A complete overview of all cities who hosted an EPrix can be found in Appendix 8.1.

| City | Year | Races |
|------------------------------|------------------------|-------|
| 1. Beijing (China) | 2014-2015 | 2 |
| 2. Berlin (Germany) | 2015-2020 | 12 |
| 3. Buenos Aires (Argentina) | 2015-2017 | 3 |
| 4. Hong Kong (China) | 2016-2017,2019 | 4 |
| 5. London (UK) | 2015-2016 | 4 |
| 6. Long Beach (USA) | 2015-2016 | 2 |
| 7. Marrakesh (Morocco) | 2016, 2018-2021 | 5 |
| 8. Mexico City (Mexico) | 2016-2020 | 5 |
| 9. Monte Carlo (Monaco) | 2015, 2017, 2019, 2021 | 4 |
| 10. New York (USA) | 2017-2019 | 6 |
| 11. Paris (France) | 2016-2019 | 4 |
| 12. Punta del Este (Uruguay) | 2014-2015, 2018 | 3 |
| 13. Putrajaya (Malaysia) | 2014-2015 | 2 |
| 14. Riyadh (Saudi Arabia) | 2018-2019, 2021 | 5 |
| 15. Rome (Italy) | 2018-2019, 2021 | 4 |
| 16. Santiago (Chile) | 2018-2020 | 3 |

Table 2: Cities hosting multiple EPrix championships

Data is collected through desk research. Desk research is a form of data collection which relies on data derived from secondary sources, eliminating the need for data collection through participants (Hoover Green & Cohen, 2021). The benefits of desk research are its cost effectiveness and the ability to quickly access large amounts of data (Shumba & Munemo, 2018). Additionally, by only using publicly available data, ethical issues in this study were diminished. To eliminate data source bias and increase data completeness, this study used a multitude of data sources for each case.

For collecting data of the individual cities' formation of FE, both the official website of FE as well as global and local newspapers were consulted. Local newspapers generally cover local events to a higher degree compared to national or global newspapers (Barranco & Wisler, 1999). Thereby, including local sources increases validity. Local newspapers were identified through Google's list of newspapers in local areas. However, as local documentation on Formula E is expected to increase when the city size increases, data collection for cities which are comparatively small (e.g., Punta del Este) was extended to also include domestic newspapers. To ensure comparability, the study devised a general search query for collecting data in a systematic and homogenous way across the different cities. The specific query used was the following: [specific city] EPrix or Formula E and one of the following keywords: 'collaboration(s)', 'sponsorship(s)', 'charities', 'stakeholders', 'connections', 'contestation', 'pollution', 'disturbance', 'discussion', 'investments', 'regulation(s)', 'exemptions' and 'subsidies'. For triangulation purposes, google search queries were furthermore specified to look for articles only on specific sites (e.g., 'site:nytimes.com'). This was done to avoid relying on a single data source, but also to increase data richness. For local newspapers (in their native language) the search queries were translated to the local language. Google Translate was used to translate non-English/Dutch articles. The data for the place-specific factors was collected through quantitative indicators, such as disposable income per capita and co-patent publications. Data collection for these factors will be further explained in the operationalization section (3.3.2).

3.3 Operationalization

The operationalization of both the formation process and the place-specific factors followed a mixed method approach. The main reason for this approach was the unavailability of actors to be interviewed. The initial approach for this study was to conduct qualitative in-depth interviews with several actors within the Formula E niche. However, setting up interviews with these actors proved to be unmanageable within the time frame of the study. Reasons for this were the general unavailability of the actors to be interviewed, due to either busy schedules, unresponsiveness, or the Covid-19 pandemic, and expressed concerns on the potential commercial sensitive information being disclosed. These methodological problems led to the decision to take a more deductive stance and quantify the formation process of FE and the place-specific factors through using indicators which could be sourced from publicly available data.

Whereas this study deals with indirectly measurable concepts, it is important to define these concepts into measurable indicators. This section will discuss the operationalization of both the formation process of FE and the place-specific factors. For a complete overview of the operationalization of the formation process of FE, see table 2. The operationalization of the place-specific factors can be found in table 3.

3.3.1 Formation process of SUE

One of the goals of this study is to understand the characterisation of the formation process of formula E in terms of conflict, connectivity and protection and the local orientation of this process on sustainability. Following both the formation process of FE and the degree of sustainability orientation of this process had to be operationalised. The indicators used in the operationalization are selected upon relevance to the theory and their public availability.

3.3.1.1 Connectivity

The connectivity process is characterized by local and translocal networks and linkages (Torrens et. al., 2019). Following this rationale, the indicator used for this process is the way in which collaboration is organized in the formation of FE events. This indicator provides a characterization of individual collaborations. This characterization is then later aggregated to experiment level. The aggregation method used is detailed in the data analysis section (3.4). The characterization of collaboration is further operationalized along multiple sub indicators; the purpose, intensity and scale of the collaboration and the type of stakeholder(s) involved. These sub indicators are mostly based on prior literature on strategic niche management or studies investigating the characteristics of collaborations.

Purpose of collaboration

Collaborations can serve different purposes (Haus-Reve et. al., 2019). There are three notable purposes of collaboration in this case study. Collaborations can be set-up to directly facilitate the FE event (e.g., local power generation), to aid the city and its residents (e.g., helping local charities), or to stimulate the sustainable mobility niche (locally and/or globally). FE could have different motivations to collaborate on a city or niche level. They could indirectly benefit from collaborating to serve the city, or have ulterior reasons, such as goodwill or municipal obligation. These different types of purposes have inductively been identified, evolving from empirical data.

Intensity of collaboration

The intensity of the collaboration could also differ along different local contexts and collaborations. Collaborations could exist on a purely financial transaction basis or a mutual collaborative effort of both parties (Edquist et. al., 2002). Therefore, the intensity of collaboration is categorized in whether the collaboration was based on a financial agreement or not. Furthermore, the frequency of the occurrence of the specific collaboration is mapped as well.

Orientation of collaboration

Whereas this study centres around SUE, it would be logical to understand the nature of the collaboration. As proved by exploratory interviews with FE stakeholders, collaborations could fulfil different orientations rather than only a sustainable one. For instance, collaborations could have an innovation or science orientation. Since one of the goals of this study is to understand the sustainability orientation of the event, this indicator is assessed along three levels; 'sustainability', 'innovation' and the leftover category: 'other'. Sustainability collaborations are those collaborations which display a focus on sustainability, such as facilitating renewable power generation or hosting sustainable mobility conferences. The sustainability

category will also include sustainable innovations. However, FE is still an experiment heavily relying on science and innovation in general. Therefore, this indicator also included an innovation category composed of collaborations who share a focus on innovation and technology but do not have a link to sustainability. Examples of this are promoting autonomous vehicles or smart and IoT technologies. The last category are the remaining possible orientations which are found in the data.

Scale of collaboration

Stakeholders and collaborations are not necessarily confined to the local setting and recent academic work identified the role of global stakeholders in local SUE (Silver, 2017; Blok & Tschötschel, 2016). Collaborations encompass a multi-scalar arena where both international and regional interests are negotiated to facilitate the formation of an experiment (Sengers & Raven, 2015). The connectivity process is furthermore explicitly characterized by transnational linkages and international organizations. For this reason, this sub indicator is conceptualised to understand the scale of the different collaborations in the local context. It distinguishes two different scales: local and global. Local collaborations are confined to the boundaries of the city, whereas global collaborations expand to the international level.

Type of stakeholder

During SUE formation, there are a variety of stakeholders involved in different stages with different purposes (Hermans et. al., 2013; Caniëls & Romijn, 2008). Additionally, the formation process might display the presence of incumbent regime actors through for instance niche-regime interactions. Therefore, this study analysed the type of stakeholder, based on the firm being either an incumbent or an SME/start-up. Additionally, the study made a distinction in terms of the legal entity of the stakeholder. The final categorization of this sub indicator distinguishes between public, private and non-profit stakeholders (table 2).

3.3.1.2 Conflict

The conflict process describes a formation where actors use tactics such as protest and media campaigns to create attention to their problems (Torrens et. al., 2019). Local resident attitude could resemble contestation dynamics (Bulkeley & Castán Broto, 2013). However, contestation and attitude are not limited to residents but is also pressing in the political climate (Karvonen et. al., 2014). This process is thereby operationalized as the local attitude of both residents and political actors. These two indicators are comprised of the sub indicators: general local attitude and residential and political contestation.

General local attitude

The general attitude is operationalized in terms of visitor size of the FE event in the respective city. There appears to be considerable differences between visitor size along different cities, which this study assumes to be reflective of the general local attitude towards FE. The higher the visitor size, the more positive the general attitude.

Residential and political contestation

Despite a measure for general attitude, it is important to understand local contestation by either local authorities and politicians or residents and social movements. FE events can be contested due to a variety

of reasons, such as noise pollution, sustainability issues or traffic congestion. Therefore, this study operationalized residential and political contestation in both their frequency and reason. Frequency is measured through the number of different actors contesting the event. The frequency of a specific reason for contestation is also turfed. If a specific actor lists numerous arguments for contestation, they are all counted. For this reason, the degree and reason of contestation might differ in terms of their frequency. The reason for contestation is subdivided in three levels: sustainability, disturbance or commercial. Sustainability reflects all contestations because of sustainability issues of FE (e.g., conventional fossil fuel power generation). Disturbance reflects contestation due to the impact the FE event might have on the local milieu (e.g., noise pollution, traffic congestion and public blockades). Lastly, commercial concerns contestations triggered by means of commercial issues such as ticket pricing, parking, or inconveniences during the event. These categories were formed inductively.

3.3.1.3 Protection

Lastly, the protection process describes a formation through affording protection for experiments (Torrens et. al., 2019). This dynamic might also be at play in that of FE, through for instance exemption of local mainstream motorsports regulations or subsidies (Ingram et. al., 2015). Additionally, FE events create new spaces for private and public investment (McLean et. al., 2016). Protection in this study is therefore operationalized in terms of exemption from regulations and/or obligations and investments and subsidies.

Exemption from regulations/obligations

These exemptions are operationalized in terms of frequency and target. The target of exemptions in this study reflects to which sector/theme the exemption is applied. This study distinguished between three different possible targets, mainstream motorsports, city, or niche. A regulative exemption can for instance be issued on the sector level of mainstream motorsports (e.g., less permits required for hosting a motor race), on the city level (e.g., use a space otherwise not available for events) or on the niche level (e.g., tax exemption for promoting sustainable mobility). These categories were inductively created to create a good fit between the categories and the empirical data.

Investments/subsidies

This study assumed investments and/or subsidies facilitating FE furthermore reflect protection dynamics. Investments and subsidies are furthermore assessed on their size, legal entity of the stakeholder and target. The target of the investment assesses whether the investment is purposed for improving the sustainability of the event (e.g., renewable energy generation) or for other means such as logistics (e.g., paving roads) or commercial (e.g., reducing ticket price). The legal entity of the stakeholder is separated between public, private and non-profit organisations (NPOs).

3.3.2 Local sustainability orientation

The operationalization of the local sustainability orientation of Formula E is embedded in the operationalization of the different formation processes. Within the connectivity process, the orientation is assessed under the orientation of the collaboration. In short, this indicator assesses whether the specific collaboration has a focus on sustainability. For instance, a collaboration with a local solar production

company to power the event through renewable energy. In the conflict process the sustainability orientation is included by assessing if the reason of contestation is related to sustainability issues. If so, this would suggest FE is locally attributing less attention to the sustainability aspect of the race. Lastly, the process of protection includes an indicator which assesses the intended target of a specific investment. Financial instruments such as investments could have a specific purpose in which it is intended to contribute to the event. This study analysed if the investment received has a specific sustainable purpose. Combining, these indicators sketch a picture on the local sustainability orientation of Formula E.

Place-specific formation processes of sustainable urban experiments

| Process | Indicator | Sub Indicator | Operationalization |
|---------------------|--|--|---|
| <i>Connectivity</i> | Collaborations | <ul style="list-style-type: none"> - Purpose of collaboration (targeted on FE event, city or niche) - Intensity of collaboration <ul style="list-style-type: none"> - Transaction - Frequency - Orientation of collaborations - Scale of collaboration (local vs global) - Type of stakeholder <ul style="list-style-type: none"> - Incumbency - Legal entity | <ul style="list-style-type: none"> - Purpose (<i>Nominal</i>): FE, City, Niche - Transaction (<i>Binary</i>): Yes, No - Frequency (<i>Binary</i>): one-time, > 1 - Orientation (<i>Nominal</i>): sustainability, innovation, other - Scale (<i>Binary</i>): local, global - Incumbency (<i>Binary</i>): incumbent, challenger - Legal entity (<i>Nominal</i>): Private, Public, NPO/NGO |
| <i>Conflict</i> | General attitude | | <ul style="list-style-type: none"> - Visitor size (<i>Ratio</i>) |
| | Resident attitude | <ul style="list-style-type: none"> - Degree of contestation - Reason of contestation | <ul style="list-style-type: none"> - Frequency of contestations (<i>Ratio</i>) - Reason (<i>Nominal</i>): Sustainability, Disturbance, Commercial |
| | Political attitude | <ul style="list-style-type: none"> - Degree of contestation - Reason of contestation | <ul style="list-style-type: none"> - Frequency of contestations (<i>Ratio</i>) - Reason (<i>Nominal</i>): Sustainability, Disturbance, Commercial |
| <i>Protection</i> | Exemption from regulations/obligations | <ul style="list-style-type: none"> - Degree of exemption - Target of regulation | <ul style="list-style-type: none"> - Frequency of exemptions (<i>Ratio</i>) - Target of regulation (<i>Nominal</i>): Mainstream motorsport, City-wide, Mobility |
| | Investments/subsidies | <ul style="list-style-type: none"> - Size of investments/subsidy - Legal entity of stakeholder - Target of investment | <ul style="list-style-type: none"> - Size (<i>Ratio</i>): Euros - Legal entity (<i>Nominal</i>): Private, Public, NPO/NGO - Target (<i>Nominal</i>): Sustainability, Logistics, Other |

Table 3: Operationalization formation process SUE

3.3.3 Place-specific factors

The following section will discuss the operationalization of the place-specific factors. The operationalization and data collection is partially adapted from previous empirical work on geography of sustainable transitions (van den Heiligenberg et. al., 2017; Schippers, 2020) and entrepreneurial ecosystems (Leendertse et. al., 2019). All indicators, except for natural resource endowments, are operationalized on a city level. Some cities in the dataset are suburbs of larger adjacent urban regions and thus the place-specific factors of these suburbs were aggregated to the adjacent city. The suburbs in question are Long Beach and Putrajaya. Respectively the place-specific factors of their adjacent cities, Los Angeles and Kuala Lumpur were assessed. However, data availability for the place-specific factors of the cities in the dataset was rather scarce. This led to significant missing data of place-specific factors of the following cities: Punta del Este, Monte Carlo, and Marrakesh. For this reason, these cities were left out in this analysis. Furthermore, not all cities were included in all databases, especially regarding patent output and disposable income. For this reason, alternative data sources were used to complement the sources listed in table 3. A complete overview of all used data sources can be found in appendix 8.2.

3.3.3.1 Urban visions and policies

Data for local urban visions was collected from the Deloitte city mobility index. One of the factors of this index is the presence of a sustainable mobility vision and strategy in the city. Ranked on a Likert scale, with 5 being the best, it assesses the degree of a collective vision and target setting with respect to (sustainable) mobility. Policy measures to foster more sustainable mobility will be analysed through the urban mobility index. The urban mobility index analyses the mobility maturity, innovativeness, and performance of urban regions. For assessing the presence and extent of sustainable policies the performance factor of this index is assessed. The performance details the air pollution of the city and transport industry as well as the increase of share of public transport and the increase of share of zero emission vehicles. The index ranges from 1- 40, with 40 being the best possible score. Changes in air pollution, due to for instance transport emissions, are primarily driven by policy interventions (Carnell et. al., 2019). Suggesting assessing the severity of air pollution is a solid proxy for the degree of sustainable policies in place.

3.3.3.2 Informal institutions

Environmental innovations are conditioned by local informal institutions (Hansen & Coenen, 2015). The operationalization of informal institutions is adapted from Schipper (2020), and the habitat framework (van den Heiligenberg et. al., 2017), assessing the environmental awareness, openness and tolerance, creativity, learning and technology orientation of the culture in a city. These aspects of informal institutions, according to Schipper (2020), influence the success of a SUE. The following indicators are respectively used to assess these institutional aspects of the city: the planet factor of the sustainable city index, the percentage of employment of creative industries, social and regulative acceptance of LGBTQ people, the cities' relative scientific article share contribution to the region (share/million residents) and the relative patent output by its residents (patents/million residents). The planet factor ranks cities on 'green' indicators such as green space within cities, recycling and composting rates, sanitation, energy consumption and renewable energy share. Arguably the higher the rank of the city, the higher the

respective degree of environmental awareness. In a similar fashion it is expected that if a city has a high share of creative industry employment and acceptance of LGBTQ people it represents the degree of openness, tolerance, and creativity of the culture. The acceptance of LGBTQ people is in the form of an index from 1-25, 25 being the best possible score. Lastly, if a city displays significant patent and academic output, it is assumed the city values a learning and a technology-oriented culture.

3.3.3.3 Natural resource endowment

Local natural resource scarcity stimulates investments in sustainable experiments (Hansen & Coenen, 2015). For assessing the natural resource endowments, the scope is broadened to the national level. Arguably natural resource endowments will generally be limited in a highly urban area and are becoming problematic if there is domestic scarcity. Previous work, on the relationship between natural resource abundance and economic growth, used natural resource depletion as a percentage of gross national income (GNI) as an indicator (Alexeev & Conrad, 2011). This study adopts this operationalization for the natural resource endowment factor. This indicator shows how much of the gross national income of a country can be attributed to the depletion of its natural resources. This indicator is thus a measure of the countries' reliance on her resources for economic growth and is thereby a proxy to resource abundance. The underlying assumption is, if resources are scarce, a country will have a lower percentage of natural resource depletion relative to GNI.

3.3.3.4 Technical and industrial specialization

Relevant technical and industrial specialization for this case study is in the field of the sustainable and smart mobility industry. To assess the cities' specialization, the integration of sustainable or smart mobility technologies and the resident's perception of their effectiveness is investigated. The integration of sustainable or smart mobility technologies is assessed under the innovation factor of the urban mobility index. This factor indexes the degree of sustainable and smart mobility technologies in the city (1-24). The effectiveness of these technologies is assessed through the Smart Mobility Index of IMD. One of the subfactors of this index displays the perceived effectiveness of these technologies by residents (1-100). A higher integration of smart and sustainable mobility technologies and their perceived effectiveness arguably represents a higher degree of technical and industrial specialization of the city.

3.3.3.5 Network formation

The network formation of a city could have a strong local character, with a strong focus on collaborating locally (Coenen et. al., 2010). Or the city might describe a network with a strong global connectedness (Sassen, 2016). To understand these characteristics, the network formation is operationalised through the share of PCT co-patent applications within the region, resident involvement with local political decision making and the city's international connectedness. These three indicators aim to incorporate a distinction between local and international/global network formation. The share of PCT co-patent applications within the region is an indicator to assess the degree of local network formation, with a higher share of co-patents (of total issued patents) displaying a higher degree of local network formation. Previous academic work devoted to understanding the underlying mechanisms of network formation relied on co-patent data to understand these mechanisms (Park & Koo, 2021). The data is collected through the OECD regional innovation database. The second indicator ordinaly assesses the resident involvement in decision making

by the local government, on a scale from 1-100, and is thus an indicator for the degree of local network formation. Higher resident involvement hereby is assumed to portray a higher degree of local network formation. The indicator is sourced from the IMD smart mobility index. Lastly, the cities' international connectedness is assessed through the Globalization and World Cities Research Network categorization of cities. This categorization shows the degree of a cities' integration within the global economy on an ordinal scale (1-5, with 5 being the highest). The underlying assumption is hereby, the higher the integration within the global economy, the higher the degree of international network formation.

3.3.3.6 Consumer demand

Lastly, the indicator for consumer demand is based on empirical work by Leendertse et. al. (2020) on entrepreneurial ecosystem metrics. Leendertse et. al. (2020) source data from a large variety of datasets to compose credible, accurate and comparable indicators of entrepreneurial ecosystems. Leendertse et. al. (2020), argue, consumer demand can, among others, be operationalized as disposable income per capita. A higher disposable income per capita will represent a higher consumer demand.

Place-specific formation processes of sustainable urban experiments

| Place-specific factor | Indicator | Calculation | Measurement | Source |
|--|--|--|--|-----------------------------------|
| <i>Vision</i> | City Mobility Index | An ordinal measure of the degree of a collective vision and target setting | A Likert scale | <i>Deloitte</i> |
| <i>Policies</i> | Mobility Performance Index | An ordinal measure displaying the sustainability of the mobility system | An index from 1-40 | <i>Arthur D Little</i> |
| <i>Informal institutions</i> | Sustainable City Index | A scale measure of the degree of sustainability of a city | A rank from 1-100 with 1 being the best | <i>Arcadis</i> |
| | Creative industry employment | A scale measure of the share of creative industry employment | Percentage of employment over the total employment | <i>World Cities Culture Forum</i> |
| | LGBTQ Tolerance | An ordinal measure showing a cities' tolerance towards LGBTQ people | An index from 1-25 | <i>Nestpick & Equaldex</i> |
| | Academic contribution | A scale measure of the relative share of scientific articles published in the region | Scientific articles share per million inhabitants | <i>Nature</i> |
| | Patent output | A scale measure on the relative patent output of a city | Patents per million inhabitants | <i>World Council</i> |
| <i>Natural resource endowments</i> | Resource depletion | A scale measure of the share of gross net income attributed to resource depletion | Percentage of total gross net income of the country | <i>World Bank</i> |
| <i>Industrial and technical specialization</i> | Integration of sustainable mobility technologies | An ordinal measure displaying the integration of sustainable mobility technologies in a city | An index from 1-24 | <i>Arthur D Little</i> |
| | Effectiveness of sustainable mobility technologies | An ordinal measure displaying perceived effectiveness of local smart and sustainable mobility technologies | An index from 1-100 | <i>IMD Smart Mobility Index</i> |
| <i>Network formation</i> | co-patent applications within the region | A scale measure about the share of co-patent applications within a region | Percentage of co-patent applications over total applications | <i>OECD</i> |

Place-specific formation processes of sustainable urban experiments

| | | | | |
|------------------------|---|---|---|------------------------------------|
| | Resident involvement in decision making | An ordinal measure displaying the resident's involvement in local decision-making of its government | An index from 1-100 | <i>IMD Smart Mobility Index</i> |
| | GaWC classification | An ordinal measure of the integration of a city within the global economy | Classification from one to five with 1 being the best | <i>GaWC</i> |
| <i>Consumer demand</i> | Disposable income per capita | A scale measure of the per capita disposable income of a city | In euros per capita | <i>Multiple (see appendix 8.2)</i> |

Table 4: Operationalization place-specific factors

3.4 Data analysis

This study follows an abductive approach for data analysis (Ligurgo et. al., 2017). It starts from literature to understand the context and provide direction to the study but will not form hypotheses based on earlier work. Thereby an exploratory stance will be taken to understand the contextual dynamics of the formation of FE events in specific cities. Therefore, the data analysis will also balance between validating the conceptual framework and incorporating themes emerging from the raw data. In line with abductive research, there is a continuous interplay between concepts and data throughout the analysis process (Dubois & Gadde, 2002).

The data analysis will involve five steps. First, an initial narrative on the formation of FE in each of the urban regions is provided. Secondly, the analysis focuses on identifying the dominant formation process of FE in a specific city. For deciding the dominant process, all individual results of the several indicators must be aggregated to the city level. Aggregating the individual indicators of the city to a single entity is done through maximum frequency aggregation. The different levels of the indicators are turfed on frequency and aggregated by the level with the highest frequency. This will result in one overview of the formation process of FE in that respective city. Afterwards, the cities are subject to a comparative analysis for identifying categories along the formation process of the cities. The three formation processes discussed by Torrens et. al., (2019) form the initial categories for this analysis. However, this analysis also follows an *inductive* element to develop new (sub)categories if fitting to the data. Cities which depict one single formation process (e.g., only connectivity dynamics) will be categorized under this formation process. For cities which have multiple process dynamics, the relative degree of these dynamics is assessed. The operationalization of both conflict and connectivity processes contains a frequency indicator. Important to note here is that since there are considerable differences in the number of races cities have hosted, data collection could be skewed. For instance, cities which have more races will likely also have a higher number of collaborations. This study compensated for this by dividing the frequency, of for instance collaborations, by the number of races held. The *relative* frequency of collaboration and contestation (per year) are then compared. If the relative frequency of either one of those processes is higher than the average, compared to other cities, the specific city is grouped to the respective process. When a city describes a process with similar collaborations or contestation, compared to others, but also has occurrences of protection mechanisms, it is grouped to the protection process. The third step of the analysis is centred around identifying the sustainability orientation of FE. The degree of sustainability orientation is assessed through the relative focus on sustainability compared to other formation dynamics. This assessment is conducted for each of the three processes, protection, connectivity, and conflict (e.g., relative emphasis of collaborations on sustainability, innovation or other). Fourthly, the analysis will identify the place-specific factors of the different cities. Finally, the last step involves an exploratory association analysis on the role of place-specific factors in each of the formation processes of Formula E. The final step in the data analysis aims to discern whether certain place-specific factors facilitate a certain formation process. In other words, it investigates if the specific shape of place-specific factors increases the likelihood of Formula E forming under a distinct process (connectivity, conflict, or protection). This analysis is approached inductively and is informed through the analysed empirical data. Whereas all place-specific factors' indicators are either an ordinal or scale measure, averages can be

calculated for these indicators. In the previous step of the analysis, cities which describe a similar formation process were grouped. Following, in this step the average values of the place-specific factors of these grouped cities were calculated. Since every indicator involves a different scale, these averages will be normalized. Normalization is done through the following formula: $Z_i = \frac{x_i - \min(x)}{\max(x) - \min(x)}$ where $x = (x_1, \dots, x_n)$ and Z_i is now the *ith* normalized data.

4. Results

This chapter elaborates on the results of the presented conceptual framework. The results will start off with discussing the formation process of the FE event in the specific city. Following, the aggregated formation process results are detailed. Finally, the shape of the place-specific factors in these processes will be presented.

4.1 The local formation processes of FE

This subsection provides an overview on the dominant formation process found in the sixteen differing cities. The accompanying tables for both the individual and aggregate results can be found in the appendix (8.3 and 8.4).

4.1.1 Berlin

Berlin's FE Street race has been staged since the inaugural season in 2014/2015 (FIA, 2016). Due to several double headers, it is the most staged ePrix, with a total of twelve races. Berlin's circuit is foremostly staged at Tempelhof airport. However, during the refugee crisis in 2016, the airport was used as a refugee centre. Needing the race to be scheduled to a different location (Formula E, 2016). The new street circuit in the city centre, along the Karl-Marx-Allee, was approved by the FIA and Berlin city authorities for the 2015/2016 season. The following seasons would return to the Tempelhof area.

In Berlin, FE Holdings collaborated with the Berliner Krebsgesellschaft, which aims to improve the quality of life of those affected by cancer and increase their chance of healing (Formula E, 2018a). In the following season, Allianz and the Prince Albert II of Monaco Foundation hosted a conference discussing sustainable mobility, as well as mobility for the public (Formula E, 2019). Furthermore, FE Holdings invited 100 local schoolgirls and refugees (who lived at Tempelhof) for an activity day. Introducing them to sustainable motorsports and encouraging young women to 'get behind the wheel'. This initiative was continued next year in the form of FIA's 'Girls on Track' program, stimulating women's involvement in professional motorsport (Formula E, 2020b). Due to the covid-19 pandemic, for the 2019/2020 season there has been strong collaboration with local authorities to safely organize six consecutive races in Berlin (Formula E, 2020a). Furthermore, the Berlin administration is in close coordination with the organizer for hosting the Berlin race (Neumann, 2016). Lastly, FE collaborated with Gil and Weingärtner, a Berlin-based event production company for hosting the ePrix at Tempelhof Airport.

Politicians welcomed FE to the streets of Berlin, mentioning Berlin being a leading metropole for electromobility, making it especially suitable. (Süddeutsche Zeitung, 2015, Berlin, 2021). However, the

organizer's request to be allowed to drive on Straße des 17. Juni, alongside the Brandenburg Gate, was rejected. Both local city centre districts furthermore rejected to host FE in the city centre (Karl-Marx-Allee). According to the districts, the imposed restrictions required for the race were unreasonable for the residents (Tagespiegel, 2017; Smith, 2017). However, the Berlin senate approved the race on the Karl-Marx-Allee regardless, due to 'supra-local interest' (Tagespiegel, 2017). Although generally well received, the race on the Karl-Marx Allee resulted in noise complaints by residents (Schmitt, 2017). The senate's decision also led to complaints by district politicians about noise and traffic congestion. Johannes Schneider, the Green party's transport policy spokesman in Berlin-Mitte mentioned: *"The massive restrictions caused by the construction, the event itself and the dismantling of the barriers causes too much noise pollution, which affected all residents."* (Smith, 2017). Potentially due to this resident and political contestation, the Senate announced to reject FE hosting the ePrix at the same location and advocated for moving the event to Tempelhof Airport. (Neumann, 2017).

4.1.2 London

FE's street circuit in London used to be hosted in Battersea Park until 2016 (Sturm, 2018). London was afterwards scrapped from the FE race season, until 2019/2020. FE announced a return to London, on a new circuit around the Royal Docks and ExCel London, an exhibition centre (Formula E, 2019b).

In 2016, FE supported StreetGames, whose mission is to bring sports to educate and empower young people from disadvantaged areas across the UK (Formula E, 2017a). Fans had the option to text-to-donate to StreetGames. For the same year FE has partnered with Lightsource, a European solar energy company, to power the FE event through a solar photovoltaic (PV) panel system combined with storage and glycerine bio-fuel solutions (Formula E, 2016). In the 2015 London ePrix, a life-sized polar bear, the mascot of Greenpeace's Cleaner Future Campaign, was displayed (Formula E, 2016b). For the 2015 race, FE collaborated with Greenpower Education Trust, a UK based charity with the goal to motivate children to become enthusiastic concerning science and engineering through challenging them in building an electric race car (Dunne, 2015). During the FE weekend the children participating in engineering an electric car, were allowed to race on the circuit in the build vehicles. Lastly, through a multi-year financial agreement, ExCel will be the future base of the London race (Formula E, 2019b).

Residents contested the race in Battersea Park, arguing it disrupted the free local space of the park. Parts of the arguments dealt with noise complaints, restricted access, and damage to the park (Sturm, 2018). FE Holdings noted the early complaints by the residents, but according to the CEO a noise test did not spark any complaints (Bose, 2015). Despite FE Holdings offering a £1m compensation, of which the local council suggested £200,000 would go directly back into the park, the residents mobilised multiple action groups to prevent further events in the park (Sturm, 2018). Regardless of the efforts of the action groups, the council approved a consecutive race in the park in the following season. The action groups became more vocal and legal action was being prepared against the council (Micklethwaite, 2016). The legal threat and large public opposition resulted in FE announcing to retire the circuit after the 2016 race (Wandsworth, 2016). FE only returned to London when they were able to host the race in ExCel, without the need to disrupt the residents through closure of roads and parks and noise pollution.

4.1.3 Paris

For the 2018/2019 season, The UNEP #BreatheLife campaign was also activated during the Paris ePrix. After the race weekend, leftover food in the 2017/2018 season was donated to Parisians through Linkee (Formula E, 2019b). In the same season, FE collaborated with L'Association du Sport et Plus. The NGO aims to improve the life quality of terminally ill children. During the ePrix, twelve adults and children were invited to experience Formula E. FE furthermore worked with Pollutrack to measure urban air quality and monitor the effect of changes in vehicle usage. Lastly, in collaboration with Jour de la Terre, the French association of Earth Day, Formula E presented at the 2016 Paris ePrix four videos that highlighted sustainable innovation in the themes of: transportation, clean energy, air quality and solutions for a better planet (Formula E, 2017a).

Generally, the FE event was well received by residents (Hasse, 2016). However, during the 2016 race visitors criticized the lack of visibility of the race (Burrows-Taylor, 2019). Residents furthermore contested the event for the temporary restricted access of roads, parking spaces and the potential costs for the city (Hammadi, 2019; Soulié, 2019). The latter was invalidated by the town hall, stating FE did not incur costs on the municipality. Adding, residents and some elected environmentalists denounce the race for being a "falsely green" race (Soulié, 2019). In French author Paul Aries' book: *Les sports mécaniques, une arme de destruction massive* he criticises Formula E and the French politicians who see the race as a saviour. The argument is mostly related to the seeming paradox of branding FE as a sustainable motorsport while the cars are shipped, and air transported across the globe (Næss & Tjønnedal, 2021). The Paris E-Prix was furthermore criticized for 'greenwashing' the car industry.

The elected representatives of the Ecologist Group of Paris (GEP) contested the Parisian race, arguing the environmental detrimentality of the event through the waste of energy, carbon footprint and the carcinogenic risks of covering the cobblestone roads with tar (GEP, 2016). This view is backed by the Greens party of Paris who furthermore contest the noise pollution of the event (Kovarik, 2016). Benjamin Grivaux, ex-minister, coined the race as an "*environmental aberration*" signalling the issues surrounding traffic congestion, tar paving, closing of metros stations and restricted access to museums (Lara, 2019). Lastly, the financial results of the race were also questioned by elected officials (Le Parisien, 2018). In response to the environmentalist's action's, a left-right coalition in the Council of Paris was established so the race could pass regardless (Le Parisien, 2016).

4.1.4 Rome

In 2012, the Italian capital discussed the possibility of hosting a Formula E race in the Colosseum-Circus Maximus area, but the plans never came about (WantedInRome, 2017). However, in 2017 discussion resumed for the return of the race to Rome (Colla, 2017). As a result, FE established the Roman ePrix through collaboration with the administration of Rome (Corriere dello Sport, 2020). FE, in collaboration with UNEP, activated the global #BreatheLife Campaign in their Rome E-village (Formula E, 2020b). #BreatheLife is a campaign to improve worldwide air quality. According to the general manager of the Italian FE Holdings team, there has been strong support of the local authorities, such as the municipality and transportation organizations, for organizing the Rome ePrix (Johnson, 2019). Rome is furthermore

part of FIA's Smart Cities initiative (Formula E, 2020b). The initiative aims to *“ensure that mobility in the cities of tomorrow is safer, cleaner and more accessible for all road users”* (FIA Smart Cities, 2021). It centers around three pillars: forum, start-up, and legacy. Forum focuses on hosting conferences related to the mobility sector. The start-up pillar relates to supporting entrepreneurs within urban mobility. Lastly, legacy is building capacity and expertise for long-lasting benefits for citizens.

4.1.5 Monte Carlo

There seems to be strong involvement of the Monaco principality in hosting FE events (Pacary, 2016). FE Holdings hosted a charity gala dinner for the Prince Albert II of Monaco Foundation (PAF), raising a total of €135.000 (Formula E, 2018a). The foundation is dedicated to the protection of the environment and the promotion of sustainable development on a global scale by supporting public and private initiatives in the domains of research, innovation, and socially aware practices (PAF, 2021). Monte Carlo is furthermore, together with Rome, Mexico City and Hong Kong, part of FIA's Smart Cities initiative (Formula E, 2020b). The Automobile Club of Monaco (ACM) is collaborating with FE for designing the track circuit for the Monaco ePrix (Formula E, 2021a). ACM serves as the governing body for motorsport within Monaco and is furthermore responsible for hosting the regular Formula one grand prix and Monte Carlo Rally.

4.1.6 Riyadh

For the 2018 race in Saudi Arabia, FE worked with CBX to organize the race. CBX will be responsible for the event stage and the three-day festival around it for the coming ten years in Riyadh (CBX, 2021; Formula E, 2020). CBX works closely with the Saudi Automobile and Motorcycle Federation (SAMF) and the Ministry of Sports to organize the electric race (Al-Thaqafi, 2021). FE furthermore signed a 10-year agreement with the General Sports Authority and Saudi Arabian Motor Federation to host FE in Saudi Arabia (Formula E, 2018b; Wirtz, 2018). The size of this contract deal is around €260 million spread across the 10 years (F1-Insider, 2019). For the 2021 race, FE collaborated with local charity Society of Autism Families (SAF) (Formula E, 2021c). SAF is an NPO which provides professional and financial support as well as activities to aid the mental and physical wellbeing of children with autism and their families. To raise awareness, families were accompanied by the chairman of the SAF for the FE double-header (Formula E, 2019c). FIA's initiative Girls on Track was also activated in Riyadh (Formula E, 2020c).

4.1.7 Buenos Aires

During the 2017 season, FE lent its circuit to Roborace, a driverless electric race series in development (Formula E, 2017b). Buenos Aires functioned as a pilot for the Roborace, using two 'Robocars'. FE furthermore contracted a promoter for The Buenos Aires ePrix, Fenix Entertainment Group (Formula E, 2014a). The transactional collaboration between FE and Fenix is also mentioned in local newspapers. (e.g., Clarin, 2017). The city government and other local authorities showed continued support, investment and backing for the race (Formula E, 2014a). The street track requires a million-dollar investment but both parties did not come to a financial agreement as the race has not returned to Buenos Aires since 2017. However, before the first FE race kicked off, the city of Buenos Aires had already consented to the idea of hosting a race weekend here (Clarin, 2016). For the initial three races the municipality and local authorities invested to host the race (Phillips, 2014). However, for the return of FE to the Buenos Aires streets, the

municipality had to invest in the street lay-out but preferred to renovate the Autodrome circuit instead (Panelo, 2017). The municipality advocated to host the FE race on the Autodrome, but to no avail.

4.1.8 Hong Kong

Hong Kong was also part of FIA's Smart Cities initiative in the fourth and fifth season (Formula E, 2019a). Lawrence Yu Kam-Kee, President of the Hong Kong Automobile Association (HKAA) is quoted as the driving force behind the Hong Kong FE race (Formula E, 2015). Yu Kam-kee played a key role in helping Hong Kong become part of the inaugural circuit in 2016 when he was chairman of the body (Kin-Wa & Careem, 2019). He stipulated the involvement of the Hong Kong Government and Tourism Commission for the realisation of the Hong Kong ePrix (Formula E, 2016c). The HKAA negotiated with the World Motor Sport Council, the Hong Kong government, and private organizations to convince the parties the race is viable in Hong Kong (Sallay, 2013). Government departments including the traffic police, the Transport Department, and the Emergency Transport Coordination Centre (ETCC) will monitor traffic conditions throughout the race weekend (Atkin, 2019). Many residents contested the (inaugural) race due to the high-ticket prices, traffic congestion, lack of public engagement, restricted access to the harbour and the lack of proper signage (Yeung, 2017; Lau & Singh, 2016). In response to the resident contestation regarding ticket prices, one of the local politicians, argued for the financial involvement of the government to compensate the ticket prices (Kin-Wa, 2017). The Hong Kong E-Prix was granted an exemption by the FIA regarding the street circuit length (Kin-Wa, 2019). The E-Prix has been allowed to run on a shorter 1.86-kilometre street circuit since its inaugural race in 2016 (Kin-Wa, 2019). However, for the 2019 and future races the FIA removed the exemption, and the circuit needs to meet the required distance of 2.2 kilometres. The Hong Kong administration invested around 2.4 million euros to be able to set up the FE race (Blusm, 2016). This investment was proposed, among other things, for the repair of roads and the construction of hospitality and grandstands.

4.1.9 Long Beach

The race in Long Beach is contracted with the city and the Grand Prix Association of Long Beach oversees the logistics of the event (Formula E, 2016d). According to FE, receiving the appropriate permits for racing in Long Beach is relatively easy compared to other cities, as the city has an effective special events department. This department brings in the various service agencies within the city to realise the event. Also, the media confirms the role of the Grand Prix Association of Long Beach in realising the FE event in the city (Los Angeles Times, 2014). For the initial race the event was free to attend, which contrasts with other cities (Bradley, 2014). All the city's costs associated with the race were initially covered by FE (Undercoffler, 2013). However, after two consecutive years, the local authorities and FE could not come to a financial agreement (Lair, 2017). Implying a shift by FE to request a financial involvement of the authorities, to no avail.

4.1.10 Marrakesh

Also in Marrakesh, the Prince Albert II of Monaco Foundation hosted charity galas and the UNEP #Breathelife campaign was activated (Formula E, 2018a; Formula E, 2020b). They furthermore hosted the annual Electric Sports Coalition meeting to report on the progress made towards CO2 emission reductions

and electric mobility developments (Formula E, 2016e, Formula E, 2020b). This coalition is in collaboration with the Moroccan Ministry of Youth and Sports.

4.1.11 Mexico City

In Mexico, FE worked with Con Ganas de Vivir, a local NGO, to create a daytrip for people living with cancer in Mexico City (Formula E, 2018a). Also, both FIA's Girls on Track and Smart Cities initiative as well as UNEP's #BreatheLife campaign was activated in the city (Formula E, 2020b; La Jornada, 2019b). According to FE, the race in Mexico will return if either private investment covers the costs, or through public investments by the government (La Jornada, 2020). The race in Mexico City is thereby dependent upon the position of the new municipality and the local promoter Ocesa (La Jornada, 2018; La Jornada, 2019b). One of the striking differences of the Mexican ePrix, compared to other FE races, is the fact the race is held on a pre-existing circuit, the Autodromo Hermanos Rodriguez (Southwell, 2021). Instead of the heavily marketed custom-built street circuits, the Mexican race will be contested on the same racetrack as Formula One.

4.1.12 New York City

Earth Day Initiative was involved with the New York ePrix with their Count to 50 campaign, encouraging people to switch to clean energy providers (Formula E, 2018a). FE furthermore worked with the Red Hook initiative which supports young adolescents to become co-creators of their lives, community, and society. This initiative was collectively hosted with PortSide, an NPO which aims to change New York policy so that maritime activity is more integrated in revitalization plans (PortSide, 2021). UNEP again joined FE with their #BreatheLife campaign at the New York City ePrix. Additionally, together with the Climate Group, FE arranged an end of season gala and EV summit (Formula E, 2019a). In New York, FE collaborated with the New York City Economic Development Corporation (NYCEDC (Higgins, 2017). The NYCEDC is an NPO with the goal to stimulate and promote economic development within New York City. This collaboration was in the form of a multimillion-dollar investment to build the racetrack in exchange for a permit to host the race (Mathisen, 2017). It furthermore made sure to repave surfaces around the Atlantic Basin and to bring the New York Water Ferry to Red Hook. Additionally, FE received a 10-year agreement with New York City to return to the city for their race (Florio & Shapiro, 2017). Although it will need to renew its permit annually.

4.1.13 Beijing

For designing the Beijing track, FE worked with the China Motor Sport Federation (FASC), the Olympic Park Committee and event organiser Team China Racing (Formula E, 2014b). Team China Racing, a local promoter, was responsible for organizing the Beijing event.

4.1.14 Punta del Este

FE worked with local authorities in the sense of receiving an acceptance to race in the city on a street circuit (Formula E, 2017a). FE also worked with a local promoter, SportLink, for the organization of the assembly of the corresponding circuit (La Red, 2014; Referi, 2014). In the E-village, Antel Auto, a

Uruguayan Internet of Things (IoT) company which transforms a car into a connected vehicle, presented their first IoT vehicle at the FE race (La Red, 2018).

The inaugural race in Uruguay required an investment by the local authorities of 800,000 US Dollars (La Red, 2018). For the following Uruguayan race, a fee of 1.5 million US Dollars from the city was requested by FE (El Pais, 2018). This fee was designated for the construction of the circuit. Furthermore, the state-owned electric power company UTE contributed a sixty thousand US Dollar sponsorship to the event. Additionally, ANCAP, a state-owned petroleum products producer, supplied the necessary asphalt for the event, without charge. Besides public organizations, private companies also invested in the FE event (Panelo, 2017). After the 2018 race, FE announced it would return to Punta del Este if they would receive additional investment by the national government (2-3 million US dollars) (Gallardo, 2018). FE has not returned to Punta del Este since.

4.1.15 Putrajaya

The local authorities cooperatively collaborated with FE for the race in Putrajaya (McCormick, 2015). The municipality of Putrajaya signed a City Agreement for the permit to host FE in Putraya (Pillai, 2013). The Prime Minister of Malaysia was also involved in this process (Waran, 2014). To avoid residential contestation and make the event more appealing, the entrance to the circuit was made free (Zulzaha, 2015). The Putrajaya ePrix is furthermore backed by the Malaysian government through financial investments, closure of roads and supplying manpower to facilitate the race (McCormick, 2015).

4.1.16 Santiago

FE worked closely with the ministry of Sports for a couple of months to carry out the event (Gutiérrez, 2018). Santiago was furthermore involved in FIA's Girls on Track and Smart Cities initiative (Formula E, 2021b, Formula E, 2019b). Additionally, together with Enel X, an energy solutions company, FE installed renewable LED lighting in the park of the event (Formula E, 2020b). Lastly, FE collaborated with local charity EtoDog, a dog behavioural improvement and rehabilitation service, while FE had to displace some stray dogs for the race.

Residents of Santiago contested the race due to the restricted access of roads and Forest Park and damage to sculptures (Kalinauckas, 2018; Castro, 2019). The residents put up an appeal to the court to prevent the race, but the court denied the appeal (Núñez, 2018). Due to this contestation, FE moved the race to a different park (O'Higgins Park). Also, the requested financial involvement of local authorities to host the race was contested by residents (Muñoz, 2018).

The Heritage Committee of the Chilean College of Architects also contested the race because of the potential impact on the environment (e.g., removal of trees) and FE furthermore raced through delicate spaces (Hernández, 2018). Local authorities for the initial race supplied an investment of €625,000 euros (Muñoz, 2018). For the following two races the Minister of Energy, Susana Jiménez disclosed no public money was invested in the race.

4.2 Connectivity, conflict, and protection characteristics

The empirical data of the individual cities display a variety of characteristics in terms of connectivity, conflict, and protection. This section will dive deeper into the specific empirical characteristics of these processes.

4.2.1 Connectivity

There are considerable differences regarding the characteristics of connectivity. New York City, Mexico City, London, Riyadh, and Santiago are cities which all display a relatively high degree of collaborations. These collaborations have a local character and are predominantly with NPOs or public authorities. Although there is a high degree of collaborations with NPOs, which are predominantly targeted to improve the well-being of the city (e.g., StreetGames in London), the main purpose of these collaborations is still focussed on the FE event itself.

| | City | London | Mexico City | New York City | Riyadh | Santiago |
|---------------------|--------------------------|----------|-------------|---------------|--------------|----------|
| Connectivity | Number of collaborations | 6 | 5 | 7 | 5 | 5 |
| | Purpose | FE | FE | FE - City | FE | City |
| | Transaction | Yes | Equal | No | No | No |
| | Frequency | One-time | >1 | >1 | >1 | >1 |
| | Orientation | Other | Other | Other | Other | Other |
| | Scale | Local | Local | Local | Local | Local |
| | Incumbency | No | Yes | No | Yes | Yes |
| | Legal entity | NPO | Pubic - NPO | NPO | Public - NPO | NPO |
| | Number of race years | 2 | 4 | 3 | 3 | 3 |

Table 5: Cities displaying high connectivity characteristics

Following, Beijing, Berlin, Paris, Punta del Este, Buenos Aires, and Long Beach describe a relatively moderate degree of connectivity characteristics. The number of collaborations, relative over the number of race years, is somewhat lower compared to the previous cities. Besides the fact that these cities seem to collaborate relatively less, there is also more involvement of private and public parties. Private parties consist primarily of local promoters, in charge of hosting the event in the urban space. (e.g., Buenos Aires and Punta del Este). While public and private stakeholders were also involved in the previous cities, it seems the higher degree of collaborations are foremostly due to additional collaborations with NPOs, to tackle social or sustainable issues of the city.

| | City | Beijing | Berlin | Paris | Punta del Este | Buenos Aires | Long Beach |
|---------------------|--------------------------|------------------|--------------|----------------|----------------|--------------|--------------|
| Connectivity | Number of collaborations | 2 | 5 | 4 | 3 | 3 | 2 |
| | Purpose | FE | FE - City | City | FE | FE | FE |
| | Transaction | Equal | No | No | No | Yes | Equal |
| | Frequency | >1 | >1 | Hybrid | >1 | >1 | >1 |
| | Orientation | Other | Other | Sustainability | Other | Other | Other |
| | Scale | Local | Local | Local | Local | Local | Local |
| | Incumbency | No | Yes | No | No | No | Yes |
| | Legal entity | Public - Private | Public - NPO | NPO | Private | Private | Public - NPO |
| | Number of race years | 2 | 5 | 4 | 3 | 3 | 2 |

Table 6: Cities displaying connectivity characteristics

The remaining two cities, Hong Kong and Putrajaya have comparatively the lowest degree of collaborations but are in terms of specific characteristics like the cities which have a high degree of collaborations. These cities collaborated foremostly with public authorities and NPOs with the purpose of realising the FE event. A remark for the case of Putrajaya must be made, however. Generally, data was limited on the formation process of Putrajaya, thus this lack of collaboration could also be due to the limited data publicly available.

| | City | Hong Kong | Putrajaya |
|---------------------|--------------------------|--------------------|-----------|
| Connectivity | Number of collaborations | 2 | 1 |
| | Purpose | FE - Niche | FE |
| | Transaction | No | No |
| | Frequency | >1 | >1 |
| | Orientation | Innovation - Other | Other |
| | Scale | Local - Global | Local |
| | Incumbency | Yes | Yes |
| | Legal entity | Public - NPO | Public |
| | Number of race years | 3 | 2 |

Table 7: Cities displaying low connectivity characteristics

4.2.2 Conflict characteristics

Cities which displayed conflict characteristics are Berlin, Hong Kong, London, Paris, and Santiago. The abbreviations in the table below are the following: Commercial (C), Disturbance (D) and Sustainability (S). The numbers behind the letters indicate the frequency of the specific contestation. Berlin has contestation dynamics which are mostly related to disturbance issues such as noise complaints and traffic disruption. Contestation in Berlin is, compared to the other cities which showed forms of contestation, also relatively small. However, as contestation increases, relatively, disturbance issues start to be accompanied by commercial and sustainability issues. For instance, in Hong Kong besides similar disturbance complications (e.g., noise complaints and traffic congestion), residents contested the race due to the high-ticket pricing and lack of proper signage. The cities with the highest degree of contestation (Santiago and Paris) also show a shift of contesting FE regarding its sustainability aspect. These cities criticized the event for instance on their seemingly false promise of being sustainable, as the global nature of the race results in

substantial impact on the environment due to freight and personnel transportation. Another reason for contestation was the local impact on the environment by for instance the removal of trees. Especially on a political level sustainability issues were contested. On a resident level, contestation was mostly due to disturbance and commercial problems.

| | City | Berlin | Hong Kong | London | Paris | Santiago |
|-----------------|----------------------------------|--------|-------------|--------|---------------------|----------|
| Conflict | General attitude (visitor size) | 19.500 | 17.800 | 60.000 | 20.000 | 17.500 |
| | Degree of resident contestation | 1 | 3 | 2 | 3 | 2 |
| | Reason of resident contestation | D | D (2), C(1) | D | D (2), S (1) | D, C |
| | Degree of political contestation | 2 | | | 4 | 1 |
| | Reason of political contestation | D | | | D (2), S (3), C (1) | D, S |
| | Number of race years | 5 | 3 | 2 | 4 | 3 |

Table 8: Cities displaying contestation characteristics

4.2.3 Protection characteristics

Lastly, cities who showed any protection characteristics were Buenos Aires, Hong Kong, Long Beach, Mexico City, Punta del Este, Putrajaya, Riyadh, and Santiago. Practically all investments received by FE, in these cities, are through public authorities. These investments are destined to aiding the realisation of the event in their city without having any requirement on sustainability aspects of the race. However, there are considerable differences in the size of the investment, the municipality of Riyadh being the largest investor. Exemptions from regulations or obligations are displayed by Hong Kong, Long Beach and Putrajaya, albeit limited. These exemptions are either related to reduced ticket prices (or even free) or track lay-out. The data shows cities which aim to facilitate formula E through protection dynamics are more inclined to nurture the event through financial instruments (i.e., investments) rather than through shielding dynamics such as exemptions from mainstream motorsport regulations. This could be a result since FE has to give accountability to an incumbent multinational organization, FIA, regarding its laws and regulations. Local actors might therefore have less power in exerting shielding mechanisms to facilitate the event locally.

| | City | Buenos Aires | Hong Kong | Long Beach | Punta del Este | Putrajaya | Riyadh | Santiago |
|-------------------|-----------------------|--------------|--------------|------------|-----------------------|-----------------------|--------------|-----------|
| Protection | Degree of exemption | | 1 | 1 | | 1 | | None |
| | Target of exemption | | Motorsport | Motorsport | | Motorsport | | |
| | Size of investment | Unknown | €2.4 Million | | > US\$ 2.5 Million | Unknown | €260 Million | € 625.000 |
| | Legal entity investor | Public | Public | | Public | Public | Public | Public |
| | Target investment | Logistics | Logistics | | Commercial, logistics | Commercial, logistics | Logistics | Logistics |
| | Number of race years | 3 | 3 | 2 | 3 | 2 | 3 | 3 |

Table 9: Cities displaying protection characteristics

4.3 Sustainability orientation of FE

Interestingly, the data shows the orientation of FE has in few instances a significant sustainability orientation. Rome, Marrakesh, and Monte Carlo represent a greater orientation on sustainability and have more transnational relationships compared to the other cities. There is a stronger focus on improving the broader sustainability regime (e.g., hosting conferences). The main stakeholders in these cities are

furthermore public authorities. The purpose of the collaborations is also more targeted towards stimulating the sustainable mobility niche. Examples of such collaborations are the relationship with the Prince Albert of Monaco foundation to host sustainable mobility conferences and FIA’s smart city initiative. However, there are also cities (Santiago & Paris) which criticize the sustainability orientation of FE. They contested the sustainability aspect of FE for instance on the local logistics side, by removing trees and racing through environmentally sensitive areas, or on the environmental detrimentality of the global transportation required for the race. Other cities are less vocal on either advocating or contesting the sustainability orientation of FE. This does not imply other cities do not have any orientation on sustainability but rather it suggests there is relatively less focus on sustainability in the organization of the event. For example, in London, FE worked together with a local solar energy production company to power the event through a solar photovoltaic (PV) panel system. They furthermore worked with Greenpeace to promote climate change issues. However, these initiatives are relatively slim compared to the number of collaborations which are oriented on hosting the FE event (e.g., with local authorities) or on improving city residents through for instance collaborating with local charities.

| | City | Rome | Marrakesh | Monte Carlo |
|---------------------|--------------------------|----------------|----------------|----------------|
| Connectivity | Number of collaborations | 3 | 3 | 3 |
| | Purpose | Equal | Niche | Niche |
| | Transaction | No | No | No |
| | Frequency | >1 | >1 | >1 |
| | Orientation | Sustainability | Sustainability | Sustainability |
| | Scale | Global | Global | Global |
| | Incumbency | Yes | Yes | Yes |
| | Legal entity | Public | Public | NPO |
| | Number of race years | 3 | 4 | 4 |

Table 10: Cities displaying connectivity and sustainability characteristics

4.4 Aggregated formation processes of FE

After comparing the cities in terms of connectivity, conflict and protection dynamics, the following four processes were empirically identified: sustainability-oriented connectivity, connectivity, conflict, and protection. These processes are identified through the aggregation method mentioned in the data analysis. It is important to note that these aggregated processes are not discrete processes, but centre around its relative emphasis in the process on connectivity, conflict, or protection characteristics.

4.4.1 Sustainability-oriented connectivity

The sustainability-oriented connectivity is a bundle of cities whose process can be characterized with a relative emphasis on connectivity. This process is characterized by a relatively moderate number of collaborations but with a clear orientation on sustainability, operating on a rather global scale with incumbent stakeholders. For example, FE collaborated with the United Nations Environment Program to improve the air quality in multiple cities. There is also a tendency to focus on the local sustainable mobility niche through for instance collaborating with the Prince Albert Foundation to organize sustainable mobility conferences. These cities furthermore express a great involvement of public stakeholders in the

process. General local demand for the race is comparatively small. There is no empirical evidence of any conflict or protection dynamics in the formation of FE in these cities This process comprises the following cities: Rome, Marrakesh, and Monte Carlo.

| | City | Rome | Marrakesh | Monte Carlo |
|---------------------|----------------------------------|----------------|----------------|----------------|
| Connectivity | Number of collaborations | 3 | 3 | 3 |
| | Purpose | Equal | Niche | Niche |
| | Transaction | No | No | No |
| | Frequency | >1 | >1 | >1 |
| | Orientation | Sustainability | Sustainability | Sustainability |
| | Scale | Global | Global | Global |
| | Incumbency | Yes | Yes | Yes |
| | Legal entity | Public | Public | NPO |
| Conflict | General attitude (visitor size) | 30.000 | | 18.750 |
| | Degree of resident contestation | | | |
| | Reason of resident contestation | | | |
| | Degree of political contestation | | | |
| | Reason of political contestation | | | |
| Protection | Degree of exemption | | | |
| | Target of exemption | | | |
| | Size of investment | | | |
| | Legal entity investor | | | |
| | Target investment | | | |
| | Number of race years | 3 | 4 | 4 |

Table 11: Sustainability-oriented connectivity process

4.4.2 Connectivity

The connectivity process is described by those cities which have a high degree of local collaborations with non-incumbent local NPOs, focussed on organizing the FE event. Compared to the sustainability-oriented process, there is less focus on the sustainability aspect of the event. Transactional collaborations are more rooted in this process but are still being dominated with public and NPO relations. Compared to the previous cities, general consumer demand is also considerably higher in these cities. Contrary to the previous process, some cities also display characteristics of contestation and protection albeit relatively minor. This proves the earlier suggestion that experiments are formed not in mutually exclusive processes but rather depict a relative emphasis on one of the formation processes. The respective cities are New York City, Mexico City, London, and Beijing.

| | City | New York City | Mexico City | London | Beijing |
|---------------------|----------------------------------|---------------|-------------|------------|------------------|
| Connectivity | Number of collaborations | 7 | 5 | 6 | 2 |
| | Target | FE - City | FE | FE | FE |
| | Transaction | No | Hybrid | Yes | Hybrid |
| | Frequency | >1 | >1 | One-time | >1 |
| | Orientation | Other | Other | Other | Other |
| | Scale | Local | Local | Local | Local |
| | Incumbency | No | Yes | No | No |
| | Legal | NPO | Pubic - NPO | NPO | Public - Private |
| Conflict | General attitude | 18.000 | 40.000 | 60.000 | 76.000 |
| | Degree of resident contestation | | | 2 | |
| | Reason of resident contestation | | | D | |
| | Degree of political contestation | | | | |
| | Reason of political contestation | | | | |
| Protection | Degree of exemption | | | 1 | |
| | Target of exemption | | | Motorsport | |
| | Size of investment | | | | |
| | Legal entity investor | | | | |
| | Target investment | | | | |
| | Number of race years | 3 | 4 | 2 | 2 |

Table 12: Connectivity process

4.4.3 Conflict

The formation process which describes an emphasis on conflict is characterized by dominant contestation both on a residential and political level. In Berlin contestation was primarily a result of local disturbance issues (D). However, for Santiago and Paris the sustainability of the event was also contested. Interestingly, where collaborations shifted more towards tackling sustainability issues, both at the event and city level, there was also a higher degree of sustainability contestation (S). Compared to the connectivity process, general demand is also smaller. The cities belonging to the conflict process are Berlin, Santiago, and Paris. When cities have a relative emphasis on conflict dynamics, it becomes apparent that these cities have a different intention and purpose of collaborations. There are relatively moderate (local) collaborations, with a predominant focus on city well-being (e.g., #Breathelife campaign), working with mostly local NPOs. These types of collaborations seem to have the purpose of proving the sustainability orientation of the event to the city. However, a minority of these collaborations show, on an environmental level, an actual sustainability orientation. Rather they incorporate a more social sustainability aspect (e.g., improve well-being of local cancer patients). It seems FE aims to improve their relationship with the local actors, in cities where the race is contested, by focussing on seemingly sustainable local initiatives. Lastly, if there is a relative emphasis on conflict dynamics, protection characteristics are scant. Only Santiago displayed characteristics of protection through a relatively small investment by public authorities to host the event in the city.

| | City | Berlin | Santiago | Paris |
|---------------------|----------------------------------|--------------|-----------|---------------------|
| Connectivity | Number of collaborations | 5 | 5 | 4 |
| | Target | FE - City | City | City |
| | Transaction | No | No | No |
| | Frequency | >1 | >1 | Hybrid |
| | Orientation | Other | Other | Sustainability |
| | Scale | Local | Local | Local |
| | Incumbency | Yes | Yes | No |
| | Legal | Public - NPO | NPO | NPO |
| Conflict | General attitude | 19.500 | 17.500 | 20.000 |
| | Degree of resident contestation | 1 | 2 | 3 |
| | Reason of resident contestation | D | D, C | D (2), S (1) |
| | Degree of political contestation | 2 | 1 | 4 |
| | Reason of political contestation | D | D, S | D (2), S (3), C (1) |
| Protection | Degree of exemption | | None | |
| | Target of exemption | | | |
| | Size of investment | | € 625.000 | |
| | Legal entity investor | | Public | |
| | Target investment | | Logistics | |
| | Number of race years | 5 | 3 | 4 |

Table 13: Conflict process

4.4.4 Protection

The last empirical formation process, protection, is characterized by an emphasis on significant investments and/or exemptions while there is little connectivity in the form of collaborations and no conflict dynamics. Practically all investments are coming from local public authorities. These investments can either be a result of fees charged by FE, local logistical problems, or a city's own interest in attracting FE to the city. Interestingly, there are also stark differences in general demand between the cities, ranging from 17.000 to 91.000 visitors per race. There is relatively little empirical data on exemptions being granted to FE. A potential reason for this might be the fact that the event still must be obliged by the regulations of the FIA to be recognised as an official motorsport. Collaborations are functional and targeting the event itself and have no clear sustainability orientation. There is additionally more involvement of private parties, for instance in the form of local promoters. Lastly, using the aggregation method described in the methodology, Hong Kong did not detail a clear dominant formation process, falling in between protection and contestation dynamics.

| | City | Buenos Aires | Long Beach | Punta del Este | Putrajaya | Riyadh |
|---------------------|----------------------------------|--------------|--------------|-----------------------|-----------------------|--------------|
| Connectivity | Number of collaborations | 3 | 2 | 3 | 1 | 5 |
| | Purpose | FE | FE | FE | FE | FE |
| | Transaction | Yes | Equal | No | No | No |
| | Frequency | >1 | >1 | >1 | >1 | >1 |
| | Orientation | Other | Other | Other | Other | Other |
| | Scale | Local | Local | Local | Local | Local |
| | Incumbency | No | Yes | No | Yes | Yes |
| Conflict | Legal entity | Private | Public - NPO | Private | Public | Public - NPO |
| | General attitude (visitor size) | 17.000 | 17.000 | 1.000 (Grandstands) | 91.000 | 50.000 |
| | Degree of resident contestation | | | | | |
| | Reason of resident contestation | | | | | |
| | Degree of political contestation | | | | | |
| | Reason of political contestation | | | | | |
| Protection | Degree of exemption | | 1 | | 1 | |
| | Target of exemption | | Motorsport | | Motorsport | |
| | Size of investment | Unknown | | > US\$ 2.5 Million | Unknown | €260 Million |
| | Legal entity investor | Public | | Public | Public | Public |
| | Target investment | Logistics | | Commercial, Logistics | Commercial, Logistics | Logistics |
| | Number of race years | 3 | 2 | 3 | 2 | 3 |

Table 14: Protection process

4.5 The shape of place-specific factors facilitating SUE formation

Following, the aggregated place-specific factors of the different formation processes will be discussed. As mentioned in the methodology, the place-specific factors of the individual cities are aggregated through calculating averages and normalizing these averages. The complete overview of the place-specific factors of the individual cities, can be consulted in appendix 8.5. Due to limited data availability for Monte Carlo, Marrakesh and Punta del Este, these cities had to be excluded from this analysis. Whereas both Monte Carlo and Marrakesh belong to the sustainability-oriented connectivity group, the remaining city from this process, Rome, is included with the other connectivity cities for connecting the place-specific factors to the formation processes. Table 15 presents the normalized data of the place-specific factors of the different formation processes.

| Place-specific Factors | Indicator | Process | | |
|--|--|--------------|----------|------------|
| | | Connectivity | Conflict | Protection |
| Visions & Policies | Collective vision | 1,00 | 0,57 | 0,00 |
| | Mobility performance index | 0,19 | 1,00 | 0,00 |
| Informal institutions | | | | |
| Environmental awareness | Sustainable City Rank | 0,74 | 1,00 | 0,00 |
| Creativity | Creative industry employment (%) | 0,25 | 0,00 | 1,00 |
| Openness & Tolerance | LGBTQ index | 0,72 | 1,00 | 0,00 |
| Learning | Scientific share per million residents | 0,47 | 1,00 | 0,00 |
| Technology-oriented | Patents per million residents | 0,00 | 1,00 | 0,24 |
| Natural Resource endowments | | | | |
| Resource depletion | Percentage of Gross Net Income | 0,13 | 0,00 | 1,00 |
| Technical & industrial specialization | | | | |
| | Sustainable Mobility Index | 0,82 | 1,00 | 0,00 |
| | Effectiveness sustainable mobility | 0,81 | 0,00 | 1,00 |
| Network formation | | | | |
| | Co-patents within region (%) | 0,16 | 0,00 | 1,00 |
| | Resident involvement decision-making | 0,52 | 0,00 | 1,00 |
| | GaWC classification | 1,00 | 0,00 | 0,08 |
| Consumer demand | Disposable income per capita | 1,00 | 0,53 | 0,00 |

Table 15: Aggregated and normalised place-specific factors

4.5.1 Connectivity formation process

First and foremostly, cities which display a strong local and global network formation are more inclined to form experiments under connectivity characteristics. Network formation of these cities describe a pattern of global connectivity. Although there is significant collaboration occurring locally, the cities are vastly connected in the global economy. This confirms the idea that network formation in this process is focussed on a wide transnational network of actors and having a globalist perspective. These cities leverage their vast interregional network and strong relationships with relevant actors to aid the formation of an experiment. These cities furthermore display an open and tolerant culture. A culture which represents a tolerance towards diversity and multiculturalism might be a reason through which connectivity dynamics are facilitated since this culture is more open to other cultures and thereby facilitates trans-local relationships.

Regarding setting a collective vision for sustainable mobility, cities with a relatively strong focus on connectivity are more likely to have collective visions for sustainable mobility in place. However, this does not translate equally to the actual local sustainability policies in place since sustainability policies score comparatively lower. This is however not unsurprising as this study argued such cities likely have more emphasis on policies towards supporting and coordinating the connectivity of the urban region with other places. When looking at informal institutions, cities under the connectivity process are predominantly 'Inbetweeners'. These cities are not frontrunners, and the informal institutions of these cities can be described by a moderate degree of environmental awareness, creativity, and learning. Local learning in terms of patent and scientific output is relatively smaller since learning in this process involves the "de-embedding, translation and re-embedding of lessons and experiences across places and scales" (Torrens et. al., 2019 p. 218). There is furthermore a lack of technology orientation within the culture of these

cities. The technical and industrial specialization is however above average. Both in terms of the degree of sustainable and smart mobility technologies as well as the resident's perception of its effectiveness. Apparently, FE which is formed under connectivity dynamics occurs in cities where there is some degree of sustainable mobility knowledge and specialization. Lastly, this formation process is characterized by a large local consumer demand.

4.5.2 Conflict formation process

Cities which have sustainability high on their agenda both formally and informally are more inclined to form experiments under conflict characteristics. More specifically, cities who have an emphasis on conflict dynamics around Formula E, are those cities where there are effective policies in place and there is strong environmental awareness among citizens. Sustainability is thus vastly embedded in both formal and informal institutions. This finding contradicts previous noted expectations which argued policies and visions might be conservative regarding sustainable mobility. A potential mechanism why these place-specific factors influence FE to be formed under predominantly conflict dynamics is an increased critical attitude towards sustainability experiments. Since these cities exemplify a significant degree of sustainability, they become increasingly critical on new sustainability initiatives. Questioning whether these seemingly sustainable experiments are conducted in a sustainable manner. For instance, Paris politicians contested the Parisian ePrix because of the impact FE has on the environment, through its global freight transportation. This mechanism is also backed by the fact that these cities have significant technical and industrial specialization in sustainable mobility. This comparatively high specialization provides these cities with the technical and industrial know-how allowing them to be critical on new experiments. This form of critical thinking might also be facilitated through their culture which expresses an appreciation for technology and learning. A learning culture namely facilitates critical thinking skills (Sabri, 2015). Contrarily to previous expectations, these cities rely very little on natural resources for their income, indicating limited natural resource endowments. As was previously expected, network formation is more locally oriented. There is a similar degree of local collaboration compared to the connectivity process but depicts less international collaboration. Lastly, consumer demand is practically on average.

4.5.3 Protection formation process

Contrarily to the conflict process, FE is predominantly formed through protection mechanisms in cities where sustainability is less prominent on the agenda both regarding formal institutions as well as informal ones. In line with these findings is a relatively lacking technical and industrial specialization. An explanation why the shape of these place-specific factors facilitates a protection formation process might be the fact that (public) local stakeholders effectively aim to transition to a more sustainable city and improve local technical know-how. Local actors recognize the underperformance of their city and try to attract (global) sustainable experiments through protection and nurturing mechanisms. For instance, Riyadh, the capital of Saudi Arabia, relies still heavily on their natural resources but is actively trying to move away from their dependency on fossil fuels (CNN, 2018). *"Riyadh is looking to the future and Formula E is the motorsport of the future"* - Prince Abdulaziz, vice-chair of the Saudi Arabia general sports authority. This signals a clear intention of local authorities to effectively address the current milieu of the city by attracting FE through significant financial investments.

Cities which formed FE under conflict dynamics furthermore express a higher degree of creativity, although the difference is incremental. Values such as openness and learning are also minorly expressed in the culture. However, there is a higher degree of technology orientation compared to the connectivity process. Thus, the informal institutions are predominantly characterized by a focus on technology and creativity rather than sustainability and tolerance issues. This confirms the belief that nurturing configurations are facilitated by a culture valuing and supporting science and technology initiatives. Cities furthermore have a considerable reliance on their natural resources for their income. Natural resources are more abundant in these places which might also be a possible explanation to the underperformance of the sustainability of these cities. There is a less stringent need to transition to sustainable alternatives. This argument can be interpolated to the industrial and technical specialization of these cities. Although residents perceive the mobility system quite effective, the system itself is relatively underperforming compared to the other processes. When looking at network formation, there is a clear trend of strong local collaboration. Both resident involvement in decision-making and co-patents within the region score significantly higher compared to the other cities, whereas the GaWC classification is on par with the conflict process. This supports earlier expectations where network formation was expected to centre around connecting local actors and building strong local relationships. Lastly, there are considerable differences in the size of the investment, the municipality of Riyadh being the largest investor. It is hard to form a hypothesis on the underlying mechanisms explaining these differences, but a potential pathway could be differences in regional financial health and willingness to host FE. Riyadh has for instance a vast disposable income per capita, whereas Punta del Este is a small coastal city in Uruguay with a much smaller economy. Generally, such cities will have more difficulty in financially aiding the event. The other argument, willingness to host FE, deals with public authorities who might have a higher incentive to host FE in their region and are thus more willing to be financially involved.

5. Conclusion

This thesis centred around the notion that the local formation process of a global SUE differs across places, due to the different local contexts in which the experiment is embedded. Thereby addressing the following research question: “*How do place-specific factors shape the processes of protection, connectivity and conflict in the formation of Formula E?*”.

To answer the research question, a mixed method comparative multi-case study of Formula E was conducted. A total of sixteen cities were included in the data sample. Due to complications regarding setting up qualitative interviews (e.g., due to Covid-19), this study operationalized the formation process of FE and the respective place-specific factors of the cities in a semi-quantitative manner. Data for the formation process of FE was sourced through publicly available data such as global and local newspapers and the official website of FE. These documents formed a qualitative narrative of the formation process of FE and were quantified to link the place-specific factors with these processes. The place-specific factors were operationalised using a quantitative approach and were predominantly sourced from indexes (e.g., IMD Smart Mobility Index), databases (e.g., OECD regional innovation database), and other quantitative indicators (e.g., disposable income per capita).

The study empirically analysed how Formula E comes about in urban spaces and what the role is of place-specific factors in facilitating different types of formation processes. The results can be concluded in three sections, the characterization of the specific formation process, the orientation on sustainability and the role of place-specific factors in this process. First, this study showed the appropriateness of using the concepts in the framework of Torrens et. al (2019) to characterize the formation process of a single (sustainable) experiment. Although originally developed to understand favourable environments for sustainable urban experimentation, this study suggests experiment formation on an individual level describes similar characteristics to these favourable environments of connectivity, conflict, and protection. The study furthermore proves these three formation processes are not mutually exclusive, but rather the formation of an experiment is characterized by one dominant formation process. Secondly, Formula E displays considerable variation in the orientation on sustainability in the local formation of Formula E, confirming earlier expectations on the role of sustainability in the local context. Lastly, the results show that the specific shape of place-specific factors indeed shapes the way in which Formula E is formed in its local space.

FE being formed under the *connectivity* process is characterized by a high degree of local and global collaborations. If there is a high degree of connectivity dynamics, there is no significant financial involvement for protecting the event and contestation is limited. Within this process there is also a distinction between cities who have less frequent collaborations but a strong focus on the sustainability aspect of the event and those cities which have the exact opposite. Probably the most striking feature regarding the place-specific factors shaping this process is the clear global connectivity through transnational linkages and collaborations. Cities which display a high global orientation in their network formation are more likely to form FE under the connectivity process as they can leverage their vast interregional network and strong relationships with relevant actors to aid the formation of FE.

Furthermore, cities which have an open and tolerant culture are also more likely to display connectivity dynamics since these cities are more open to other cultures and thereby facilitate trans-local relationships. Place-specific factors facilitating a connectivity process for sustainable urban experiments furthermore have moderate to strong policies and visions facilitating the niche of the experiment. The culture is expressed by overall moderation and a lack of technology orientation. There are little natural resources available which results in a higher technical specialization in the specific sustainable niche.

The *conflict* process is characterized by a relative emphasis on contestation both on a residential and political level. Interestingly, in cities where Formula E is being contested on their sustainability aspect FE seems to work with mostly local NPOs. These types of collaborations have the purpose of proving the sustainability orientation of the event to the city. However, a minority of these collaborations show, on an environmental level, an actual sustainability orientation. Cities which exemplify a significant degree of sustainability, both in their formal and informal institutions and have significant technical and industrial specialization have a higher likelihood of forming FE under conflict dynamics. Arguably the reason for this is, since these cities both possess the technical know-how and considerable environmental awareness, these cities become increasingly critical of new sustainability initiatives and question whether these seemingly sustainable experiments are conducted in a sustainable manner. Additionally, a technology-oriented culture is likely conducive for criticality towards sustainability experiments and thus likely to facilitate a conflict process.

Lastly, the findings show that the *protection* formation process describes a process with significant investments and/or exemptions but have relatively little collaborations and an absence of contestation. For the case of Formula E these protection dynamics are primarily displayed through financial involvement of public authorities. The protection process is shaped by place-specific factors such as formal and informal institutions with little focus on sustainability and limited technical know-how. This disproves earlier expectations of this study, which argued protection mechanisms are likely displayed by cities which have a high degree of sustainable policies and visions. An explanation why the shape of these place-specific factors facilitates a protection formation process is due to some local actors actively aiming to transform the urban region to incorporate more sustainability both formally and informally. Network formation is furthermore centred around connecting local actors and building strong local relationships to facilitate this transition.

Concluding, although FE is a global urban experiment, there is considerable local variation in the formation of FE. The shape of place-based factors influences the likelihood of FE forming under a certain formation process and differ significantly across these processes. Signalling evidence to the argument that the local context plays an important role in the formation process of a global sustainable urban experiment. Thus, sustainable urban experiments are globally connected by locally embedded.

6. Discussion

6.1 Theoretical contribution

This research developed new theoretical insights about place-specificity of urban experimentation. This study contributes to the geography of sustainable transitions literature and our understanding of transition processes through providing an in-depth answer to the specific contextualities of the formation of SUE (e.g., Shove & Walker, 2007; Trutnevyte et. al., 2012). Furthermore, the study adds to strategic niche management literature by integrating geographically sensitive concepts in understanding SUE formation (e.g., Schot & Geels, 2008; Kemp et. al., 1998). Specifically, this study provided new theoretical insights on the influence of the local context on the formation and realisation of global experiments, which are respectively embedded in global niches. While previous literature understood the importance of place-specific factors in the formation of experiments, this study linked *specific shapes* of these place-specific factors to different formation processes of SUE. Particularly, this study empirically validated the local variation of a global experiment and the importance of place-specific factors influencing this variation. More concretely, the shape of these place-specific factors influences the way in which an experiment is locally formed, complementing academic work on the local embedding of global niches and the geography of transitions. This study furthermore contributed to the framework by Torrens et al. (2019), in two-fold. First, the framework proposed by Torrens et. al. (2019), was derived through a literature review, grouping the results of individual scientific contributions into a single framework. This study provided initial empirical data proving the validity of the framework by Torrens et. al. (2019) for characterizing the formation process of (sustainable) urban experiments. Secondly, it extended the framework by understanding the underlying mechanisms through which these different processes unfold.

6.2 Methodological reflection

The most significant methodological limitation is the relatively quantitative way this study operationalized both its dependent and independent variable. Especially the dependent variable, which is a process variable, is thereby limited in exploring empirical emerging themes not incorporated in the predefined operationalization table. Furthermore, relying on publicly available data also reduces insights in the operationalized themes while certain process dynamics might not be disclosed to the public. For instance, the role of intermediaries in the formation of FE was not included in the operationalization while it was expected that such data would be difficult to retrieve from public documents. The use of public available data also resulted in a lack of data on foremostly the independent variables. Sometimes city-level data was missing or not available at all, resulting in the exclusion of three cities when linking the place-specific factors to the different formation processes. Adding, sometimes sources were kept behind a paywall which limited data availability. This missing data weakened the reliability and conclusions of the study. However, the missing data is compensated by the relatively big sample size for a comparative qualitative study. Another limitation of using public data such as local newspapers is the certain degree of data loss due to translation. Data sources which were in other languages than either Dutch or English were translated using Google Translate. However, Google Translate is proven to have some inaccuracies in its translations on a grammatical and diction level (Nugraha, 2020). These inaccuracies were noticeable when translating non-Latin alphabets (e.g., Arabic or Chinese). This limitation was mitigated by aiming to triangulate non-Latin sources with English sources.

Reflecting on the use of Formula E as a case study to understand local variation in experimentation, the main differentiating factor of using Formula E as a case is the fact it is a sports championship. Although it can be considered as a sustainable urban experiment, being a sports experiment might impose slightly different dynamics in their formation process compared to other experiments. The main reason for this is due to Formula E having a global stakeholder, Formula E Holdings, which is involved in all local developments. Other sustainable urban experiments, although forming a global niche, typically will not have one dominant actor overseeing the formation of this experiment in all different local spaces. Formula E Holdings arguably has a relatively vast interregional network to tap into, compared to other sustainable urban experiments. This might lead to some degree of overrepresentation of global connectivity dynamics, compared to the formation of other sustainable urban experiments. Additionally, although FE facilitates technological advancements in low-carbon technologies, suggesting the sustainability potential of the experiment, the local formation of an EPrix does not directly develop local sustainability advancements but is rather a cog in the wheel of developing sustainable mobility technologies through Formula E. However, despite not having a clear direct link to local sustainability, Formula E's primary goal remains to advance sustainable transportation and thus could still be regarded as a sustainable urban experiment.

6.3 Quality criteria

In quantitative research, reliability is the quality criteria centring around the reproducibility of the study (Leung, 2015). The concept of reliability for qualitative research is generally more oriented on consistency while methodological criteria such as reliability, validity and generalizability are often not directly applied (Kitto et. al., 2008). However, while this study operationalized qualitative concepts into measurable quantitative indicators, such quality criteria are deemed more relevant to assess. To achieve internal reliability of the data, this study used a systematic data collection protocol. Data on the formation process of FE was collected through using the same search query but for different cities, increasing the reproducibility. Furthermore, another advantage of sourcing data through publicly available data is the fact that data can be triangulated by using multiple evidentiary sources. Secondly, external reliability is generally hard to ensure in qualitative research but through using a mixed method approach and a relatively big sample size for case study research, the external reliability is increased. For instance, data sourced desk research remains stable over time, making it significantly reproducible.

In research internal validity refers to the appropriateness of tools, processes, and data (Leung, 2015). A limitation hereby is the choice of methodology for answering the research question. The dependent variable in this study is a process outcome. Arguably operationalizing a process in semi-quantitative indicators makes this process more simplistic compared to conducting in-depth interviews. For instance, the presence and role of intermediaries in the formation process of FE is omitted because of the operationalization. Additionally, one of the limitations of this study is the limited inclusion of empirically verified indicators for both the dependent and independent variable. The study had to forego numerous assumptions for setting up measurable indicators for the concepts used in the conceptual framework. Where possible these indicators were based on previous empirical work, establishing internal validity.

However, not all indicators could be derived from established academic work, which reduces the internal validity of the study. External validity deals with knowing whether the results are generalisable beyond the immediate case (Otera-Neira et. al., 2009). Although with qualitative case study research external validity is typically dismissed as unattainable (Carminati, 2018), the relatively large sample size of the study does pose some form of generalizability. Furthermore, as Yin (2017) proposed, this study achieved external validity through using a comparative multi-case methodology and the generalization of the theoretical relationships found in the data.

6.4 Policy implications

The policy implications of this study centres around the actionable insights it created for fostering sustainable urban experiments. While Torrens et. al. (2019) already disproved the idea that experiments are only formed through protection mechanisms, this study extends this disposition by suggesting the specific characteristics of the local space in which the experiment is embedded shapes the process under which the experiment is formed. From a policymaker perspective this suggests it is fruitful to investigate its place-specific factors to understand under which dynamics experiments are more likely to be formed. Thereby policymakers can then aid the formation of local sustainable urban experimentation through setting up supporting mechanisms to facilitate formation process specific characteristics. For instance, if an urban region displays place-specific characteristics which facilitates experiment formation mostly dominated by connectivity mechanisms, it would be advised for policymakers to facilitate these mechanisms through stimulating and advocating interregional relationships and collaborations. This study suggests an urban region should leverage its place-specific characteristics to advance sustainable urban experimentation. This is in line with academic work by Engel (2015), who suggests leveraging and enhancing existing local capabilities is critical in forming clusters of innovation. Concretely, if for instance the network formation of an urban region is generally high and globally oriented, for policymakers to encourage experimentation, this study suggests focusing on facilitating these connectivity dynamics, which in turn facilitates urban experimentation.

6.5 Suggestions for further research

This study proposes several potential avenues for further research. As mentioned in the methodological reflection, a limitation of this study was the use of the quantitative operationalization of a process outcome. This allowed for a broad description of the local contextualism of global experiments, such as Formula E. Future research could complement this description with in-depth case studies to form a more nuanced picture of how global sustainable urban experiments are formed. A more qualitative research design could also approach the problem more inductively. Inductivist studies would have more room in identifying important concepts emerging from the data, compared to this study. Besides verifying and extending the results of this study through complementary qualitative research, another avenue of further research could be in the direction of the place-specific factors influencing experiment formation. This study does not address if certain place-specific factors are of higher importance, compared to others, to the formation of sustainable urban experiments. However, one could argue specific factors are more facilitative towards certain processes of experiment formation. A suggestion for further research is to explore this hierarchy of importance of the place-specific factors in the formation of a sustainable urban

experiment. This hierarchy of factors could also be studied by looking at a larger set of experiments within the same niche and see commonalities in the shape of place-specific factors across the experiments. Additionally, further research could investigate if place-specific factors hold different shapes and importance in the formation of experiments which are not oriented on sustainability.

7. References

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8. Appendix

8.1 List of EPrix

| City | Year | Races |
|------------------------------|------------------------|-------|
| 1. Riyadh (Saudi Arabia) | 2018-2019, 2021 | 5 |
| 2. Berlin (Germany) | 2015-2020 | 12 |
| 3. Bern (Switzerland) | 2019 | 1 |
| 4. Buenos Aires (Argentina) | 2015-2017 | 3 |
| 5. Hong Kong (China) | 2016-2017,2019 | 4 |
| 6. London (UK) | 2015-2016 | 4 |
| 7. Long Beach (USA) | 2015-2016 | 2 |
| 8. Marrakesh (Morocco) | 2016, 2018-2021 | 5 |
| 9. Mexico City (Mexico) | 2016-2020 | 5 |
| 10. Miami (USA) | 2015 | 1 |
| 11. Monte Carlo (Monaco) | 2015, 2017, 2019, 2021 | 4 |
| 12. Montreal (Canada) | 2017 | 2 |
| 13. Moscow (Russia) | 2015 | 1 |
| 14. New York (USA) | 2017-2019 | 6 |
| 15. Paris (France) | 2016-2019 | 4 |
| 16. Beijing (China) | 2014-2015 | 2 |
| 17. Punta del Este (Uruguay) | 2014-2015, 2018 | 3 |
| 18. Putrajaya (Malaysia) | 2014-2015 | 2 |
| 19. Rome (Italy) | 2018-2019, 2021 | 4 |
| 20. Sanya (China) | 2019 | 1 |
| 21. Santiago (Chile) | 2018-2020 | 3 |
| 22. Valencia (Spain) | 2021 | 2 |
| 23. Zürich (Switzerland) | 2018 | 1 |

8.2 List of data sources used

| Place-specific factor | Indicator | Source(s) |
|--|--|--|
| <i>Vision</i> | City Mobility Index | Deloitte (2020) |
| <i>Policies</i> | Mobility Performance Index | Arthur D Little (2018) |
| <i>Informal institutions</i> | Sustainable City Index | Arcadis |
| | Creative industry employment | World Cities Culture Forum, Statista, Beijing Cultural and Creative Industries, Censos Economicos 2019, Caiino (2020), Cendana 2018), Prochile (2021), Projekt Zukunft (2018). |
| | LGBTQ Tolerance | Nestpick (2017), Equaldex (2020) |
| | Academic contribution | Nature (2020) |
| | Patent output | World Council on City Data, World Bank (2020a), (Yang, 2018) |
| <i>Natural resource endowments</i> | Resource depletion | World Bank (2020b) |
| <i>Industrial and technical specialization</i> | Integration of sustainable mobility technologies | Arthur D Little (2018) |
| | Effectiveness of sustainable mobility technologies | IMD Smart Mobility Index (2020) |
| <i>Network formation</i> | co-patent applications within the region | OECD (2015) |
| | Resident involvement in decision making | IMD Smart Mobility Index (2020) |
| | GaWC classification | GaWC (2020) |
| <i>Consumer demand</i> | Disposable income per capita | US Census Bureau, Average Salary Survey, Numbeo, Check In Price |

8.3 Aggregated results of the formation process of FE

8.3.1 Berlin

| Aggregated formation process | | | |
|------------------------------|------------------|--------------------------|--|
| Connectivity | Indicator | Sub Indicator | Aggregated result |
| | Collaboration | Number of collaborations | 5 |
| | | Purpose | Target: FE - City Transaction: non-transactional Frequency: >1 |
| | | Orientation | Other |
| | | Scale | Local / Global (3v2) |
| | | Type of stakeholder | Incumbency: Yes Legal entity: Public / NPO |
| | | | |
| Conflict | General attitude | | 19,500 |
| | Residential | Degree of contestation | 1 |
| | | Reason of contestation | Disturbance |
| | Political | Degree of contestation | 2 |
| | | Reason of contestation | Disturbance |

8.3.2 London

| Aggregated formation process | | | |
|------------------------------|-----------|---------------|-------------------|
| Connectivity | Indicator | Sub Indicator | Aggregated result |

Place-specific formation processes of sustainable urban experiments

| | | | |
|----------|------------------|--------------------------|---|
| | Collaborations | Number collaborations of | 6 |
| | | Purpose | Target: FE Transaction: Yes Frequency: One-time |
| | | Orientation | Other |
| | | Scale | Local |
| | | Type of stakeholder | Incumbency: No Legal entity: NPO |
| Conflict | General attitude | | 60,000 |
| | | Residential | Degree of contestation |
| | | Reason of contestation | Disturbance |
| | Political | Degree of contestation | None |
| | | Reason of contestation | |

8.3.3 Rome

| Aggregated formation process | | | |
|------------------------------|----------------|---------------------------------|--|
| Connectivity | Indicator | Sub Indicator | Result |
| | Collaborations | <i>Number collaborations of</i> | 3 |
| | | <i>Purpose</i> | Target: equal Transaction: Non- transactional Frequency: >1 |
| | | <i>Orientation</i> | Sustainability |
| | | <i>Scale</i> | Global |

| | | | |
|-----------------|------------------|----------------------------|---|
| | | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |
| Conflict | General attitude | | 30,000 |

8.3.4 Paris

| Aggregated formation process | | | |
|-------------------------------|------------------|---|--|
| Connectivity | Indicator | Sub Indicator | Aggregated result |
| | Collaborations | <i>Number of collaborations</i> | 4 |
| | | <i>Purpose</i> | Target: City Transaction: No Frequency: Hybrid |
| | | <i>Orientation</i> | Sustainability |
| | | <i>Scale</i> | Local |
| | | <i>Type of stakeholder</i> | Incumbency: No Legal entity: NPO |
| Conflict | General attitude | | 20,000 |
| | | | |
| | Residential | <i>Degree of contestation</i> | 3 |
| | | <i>Reason of contestation</i> | Disturbance (2), sustainability (1) |
| | Political | <i>Degree of contestation</i> | 4 |
| <i>Reason of contestation</i> | | Sustainability (3), Disturbance (2), Commercial (1) | |

8.3.5 Monte Carlo

Aggregated formation process

| Connectivity | Indicator | Sub Indicator | Aggregated result |
|---------------------|------------------|---------------------------------|--|
| | Collaborations | <i>Number collaborations of</i> | 3 |
| | | <i>Purpose</i> | Target: Niche Transaction: Non-transactional Frequency: >1 |
| | | <i>Orientation</i> | Sustainability |
| | | <i>Scale</i> | Global |
| | | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: NPO |
| Conflict | General attitude | | 18.750 |

8.3.6 Riyadh

| Aggregated formation process | | | |
|-------------------------------------|------------------|---------------------------------|---|
| Connectivity | Indicator | Sub Indicator | Aggregated result |
| | Collaborations | <i>Number collaborations of</i> | 5 |
| | | <i>Purpose</i> | Target: FE Transaction: Non-transactional Frequency: >1 |
| | | <i>Orientation</i> | Other |
| | | <i>Scale</i> | Local |
| | | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public - NPO |
| Conflict | General attitude | | 50,000 |

| | | | |
|-------------------|--|------------------------------------|--------------|
| Protection | Exemption from regulations/obligations | <i>Degree of exemption</i> | None |
| | | <i>Target of exemption</i> | |
| | Investments | <i>Size</i> | €260 Million |
| | | <i>Legal entity stakeholder(s)</i> | Public |
| | | <i>Target</i> | Logistics |

8.3.7 Buenos Aires

| Aggregated formation process | | | |
|------------------------------|--|------------------------------------|---|
| Connectivity | Indicator | Sub Indicator | Aggregated result |
| | Collaborations | <i>Number of collaborations</i> | 3 |
| | | <i>Purpose</i> | Target: FE Transaction: Yes Frequency: >1 |
| | | <i>Orientation</i> | Other |
| | | <i>Scale</i> | Local |
| | | <i>Type of stakeholder</i> | Incumbency: No Legal entity: Private |
| Conflict | General attitude | | 17,000 |
| Protection | Exemption from regulations/obligations | <i>Degree of exemption</i> | None |
| | | <i>Target of exemption</i> | |
| | Investments | <i>Size</i> | Unknown |
| | | <i>Legal entity stakeholder(s)</i> | Public |

| | | | |
|--|--|---------------|-----------|
| | | <i>Target</i> | Logistics |
|--|--|---------------|-----------|

8.3.8 Hong Kong

| Aggregated formation process | | | |
|-------------------------------|--|---------------------------------|--|
| Connectivity | Indicator | Sub Indicator | Aggregated result |
| | Collaborations | <i>Number of collaborations</i> | 2 |
| | | <i>Purpose</i> | Target: Niche - FE Transaction: No Frequency: >1 |
| | | <i>Orientation</i> | Innovation - Other |
| | | <i>Scale</i> | Hybrid |
| | | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public - NPO |
| Conflict | General attitude | | 17,800 |
| | Residential | <i>Degree of contestation</i> | 3 |
| | | <i>Reason of contestation</i> | Disturbance (2), Commercial (1) |
| | Political | <i>Degree of contestation</i> | None |
| <i>Reason of contestation</i> | | | |
| Protection | Exemption from regulations/obligations | <i>Degree of exemption</i> | 1 |
| | | <i>Target of exemption</i> | Motorsport |
| | Investments | <i>Size</i> | €2.4 Million |

| | | | |
|--|--|---|-----------|
| | | <i>Legal stakeholder(s)</i> <i>entity</i> | Public |
| | | <i>Target</i> | Logistics |

8.3.9 Long Beach

| Aggregated formation process | | | |
|------------------------------|--|---|--|
| Connectivity | Indicator | Sub Indicator | Aggregated result |
| | Collaborations | <i>Number of collaborations</i> | 2 |
| | | <i>Purpose</i> | Target: FE Transaction: Hybrid Frequency: >1 |
| | | <i>Orientation</i> | Other |
| | | <i>Scale</i> | Local |
| | | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public - NPO |
| Conflict | General attitude | | 17,000 |
| Protection | Exemption from regulations/obligations | <i>Degree of exemption</i> | 1 |
| | | <i>Target of exemption</i> | Motorsport |
| | Investments | <i>Size</i> | None |
| | | <i>Legal stakeholder(s)</i> <i>entity</i> | |
| | | <i>Target</i> | |

8.3.10 Marrakesh

| Aggregated formation process | | | |
|------------------------------|------------------|---------------------------------|---|
| Connectivity | Indicator | Sub Indicator | Aggregated result |
| | Collaborations | <i>Number collaborations</i> of | 3 |
| | | <i>Purpose</i> | Target: Niche Transaction: No Frequency: >1 |
| | | <i>Orientation</i> | Sustainability |
| | | <i>Scale</i> | Global |
| | | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |
| Conflict | General attitude | | Unknown |

8.3.11 Mexico City

| Aggregated formation process | | | |
|------------------------------|------------------|---------------------------------|---|
| Connectivity | Indicator | Sub Indicator | Aggregated result |
| | Collaborations | <i>Number collaborations</i> of | 5 |
| | | <i>Purpose</i> | Target: FE Transaction: Hybrid Frequency: >1 |
| | | <i>Orientation</i> | Other |
| | | <i>Scale</i> | Local |
| | | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public - NPO hybrid |
| Conflict | General attitude | | 40,000 |

Place-specific formation processes of sustainable urban experiments

| | | | |
|-------------------|--|------------------------------------|------------|
| Protection | Exemption from regulations/obligations | <i>Degree of exemption</i> | 1 |
| | | <i>Target of exemption</i> | Motorsport |
| | Investments | <i>Size</i> | None |
| | | <i>Legal stakeholder(s) entity</i> | |
| | | <i>Target</i> | |

8.3.12 New York City

| Aggregated formation process | | | |
|------------------------------|------------------|---------------------------------|---|
| Connectivity | Indicator | Sub Indicator | Aggregated result |
| | Collaborations | <i>Number of collaborations</i> | 7 |
| | | <i>Purpose</i> | Target: FE - City Transaction No Frequency: >1 |
| | | <i>Orientation</i> | Other |
| | | <i>Scale</i> | Local |
| | | <i>Type of stakeholder</i> | Incumbency: No Legal entity: NPO |
| Conflict | General attitude | | 18,000 |

8.3.13 Beijing

| Aggregated formation process | | | |
|------------------------------|-----------|---------------|-------------------|
| Connectivity | Indicator | Sub Indicator | Aggregated result |

Place-specific formation processes of sustainable urban experiments

| | | | |
|-----------------|------------------|---------------------------------|--|
| | Collaborations | <i>Number of collaborations</i> | 2 |
| | | <i>Purpose</i> | Target: FE Transaction: Hybrid Frequency: >1 |
| | | <i>Orientation</i> | Other |
| | | <i>Scale</i> | Local |
| | | <i>Type of stakeholder</i> | Incumbency: No Legal entity: Public - Private |
| Conflict | General attitude | | 76,000 |

8.3.14 Punta del Este

| Aggregated formation process | | | |
|------------------------------|--|---------------------------------|---|
| Connectivity | Indicator | Sub Indicator | Aggregated result |
| | Collaborations | <i>Number of collaborations</i> | 3 |
| | | <i>Purpose</i> | Target: FE Transaction: Yes Frequency: >1 |
| | | <i>Orientation</i> | Other |
| | | <i>Scale</i> | Local |
| | | <i>Type of stakeholder</i> | Incumbency: No Legal entity: Private |
| Conflict | General attitude | | 10,000 (grandstands) |
| Protection | Exemption from regulations/obligations | Degree of exemption | None |
| | | Target of regulation | |

Place-specific formation processes of sustainable urban experiments

| | | | |
|--|-----------------------|-----------------------------|-------------------------|
| | Investments/subsidies | Size of investments/subsidy | > 2.5 million US Dollar |
| | | Legal entity of stakeholder | Public |
| | | Target of investment | Commercial, Logistics |

8.3.15 Putrajaya

| Aggregated formation process | | | |
|------------------------------|--|-----------------------------|--|
| Connectivity | Indicator | Sub Indicator | Aggregated result |
| | Collaborations | Number of collaborations | 1 |
| | | Purpose | Target: FE Transaction: No Frequency: >1 |
| | | Orientation | Other |
| | | Scale | Local |
| | | Type of stakeholder | Incumbency: Yes Legal entity: Public |
| Conflict | General attitude | | 91,000 |
| Protection | Exemption from regulations/obligations | Degree of exemption | 1 |
| | | Target of exemption | Motorsport |
| | Investments | Size | Unknown |
| | | Legal entity stakeholder(s) | Public |
| | | Target | Commercial, Logistics |

8.3.16 Santiago

| Aggregated formation process | | | |
|------------------------------|--|---------------------------------|--|
| Connectivity | Indicator | Sub Indicator | Aggregated result |
| | Collaborations | <i>Number of collaborations</i> | 5 |
| | | <i>Purpose</i> | Target: City Transaction: No Frequency: >1 |
| | | <i>Orientation</i> | Other |
| | | <i>Scale</i> | Local |
| | | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: NPO |
| | | | |
| Conflict | General attitude | | 17,500 |
| | Resident attitude | Degree of contestation | 2 |
| | | Reason of contestation | Disturbance, Commercial |
| | Political attitude | Degree of contestation | 1 |
| | | Reason of contestation | Disturbance, Sustainability |
| Protection | Exemption from regulations/obligations | Degree of exemption | None |
| | | Target of regulation | |
| | Investments/subsidies | Size of investments/subsidy | €625,000 Euros |
| | | Legal entity of stakeholder | Public |
| | | Target of investment | Logistics |

8.4 Individual collaboration formation process results

8.4.1 Berlin

| Collaboration | Sub Indicator | Result |
|---------------------------------|----------------------------|--|
| FE - Berliner krebsgesellschaft | <i>Purpose</i> | Target: City Transactional: No Frequency: One-time |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: NPO |
| FE - Allianz | <i>Purpose</i> | Target: Niche Transaction: No Frequency: One-time |
| | <i>Orientation</i> | Sustainability |
| | <i>Scale</i> | Global |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Private |
| FE - FIA | <i>Purpose</i> | Target: City Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Global |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: NPO |
| FE - Local authorities | <i>Purpose</i> | Target: FE Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Other |

Place-specific formation processes of sustainable urban experiments

| | | |
|------------------------|----------------------------|---|
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |
| FE - Gil & Weingärtner | <i>Purpose</i> | Target: FE Transaction: Yes Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No (2) Legal Entity: Private (1) |

8.4.2 London

| Collaboration | Sub Indicator | Result |
|------------------|----------------------------|--|
| FE - ExCel | <i>Purpose</i> | Target: FE Transaction: Yes Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Private |
| FE - StreetGames | <i>Purpose</i> | Target: City Transaction: No Frequency: Once |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: NPO |
| FE - Lightsource | <i>Purpose</i> | Target: FE Transaction: Yes |

Place-specific formation processes of sustainable urban experiments

| | | |
|---------------------------------|----------------------------|--|
| | | Frequency: Once |
| | <i>Orientation</i> | Sustainability |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: Private |
| FE - Greenpeace | <i>Purpose</i> | Target: FE Transaction: Yes Frequency: Once |
| | <i>Orientation</i> | Sustainability |
| | <i>Scale</i> | Global |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: NPO |
| FE - Greenpower Education Trust | <i>Purpose</i> | Target: City Transaction: No Frequency: Once |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: NPO |
| FE - Local authorities | <i>Purpose</i> | Target: FE Transaction: Yes Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |

8.4.3 Rome

| Collaboration | Sub Indicator | Result |
|------------------------|----------------------------|--|
| FE - UNEP | <i>Purpose</i> | Target: City Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Sustainability |
| | <i>Scale</i> | Global |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: Public |
| FE - FIA | <i>Purpose</i> | Target: Niche Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Sustainability/Innovation |
| | <i>Scale</i> | Global |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: NPO |
| FE - Local authorities | <i>Purpose</i> | Target: FE Transaction: No Frequency: One-time |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |

8.4.4 Paris

| Collaboration | Sub Indicator | Result |
|---------------|--------------------|--|
| FE - UNEP | <i>Purpose</i> | Target: City Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Sustainability |

Place-specific formation processes of sustainable urban experiments

| | | |
|-------------------------------------|----------------------------|---|
| | <i>Scale</i> | Global |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: Public |
| FE - L'Association du Sport et Plus | <i>Purpose</i> | Target: City Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: NGO |
| FE - Pollutrack | <i>Purpose</i> | Target: City Transaction: Yes Frequency: One-time |
| | <i>Orientation</i> | Sustainability |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: NGO |
| FE - Jour de la Terre | <i>Purpose</i> | Target: Niche Transaction: No Frequency: One-time |
| | <i>Orientation</i> | Sustainability |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: NPO |

8.4.5 Monte Carlo

| Collaboration | Sub Indicator | Result |
|--|----------------|----------------------------------|
| FE - Prince Albert II of Monaco Foundation | <i>Purpose</i> | Target: Niche Transaction: No |

Place-specific formation processes of sustainable urban experiments

| | | |
|-------------------|----------------------------|---|
| | | Frequency: one-time |
| | <i>Orientation</i> | Sustainability |
| | <i>Scale</i> | Global |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: NGO |
| FE - FIA | <i>Purpose</i> | Target: Niche Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Sustainability/Innovation |
| | <i>Scale</i> | Global |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: NGO |
| FE - Principality | <i>Purpose</i> | Target: FE Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |

8.4.6 Riyadh

| Collaboration | Sub Indicator | Result |
|---------------|--------------------|---|
| FE - CBX | <i>Purpose</i> | Target: FE Transaction: Yes Frequency: one-time |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |

Place-specific formation processes of sustainable urban experiments

| | | |
|------------------------|----------------------------|--|
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: Private |
| FE - FIA | <i>Purpose</i> | Target: Niche Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Sustainability/Innovation |
| | <i>Scale</i> | Global |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: NPO |
| FE - Principality | <i>Purpose</i> | Target: FE Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |
| FE - Local authorities | <i>Purpose</i> | Target: FE Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |
| FE - SAF | <i>Purpose</i> | Target: City Transaction: No Frequency: one-time |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |

| | | |
|--|----------------------------|--------------------------------------|
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: NPO |
|--|----------------------------|--------------------------------------|

8.4.7 Buenos Aires

| Collaboration | Sub Indicator | Result |
|------------------------|----------------------------|---|
| FE - Fenix | <i>Purpose</i> | Target: FE Transaction: Yes Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: Private |
| FE - Roborace | <i>Purpose</i> | Target: Niche Transaction: No Frequency: one-time |
| | <i>Orientation</i> | Innovation |
| | <i>Scale</i> | Global |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: Private |
| FE - Local authorities | <i>Purpose</i> | Target: FE Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: Public |

8.4.8 Hong Kong

| Collaboration | Sub Indicator | Result |
|--------------------------------|----------------------------|---|
| FE - FIA | <i>Purpose</i> | Target: Niche Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Innovation |
| | <i>Scale</i> | Global |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: NGO |
| FE - HKAA // Local authorities | <i>Purpose</i> | Target: FE Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |

8.4.9 Long Beach

| Collaboration | Sub Indicator | Result |
|-----------------------------|----------------------------|---|
| FE - Grand Prix Association | <i>Purpose</i> | Target: FE Transaction: Yes Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: NPO |
| FE - Local authorities | <i>Purpose</i> | Target: FE Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Othe |

| | | |
|--|----------------------------|---|
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |

8.4.10 Marrakesh

| Collaboration | Sub Indicator | Result |
|--|----------------------------|---|
| FE - Prince Albert II of Monaco Foundation | <i>Purpose</i> | Target: Niche Transaction: No Frequency: one-time |
| | <i>Orientation</i> | Sustainability |
| | <i>Scale</i> | Global |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: NGO |
| FE - UNEP | <i>Purpose</i> | Target: FE Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Sustainability |
| | <i>Scale</i> | Global |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |
| FE - local authority | <i>Purpose</i> | Target: Niche Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Sustainability |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |

8.4.11 Mexico City

| Collaboration | Sub Indicator | Result |
|-------------------------|----------------------------|--|
| FE - Con Ganas de Vivir | <i>Purpose</i> | Target: City Transaction: No Frequency: one-time |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: NPO |
| FE - FIA | <i>Purpose</i> | Target: Niche Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Global |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: NPO |
| FE - UNEP | <i>Purpose</i> | Target: FE Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Sustainability |
| | <i>Scale</i> | Global |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |
| FE - Local authorities | <i>Purpose</i> | Target: FE Transaction: Yes Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |

Place-specific formation processes of sustainable urban experiments

| | | |
|------------|----------------------------|---|
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |
| FE - Ocesa | <i>Purpose</i> | Target: FE Transaction: Yes Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: Private |

8.4.12 New York City

| Collaboration | Sub Indicator | Result |
|---------------------------|----------------------------|--|
| FE - Earth Day Initiative | <i>Purpose</i> | Target: City Transaction: No Frequency: one-time |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: NGO |
| FE - Red Hook Initiative | <i>Purpose</i> | Target: City Transaction: No Frequency: one-time |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: NGO |
| FE - PortSide | <i>Purpose</i> | Target: City Transaction: No Frequency: one-time |

Place-specific formation processes of sustainable urban experiments

| | | |
|---------------------------------------|----------------------------|---|
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: NGO |
| FE - UNEP | <i>Purpose</i> | Target: FE Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Sustainability |
| | <i>Scale</i> | Global |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |
| FE - The Climate Group | <i>Purpose</i> | Target: Niche Transaction: No Frequency: one-time |
| | <i>Orientation</i> | Sustainability |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: NPO |
| FE - Economic Development Corporation | <i>Purpose</i> | Target: FE Transaction: Yes Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: NPO |
| FE - local authorities | <i>Purpose</i> | Target: FE Transaction: No Frequency: >1 |

Place-specific formation processes of sustainable urban experiments

| | | |
|--|----------------------------|---|
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |

8.4.13 Beijing

| Collaboration | Sub Indicator | Result |
|------------------------|----------------------------|---|
| FE - local authorities | <i>Purpose</i> | Target: FE Transaction: No Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: Public |
| FE - Team China Racing | <i>Purpose</i> | Target: FE Transaction: Yes Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: Private |

8.4.14 Punta del Este

| Collaboration | Sub Indicator | Result |
|------------------------|----------------|--|
| FE - local authorities | <i>Purpose</i> | Target: FE Transaction: No Frequency: >1 |

Place-specific formation processes of sustainable urban experiments

| | | |
|-----------------|----------------------------|--|
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: Public |
| FE - SportLink | <i>Purpose</i> | Target: FE Transaction: Yes Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: Private |
| FE - Antel Auto | <i>Purpose</i> | Target: FE Transaction: No Frequency: one-time |
| | <i>Orientation</i> | Innovation |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: No Legal entity: Private |

8.4.15 Putrajaya

| Collaboration | Sub Indicator | Result |
|------------------------|----------------------------|--|
| FE - Local authorities | <i>Purpose</i> | Target: FE Transactional: No Frequency: >1 |
| | <i>Orientation</i> | Other |
| | <i>Scale</i> | Local |
| | <i>Type of stakeholder</i> | Incumbency: Yes Legal entity: Public |

8.4.16 Santiago

| | Collaboration | Sub Indicator | Result |
|----------------------|------------------------|----------------------------|--|
| Collaboration | FE - local authorities | <i>Purpose</i> | Target: FE Transactional: No Frequency: >1 |
| | | <i>Orientation</i> | Other (3) |
| | | <i>Scale</i> | Local (1) |
| | | <i>Type of stakeholder</i> | Incumbency: Yes (1) Legal entity: Public (2) |
| | FE - Enel X | <i>Purpose</i> | Target: City (3) Transaction: No (1) Frequency: One-time (1) |
| | | <i>Orientation</i> | Sustainability (1) |
| | | <i>Scale</i> | Local (2) |
| | | <i>Type of stakeholder</i> | Incumbency: Yes (1) Legal entity: Private (1) |
| | FE - FIA | <i>Purpose</i> | Target: City (2) Transaction: No (1) Frequency: >1 (2) |
| | | <i>Orientation</i> | Other (3) |
| | | <i>Scale</i> | Global (2) |
| | | <i>Type of stakeholder</i> | Incumbency: Yes (1) Legal entity: NPO (3) |
| | FE - FIA | <i>Purpose</i> | Target: City (2) Transaction: No (1) Frequency: >1 (2) |
| | | <i>Orientation</i> | Other (3) |
| | | <i>Scale</i> | Global (2) |

Place-specific formation processes of sustainable urban experiments

| | | | |
|------------------------|--|-----------------------------|---|
| | | <i>Type of stakeholder</i> | Incumbency: Yes (1) Legal entity: NPO (3) |
| | FE - EtoDog | <i>Purpose</i> | Target: City (2) Transaction: No (1) Frequency: 1 (1) |
| | | <i>Orientation</i> | Other (3) |
| | | <i>Scale</i> | Loca (2) |
| | | <i>Type of stakeholder</i> | Incumbency: No (2) Legal entity: NPO (3) |
| Conflict | General attitude | | 10,000, 25,000 |
| | Resident attitude | Degree of contestation | 2 |
| | | Reason of contestation | Disturbance, Commercial |
| | Political attitude | Degree of contestation | 1 |
| Reason of contestation | | Disturbance, Sustainability | |
| Protection | Exemption from regulations/obligations | Degree of exemption | None |
| | | Target of regulation | |
| | Investments/subsidies | Size of investments/subsidy | €625,000 Euros |
| | | Legal entity of stakeholder | Public |
| Target of investment | | Logistics | |

8.5 Individual results place-based factors

| PSF | Indicator | | Beijing | London | Mexico City | Rome | New York | Buenos Aires | Long Beach | Putrajaya | Riyadh | Santiago | Paris | Berlin | Hong Kong |
|-----------------|------------------------|-------------------------|-------------|-------------|-------------|-------------|-------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <i>Vision</i> | Collective vision | Likert (1-5) | 4 | 5 | 3 | 5 | 3 | 3 | 4 | Unknown | 3 | 3 | 4 | 4 | 4 |
| <i>Policies</i> | Mobility performance | Index | 20 | 22,6 | 21,1 | 19,5 | 25,4 | 20 | 20,9 | 20,2 | 23,7 | 23,7 | 23,5 | 24,1 | 24,3 |
| <i>Culture</i> | Sustainable City Index | Planet (rank) | 73 | 5 | 84 | 22 | 26 | 80 | 50 | 55 | 76 | 71 | 15 | 17 | 16 |
| | Creative employment | (%) | 9,9% | 12,0% | 9,0% | 8,7% | 5,4% | 9,5% | 10,5% | 10,5% | Unknown | 6,0% | 9,0% | 10,7% | 5,6% |
| | LGBTQ | Index | 9,14 | 22,46 | 16,23 | 13,76 | 21,7 | 18,13 | 18,34 | 3,9 | 3 | 13,47 | 21,57 | 21,98 | 14,05 |
| | Academic contribution | Share/million residents | 132,143454 | 80,14584725 | 5,907396951 | 53,85659589 | 245,4412638 | 1,514615284 | 88,32114948 | 0,719026549 | 0,716425687 | 1,047381546 | 451,9204072 | 136,0137174 | 54,69162115 |
| | Patent output | per million residents | Unknown | 98,2 | 7,1 | 30,6 | 127,5 | 69,9 | 173,10 | Unknown | 12 | 18,3 | 240,5 | 174,8 | 46,1 |
| <i>NRE</i> | Resource depletion | % of GNI | 0,7 | 0,6 | 1,7 | 0,1 | 0,3 | 1,6 | 0,3 | 3,8 | 8,2 | 1 | 0 | 0 | 0,7 |
| <i>T&IS</i> | Mobility Innovation | (%) | 8,30 | 11,90 | 2,90 | 4,40 | 5,50 | 2,40 | 5,30 | 3,20 | 0,70 | 3,10 | 10,50 | 8,50 | 7,90 |
| | Effectiveness | (1-100) | 77,74 | 53,66 | 54,28 | 41,66 | 60,06 | 55,48 | 54,62 | 61,4 | 63,14 | 52,06 | 55,22 | 49,72 | 53,14 |
| <i>Network</i> | % of co-patents | Within region | 83 | 77,2 | 61,4 | 75,1 | 82,2 | Unknown | 82,8 | Unknown | Unknown | 69,1 | 69,2 | 85,3 | Unknown |
| | Resident involvement | Index | 62,6 | 49,1 | 32,9 | 23,5 | 55,8 | 36,1 | 53,2 | 55,5 | 58,7 | 24,2 | 41,7 | 49 | 42,1 |
| | GaWC classification | | 2 | 1 | 3 | 5 | 1 | 4 | 3 | 3 | 4 | 4 | 2 | 5 | 2 |
| <i>Demand</i> | Disposble Income | €/capita | € 14.035,00 | € 49.356,00 | € 6.372,00 | € 33.511,00 | € 58.393,00 | € 4.050,00 | € 27.048,37 | € 12.749,00 | € 52.846,00 | € 7.983,24 | € 46.350,00 | € 31.038,00 | € 52.382,00 |