UNIVERSITY OF TWENTE.

Faculty of Behavioral, Management and Social Sciences

The Impact of Municipal Policy-making on Sustainability: A Reflection on Processes in Darmstadt

B.Sc. Thesis

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July 4th, 2019

Program: Public Governance across Borders

17,866 Words

Ethical Approval No. 190431

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Abstract

The present study about municipal policy-making on sustainability examines the sustainability potential of the mobility concept in the Lincoln settlement in Darmstadt, Germany. Using an ex-post evaluation and the methodology of causal process-tracing, the research questions which mechanisms drove the implementation of municipal policies in the field of sustainable mobility in the Lincoln settlement and which implications can be made for the transferability to other German municipalities are answered. In a first stage, an extended model of the Multi-Level Perspective with four implementation factors (*polycentric decision-making and power, local "frontrunners", financial resources,* and *conventional governance structures)* is used to analyze policy documents, transcribed interviews, and newspaper articles. The analysis dissolves that the implementation was initially triggered by the unmanageable amount of atmospheric pollution in the city and the adopted decision of first access rights with state benefits for dispensable national properties by the German parliament. During the implementation process, the decision-making power was distributed one-sidedly, within political actors in the municipal administration and public utility companies. The strong cooperation between these two actors further demonstrates why the municipality was able to implement the concept financially, as the public building society has been carrying the majority of costs. In a second step, a conceptualization of sustainable mobility is used to further investigate the "best practice" potential of the mobility concept. It is found that the implementation process is highly-contextual and therefore practically not transferable to other municipalities.

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Frequently Used Abbreviations

ABCPC	=	Advisory board for the climate protection concept
Bauverein	=	Bauverein AG
BImA	=	Federal Agency Office for Property Tasks (BImA)
BVD New Living	=	BVD New Living GmbH & Co. KG
CDU	=	Christian Democratic Union
CO2	=	Carbon dioxide
CPT	=	Causal process-tracing
EU	=	European Union
FDP	=	Free Democratic Party
GHG	=	Greenhouse gas
HEAG mobilo	=	HEAG mobilo GmbH
HVwVfG	=	Hessisches Verwaltungsverfahrensgesetz (public procurement law of the federal state of "Hessen")
MIT	=	Motorized individual transportation
MLP	=	Multi-Level Perspective
NGO	=	Non-governmental organization
NO2	=	Nitrogen dioxide
NPM	=	New Public Management
SDGs	=	Sustainable Development Goals
SO2	=	Sulfur dioxide
SPD	=	Social Democratic Party
The Greens	=	Bündnis 90/ Die Grünen
The Lefts	=	Die Linken
ULL	=	Urban living lab
UN	=	United Nations
UTL	=	Urban transition lab

Frequently Used German Terms

Darmstadt	=	A municipality in the federal state of “Hessen”, Germany
Heinerbike	=	Sharing system for cargo bicycles
Hessen	=	Federal state in Germany
Masterplan DA2030+	=	Strategic vision for the municipality of Darmstadt
Mein Lincoln mobil	=	Sharing system of electric vehicles
Mobilitätskonzept DA2030+	=	Mobility concept for the municipality of Darmstadt
Rahmenplan Bessungen Süd	=	Development plan for a recreational area in Darmstadt
Umwelthilfe	=	A non-governmental association for environmental sustainability
Verkehrsentwicklungsplan	=	The current mobility concept of Darmstadt

1 Introduction

"We can't save the world by playing by the rules, because the rules have to be changed." – Greta Thunberg

Sustainability is a widespread term that promises altruistic behavior to save the planet and mankind. However, most of the time, it has remained a fabricated notion, written on parties' programs to attract voters. Nonetheless, sustainability increasingly moves into the focus of policy-making due to the unavoidability to mitigate and adapt to climate change. More specifically, it becomes evident that urbanized areas have to cope with the issue of atmospheric pollution by vehicles.

1.1 Sustainability – from Global to Local Scale

Climate change is often depicted as the most socially challenging issue of our time. In order to mitigate climate change, several national leaders signed and adopted the Paris Agreement in 2015 (Mahapatra & Ratha, 2017). Such agreements are usually annotated as positive steps towards climate-neutrality, but practically, they entail several issues. For example, the Paris Agreement is not legally binding for national states, even though national states are obliged to monitor efforts undertaken to minimize the risk of climate change. Additionally, discussions are ongoing about financial issues, equality between developed and developing countries, and the share of carbon emissions. These are challenges, which demand for new systems of governance and institutions, especially at the national level, where the agreement has to be implemented.

Instead, politicians are assumed to fear the resistance of voters and entrepreneurs towards new environmental sustainability policies (Mahapatra & Ratha, 2017). Consequently, even Germany, as a country strongly supporting the idea of climate change, misses many opportunities to achieve its climate goals. Moreover, the inability to manage climate change at the national level becomes more obvious, as sustainability policies of many states lack specific guidelines for the local level (Shen, Jorge Ochoa, Shah, & Zhang, 2011).

Thus, the increasing need of developing and implementing climate change policies at the local, urbanized level is without doubt. This responsibility shift is as well based on the fact that most environmental pollution happens at the local level (Nagorny-Koring, 2018). The integral part of cities was already manifested in the Brundtland Report in 1987. Local climate change

management is addressed in many other reports, such as the Kyoto Protocol, EU "20-20-20", and the Paris Agreement. Additionally, the United Nations (UN) acknowledge the significance of cities in contributing to the Sustainable Development Goals (SDGs) for 2030, as they call for "inclusive, safe, resilient, and sustainable" (General Assembly, 2015, p. 14) cities.

Another argumentation for the local governance of climate change is that the phenomenon of urbanization steers even more environmental issues, such as through an increase in production, consumption. Hence, an increase in traffic occurs, making urban areas responsible for 75% of greenhouse gas (GHG) emissions (Nevens, Frantzeskaki, Gorrisen, & Loorbach, 2013). At the same time, this trend may enable cities to significantly contribute achieving environmental sustainability on the global level (Nagorny-Koring, 2018). According to the UN, more than 50% of the world's population has already lived in cities in 2014 (UN Department of Economic and Social Affairs, 2014). The number is predicted to increase to 66% in the middle of the decade. Hence, cities are a driving, an affected and a solutional instance, meaning that the urbanization trend entails both sustainability challenges and opportunities for cities, citizens, and the planet (Boone & Fragkias, 2013).

1.2 The Governance of Urban Sustainability

As new governance instruments are required to achieve "more" sustainability, recent research regarding the local governance of sustainability issues aims at examining possible pathways for a transformation among society. However, it remains questionable to which extent the inevitable rhetoric to achieve local sustainability can be transferred into practical policy-making (Bulkeley & Betsill, 2005). Hereby, based on the division of sustainability into an economic, an ecological, and a social dimension, a "more balanced" pursuit is inherently assumed to have a sector-crossing character (Ahvenniemi, Huovila, Pinto-Seppä, & Airaksinen, 2017; Nevens et al., 2013). This conceptualization is affirmed by Bulkeley & Betsill (2005), who claim that the examination of local sustainability governance should be viewed in the context of multi-dimensional governance. An influence is detected from several spheres of governance, including government and non-government actors, municipality networks, national planning guidance, and supranational funding and policy priorities from the European Union (EU). Other researchers argue that, along with state and market stakeholders, civil society has the potential to stimulate transformative change (Hargreaves, Haxeltine, Longhurst, & Seyfang, 2011).

Although it is evident that policy-making in the field of sustainability is supposed to be a participatory process, no empirical evidence exists on the applicability and the driving effect of top-down or bottom-up processes on local sustainability. However, it is generally acknowledged that so-called "frontrunners", people with a vision, are at the heart of stimulation (Nagorny-Koring, 2018; Nevens et al., 2013). "Frontrunners" may have diverse backgrounds. Additionally, the concept of urban transition labs (UTLs), as explained below, assumes that stakeholders engaged in and connected to local processes are typically more eager to design a sustainable future (Nevens et al., 2013). Practically, this argumentation seems valid, as the success of projects is dependent upon acceptance by citizens and thus requires fundamental consent from "the bottom".

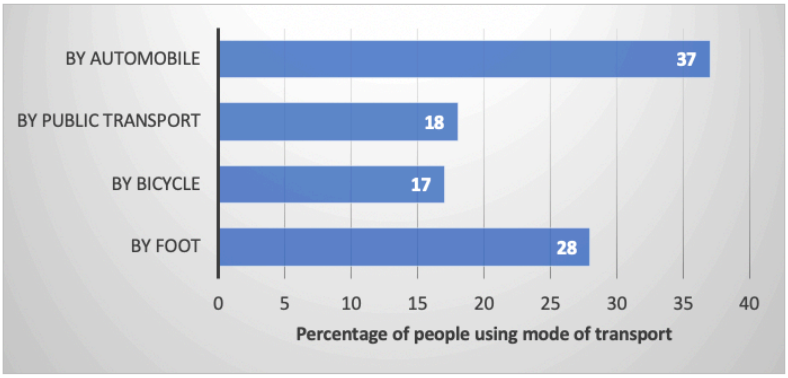
Recent literature argues that special contributions in achieving a city-wide sustainability transformation are made by UTLs or urban living labs (ULLs), collaborations where different actors cooperate to co-design, test and implement governance innovations, which enable the municipality of gaining knowledge about respective processes (Bulkeley et al., 2016; Nevens et al., 2013). Besides this "learning factor", UTLs are assumed to possess a transformative character themselves, allowing for new rules of the game: Bulkeley et al. (2016) state that "their configuration or design realises new kinds of capacities and capabilities" (p. 16). However, in urban governance approaches, sustainability is often depicted as a "wicked" problem, with ever-changing structures in which solutions have to be embedded (Ernst, Dinther, Peek, & Loorbach, 2016). Here, UTLs can unfold their potential to detect context-specific characteristics of a city, such as the city's structures, its economic development, as well as its administrative structures and their impact on the feasibility of sustainability transformation (Nevens et al., 2013).

The potentials an UTL unfolds in regard to creating knowledge about transforming to sustainability can be transferred to other municipalities, as the "best practice" research field argues (Aderhold, Mann, Rückert-John, & Schäfer, 2015). However, the "best practice" term is contested, as many researchers argue that "best" does not inherently imply universal application of the practice (Nagorny-Koring, 2018). As no indicators for replicability exist, it remains interesting to examine how context-specific the case in this thesis is.

1.3 The Case: The Potential of UTLs in Darmstadt

Within the scope of this thesis, the abovementioned potential of UTLs will be examined using the example of Darmstadt, a medium-sized city in the mid-west of Germany. The city is characterized through its high traffic density (Amt für Wirtschaft und Stadtentwicklung, 2019). In a citizen survey conducted by the Department for Economics and Urban Development, 65.2% of the surveyed persons believed that Darmstadt is a congested city when they were asked about what the city represents (Magistrat der Wissenschaftsstadt Darmstadt & Amt für Wirtschaft und Stadtentwicklung, 2018). Statistics about the modal split in 2013 show that 37% of inhabitants primarily use the car for mobility means (Urban Catalyst GmbH, 2018).

Figure 1: Modal Split in Darmstadt in 2013



Adopted from Magistrat der Wissenschaftsstadt Darmstadt & Amt für Wirtschaft und Stadtentwicklung (2018).

Even though the city is characterized by a large number of students, the percentage of people using the car is relatively high. The air pollution issue has been partly managed through several policies, such as the introduction of a low-emission zone in 2015. More recently, the city of Darmstadt has banned diesel cars and cars with high pollution emissions (only Euronorm 4 or Euronorm 3 plus particle filter are allowed) in two streets with high congestion levels. However, the citizen survey shows that inhabitants are still unsatisfied with the level of fine dust pollution (Magistrat der Wissenschaftsstadt Darmstadt & Amt für Wirtschaft und Stadtentwicklung, 2018).

As Darmstadt is characterized by a growing number of inhabitants, the management of existing and additional areas, such as housing, is required. Related to this urbanization issue is the management of traffic. In order to tackle the issue of air pollution, Darmstadt is in the process of developing a local mobility concept, centrally questioning how to transition to a more environmentally friendly mobility plan (Wissenschaftsstadt Darmstadt, n.d.). Darmstadt's

motivations in managing the traffic issue becomes even more evident through the implementation of the Lincoln settlement, which is a former United States military area (Bau- und Verkehrsdezernat, 2018). A new mobility concept has been developed in order to limit the amount of motorized individual transportation (MIT).

The mobility concept in the Lincoln settlement can be categorized as an UTL, where a shift in the existent modal split is supposed to be stimulated and thus, a transformation in sustainability reached. This thesis focusses on the case of the sustainability potential of the mobility concept in the Lincoln settlement, which results in the following research questions.

1.4 Research Question

"Which mechanisms drove the implementation of municipal policies in the field of sustainable mobility in the Lincoln settlement in the city of Darmstadt and which implications can be made regarding the transferability potential to other municipalities within Germany?"

The following sub-questions contribute to answering the research questions.

(1) How does Darmstadt articulate sustainable mobility?
(2) How did Darmstadt's mobility concept in the Lincoln settlement develop? Which actors were involved and under which conditions was the settlement created?
(3) Which factors contributed to the implementation of the respective settlement?
(4) Is the respective mobility concept sustainable?
(5) Does the mobility concept have a "best practice" potential and can a more general theory for the transferability to other German municipalities be developed?

1.5 Social and Scientific Relevance

As implied in the section 1.2, the research gap relevant for this work is the substantive contribution of the dynamics of UTLs to create knowledge about sustainability transformations at the local scale. Thus, this work focuses on the societal relevance of findings, which come under the heading of trying to attain the purpose of Germany's climate aims through developing a set of guidelines for achieving sustainability transformations with the help of UTLs within Darmstadt and beyond. Therefore, the findings of this research have the aim to serve as recommendations for municipal policy-makers.

Because the research on local sustainability transformations is still in its beginnings, this thesis further creates an integrated and holistic theoretical framework to observe and detect mechanisms in developing and successfully deriving insights from an UTL. This is the main scientific interest. Additionally, the sustainability concept is applied to mobility, which is supposed to derive new theoretical insights about restricting factors and the consequences of implementation. In the end, a more general construct or even a theory can be derived on the sustainability potential of UTLs.

1.6 Outline of the Bachelor Thesis

In order to arrive at new theoretical and practical insights, the research questions and the five sub-questions are incrementally approached in different sections. Section 2 focusses on the theory and the conceptualizations of urban sustainability transformations, hereby defining sustainable mobility and discussing urban sustainability governance. In the second part of this section, the theoretical framework for the "best practice" potential is laid out.

Section 3 then describes the used methodology. Limitations of the research design and data collection are discussed. Section 4 provides background information about the case by describing Darmstadt's existent administrative structures and politics.

In section 5, the analysis starts with two main sections. In the first section, an overview of the implementation process of the mobility concept is given and the implementation factors explained. In the end, an event-state network is created, which illustrates the most significant aspects of the respective process and its conditions. In the second section, the "best practice" potential is unfolded. Finally, the findings of the analysis are discussed in the discussion and conclusion (section 6). Limitations of the applied theoretical framework are illustrated and an outlook for future research is given.

2 Theories and Conceptualizations

Answering the research questions at hand requires further definitions and conceptualizations. First, sustainability will be defined, while attributing attention to the term sustainable mobility. Then, the governance of sustainability will be conceptualized. In doing so, it is necessary to incorporate transformation management into the conceptualization of urban climate governance, since it is claimed that municipalities cannot govern climate change with traditional governance tools. Four factors are identified, which may influence an implementation process. In the end, the cross-contextual applicability of "best practices" in the form of UTLs is addressed.

2.1 Sustainability

Sustainability is a normative concept, suggesting that an ideal type of society is one in which people's most basic needs can be fulfilled, while saving the planet (Thiele, 2013). Thus, sustainability is often defined as a practice which meets the needs of the present without conceding the needs of the future. Moreover, the definition suggests an integrated approach to sustainability, in that economic wealth is combined with social and ecological sustainability, the three pillars of sustainability. It is widely accepted that the term sustainability builds on three pillars, the triple bottom line. Achieving ecological goals, for example, has to be weighed against negative social and economic externalities. Thus, an integrated approach to sustainability demands sacrifice from humanity and cannot be ideal, but balanced.

Basically, the integrated definition of sustainability can account for the concept of sustainable mobility, which is defined by the World Business Council for Sustainable Development (2004) as "the ability to meet the needs of society to move freely, gain access, communicate, trade, and establish relationships without sacrificing other essential human or ecological values today or in the future" (in: Nykvist & Whitmarsh, 2008, p. 1373). Thus, a policy aiming at sustainable mobility with potentially environmental benefits needs to be weighed against economic and social consequences.

In regard to the triple bottom line, it is argued that an overly amount of focus has been put on economic wealth, whereas the ecological and social dimensions have been neglected (Nykvist & Whitmarsh, 2008). Transport, in general, has to become more energy-efficient, as claimed by Eriksson (2017). In order to achieve more sustainable mobility, thus, it is expected that UTLs aiming at increasing sustainability mainly focus on the ecological and social dimensions.

2.2 Urban Sustainability Governance

Approaching sustainability at the local level puts forward that it is a problem in society as a whole and thus, requires political solution approaches (Nagorny-Koring, 2018). It is assumed that there is a systematic reply to sustainability, which can be steered through governance. The term "governance" distinguishes itself from the traditional "government" term, which clearly puts formal institutions at the heart of a political system (Kemp, Parto, & Gibson, 2005). Instead, governance attributes high complexity to the types of interactions between formal and informal actors.

This assumption is confirmed by the reformation of public administration, which has undergone significant changes with implications for policy-making. The central aim hereby is to increase efficiency and quality of the public sector by applying market-based strategies, the so-called New Public Management (NPM) (Nagorny-Koring, 2018). Recently, public administration has tried to turn service-oriented, achieving a higher quality of life among citizens. From this perspective it is argued that research needs to incorporate strategies, processes, and programs about policy-making between formal and informal actors (Nagorny-Koring, 2018). In order to create a realistic image of the situation in Darmstadt, it is thus assumed that policy-making processes are not stimulated by formal actors, but co-evolve and that actors are mutually dependent on each other.

2.2.1 Urban Sustainability Transformations

Besides acknowledging the polycentric action in sustainability policy-making, it is assumed that traditional policy-making is ineffective to achieve sustainability goals, as a change in society needs to be stimulated with new governance instruments (Kemp, Loorbach, & Rotmans, 2007). The field of transition management addresses this issue, while also acknowledging that in processes of co-evolution, trade-offs between the economic, ecological, and social dimension of sustainability will occur. High degrees of uncertainty and the multi-dimensionality of sustainability requires adaptive policy-making. Thus, it is claimed that there cannot be "one solution" serving as a blueprint. Co-evolution takes these "cause-effect-cause loops" (Kemp, Loorbach, & Rotmans, 2007, p. 79) into account.

In recent research on transition management, the process of co-evolution is seen as a socio-technical configuration. Hereby, innovative, bottom-up technologies may steer change among societal actors by coordination of various governance levels, which then have to reorganize

themselves (Kemp et al., 2007). Geels & Schot (2007) developed the model of Multi-Level Perspective (MLP), which assumes that system innovations are driven by the interactions of and developments in three different levels: sociotechnical landscapes, sociotechnical regimes, and niche innovations. Sociotechnical landscapes, by these means, are consistent and stable social developments, such as urbanization. These landscapes may be changed through sudden shocks.

Sociotechnical regimes are defined as social, technical, or political structures that are supposed to change (Geels & Schot, 2007). A regime constitutes of various factors, such as institutions, user practices, politics, infrastructure, or culture, which are commonly significant for the specific context and together represent a system (Holtz, Brugnach, & Pahl-Wostl, 2008). For example, in the case of sustainable mobility, this perspective entails policies about sustainable mobility, climate protection agendas, or the use of transportation modes. In order to analyze the set of structures and practices in the regime present in this case, it is therefore useful to engage in actor constellations beyond analyzing existent policies.

Sociotechnical regimes are relatively stable, but might be steered through developments in the sociotechnical landscape and niche innovations (Geels & Schot, 2007). Niche innovations are small, shielded spaces, where new sociotechnical configurations are developed by "change agents", the main actors of innovations. They happen at the micro-level and are, in comparison to the other levels, unstable. Innovations might build up momentum and eventually stimulate the sociotechnical regime to change. Through these "windows of opportunity", innovations have the chance to enter the dominant regime and lead to a sociotechnical transition in the end. On the basis of this model, the assumption is made that through pioneers and experiments, a systematic change can be made at the local level. Hereby, it is acknowledged that niches can also be influenced by external circumstances from the sociotechnical landscape or the sociotechnical regime.

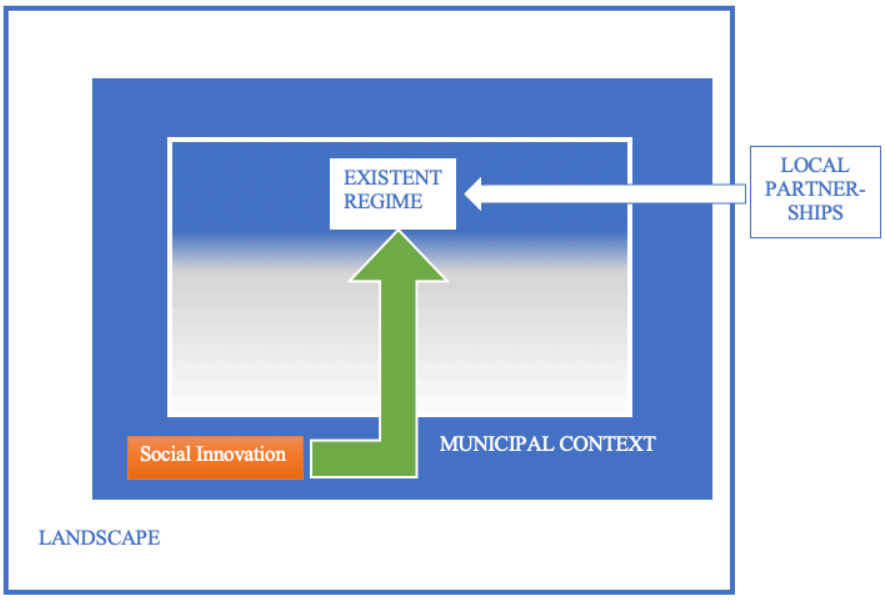
The MLP, however, can be criticized in regard to its practical applicability to social transformation processes through its static hierarchy of landscapes, regimes, and innovations (Howaldt & Schwarz, 2017). Fundamentally, it is argued by Howaldt & Schwarz (2017) that this issue leads to neglecting the force of social innovations. Social innovations are defined as a new set of social practices, which try to address recent issues by overcoming traditional practices.

Social innovations assume that external influences and facts, such as norms, are not the driver of social transformations (Howaldt & Schwarz, 2017). However, some authors argue that the embeddedness of local climate change mitigation and adaptation into the multi-level system is fully established (Frantzeskaki et al., 2018). Hereby, it is claimed that sustainability policies can only be implemented successfully when all governance levels act in a coordinative manner (Nagorny-Koring, 2018). However, the adoption of climate change policies is arranged under voluntary tasks of municipalities in Germany. Specifically, in Germany, the debate between the Ministry of the Environment and municipalities proceeds along issues of financial capacities and task redistribution in the transition of energy. Thus, though German municipalities are responsible for executing national policies at the local level, an integrated and coordinated approach to tackle climate change cannot be viewed yet in the context of the multi-level system. In connection with the argumentation of social innovations it is thus expected that the multi-level system does not simplify sustainability policy-making at the local level.

However, the practices of other municipalities, whose knowledge may be transferred to the regional context, are assumed to have an influence on sustainability transformations. In this regard, the concept of *Assemblage* can help to explain inter local transfer of knowledge: Haarstadt's (2016) model integrates a horizontal perspective, which claims that local partnerships and transnational cooperation are factors for transformations. Thus, Howaldt & Schwarz's (2017) assumptions that local social practices are the sole drivers of social transformation can only partially be expected because the multi-level system does not inflict with existent regimes, but horizontal cooperation and partnerships do.

In combining the MLP (Geels & Schot, 2007) with social innovations (Howaldt & Schwarz, 2017) assumptions, it is proposed that social innovations may cause a change at the regime level. The existent regime is made up of political, social, and technical structures in combination with inter local structures. The regime may exert influence on the landscape, while the landscape can pressure the existent regime. Social innovations can be stimulated by the existent regime or the landscape, without necessary shocks from the environment. They may then follow an implementation process. These propositions are summarized in the following model:

Figure 2: Theoretical model “MLP”, “Social innovations”, and “Horizontal perspective”



Adopted from the theoretical framework “Urban Sustainability Transformations”

The green arrow represents the process of implementation. The existent regime cannot only be stimulated by the landscape, but also by local partnerships. The landscape or the regime may exert pressure on protected spaces of innovation.

2.2.2 Factors for Implementing Urban Sustainability Transformations

It is assumed that several factors have an influence on the sustainability potential of UTLs in regard to their implementation process. The following four factors are proposed: *Conventional Governance Structures, Local “Frontrunners”, Polycentric Decision-making and Power,* and *Financial Resources*.

Conventional Governance Structures. Endangering to the implementation of sustainability policies is the persistence of conventional governance forms, especially in regard to niche innovations, which ultimately renders little potential of dispersion and success (Aderhold et al., 2015). A profound driver for the maintenance of these governance structures is hereby the deficit to integrate stakeholders, which entails the lack of a broad forum for acceptance among governance and citizens. Often, participatory processes are detached from regular local politics and administration (Aderhold et al., 2015). The persistence of traditional governance structures is further addressed by Kemp et al. (2007) by claiming that policy-making needs to be reflexive. Undynamic policies can experience a “lock-in”, while other, more adequate policy options develop subliminally.

Local "Frontrunners". A main driver of urban sustainability transformations is the engagement of so-called "frontrunners", individual personalities in politics, economics, sciences, administration, and civil society who have a sustainability vision, which they are eager to implement (Aderhold et al., 2015; Nagorny-Koring, 2018). Aderhold et al. (2015) argue that such pioneers are not only of significant potential in unfolding punctual transformation, but might also steer broader social transformation by stimulating bottom-up processes. Here, the political setting is of central importance. A change in the political landscape could also entangle a change in the adoption of policies, depending upon which party has the majority in the city's council (Nagorny-Koring, 2018). Thus, it can be argued that the long-lasting dominance of a party which profoundly supports sustainability has an influence on the city's overall transformation to sustainability (Köhler et al., 2009).

Polycentric Decision-making and Power. As implied by the acceptance argument in *Conventional Governance Structures*, local collaboration is central to the success of policy implementation, as sustainability is a goal which cannot be achieved by one actor alone (Swann, 2017). Activities based on ecological backgrounds are usually achieved by bottom-up processes, mainly led by civil society actors (Nagorny-Koring, 2018; Rohracher & Späth, 2014). Additionally, Köhler et al. (2009) argue that policy-makers have to keep in contact with grassroot movements to gain support of "unpopular" policies. This assumption aligns with the statement that "frontrunners" can only unfold their potential if they receive support from networks. Also, Kemp, Loorbach, & Rotmans (2007) argue that consistent evaluation of policy impacts might increase the degree of consent among stakeholders.

A negative aspect of collaborative management tools is the inevitable amount of different interests between stakeholders, leading to trade-offs (Swann, 2017). As a result, it is questionable to which extent the formulated policy goal aligns with the intended policy outcome. The divergence may become even more evident when looking at notions of power distribution. The "supply side", which means stakeholders who have accessibility to (financial) resources, can then push through their interests against municipalities as actors on the "demand side" (Swann, 2017). Since the financial capacity of the "demand side" is deficient, these assumptions can be made for Darmstadt. Consequently, it is argued that dissatisfied target groups hinder the implementation of environmental policies when they have access to the resources needed by formal actors (Skodvin, Gullberg, & Aakre, 2010). However, power

relationships are assumed to phase out if common visions are laid out by all stakeholders (Kemp et al., 2007).

Financial Resources. The domination of public-private partnerships and the influence of companies is often seen in a skeptical light when it comes to governance. According to the neoliberal perspective, urban development is significantly dominated by market efficiency, resource exploitation, and entrepreneurship (Raco, 2005). In this context, it is empirically confirmed that a city's fiscal health is a prerequisite for sustainable policy-making (Lubell, Feiock, & Handy, 2009). These findings about the City Fiscal Capacity model show that local governments are heavily limited on generating own incomes. Rohracher & Späth (2014) confirm the assumptions, claiming that municipalities usually do not have the financial background to bring about fundamental changes.

On the other hand, researchers argue that sustainable urban development is actually embedded into sustainable development principles, respecting "democratic empowerment, environmental conservation, and social justice" (Raco, 2005, p. 324). Although (neo-) liberal perspectives of the political system emphasize the role of businesses, the need for governments to participate in decisions about sustainability remains without doubt (Kemp et al., 2005).

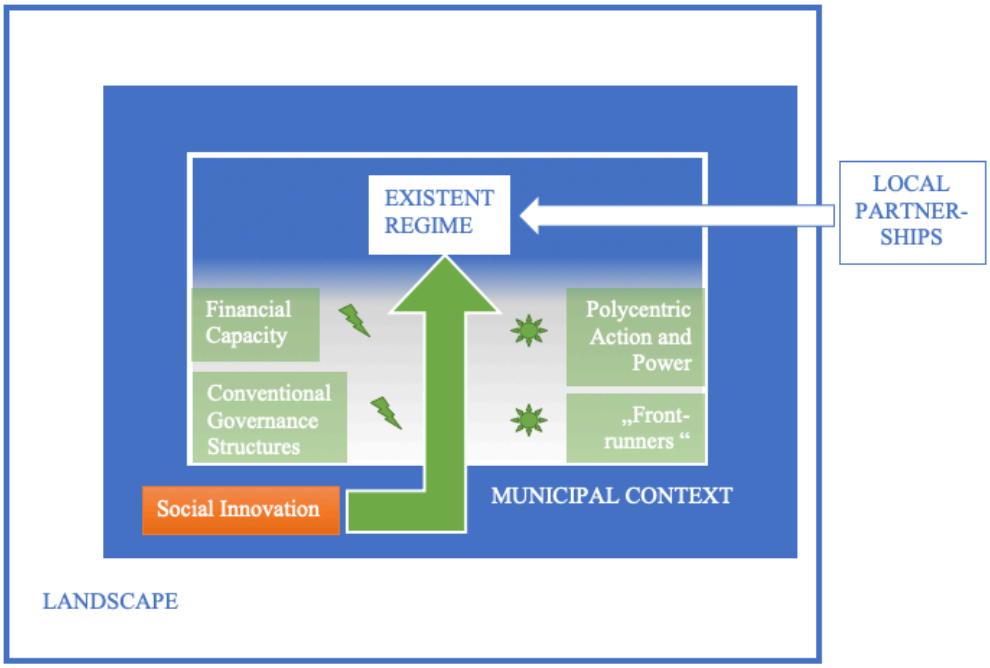
Though Lubell et. al's (2009) article examines Californian cities, the notions of fiscal health are made by several other researchers, who even claim that climate change is employed as a marketing strategy (Nagorny-Koring, 2018). Thus, sustainability and its policies are stated to be more or less a co-effect of regional supply chains and energy efficient innovations. Moreover, Nagorny-Koring (2018) finds that some municipalities try to allocate EU or national research funds by interpreting economic strategies as climate mitigation strategies. This economic dimension of climate change resembles itself in the (financial) value of energy reduction and income generated from climate-neutral initiatives. Thus, a community might try to increase its budget by adopting climate policies.

2.2.3 Integrated MLP Model with Implementation Factors

Based on the theoretical insights about the four implementation factors and the assumptions laid out in section 2.2, the following model is tested out in the frame of the first part of this research, dealing with the first part of the research questions "*Which mechanisms drove the*

implementation of municipal policies in the field of sustainable mobility in the Lincoln settlement in the city of Darmstadt":

Figure 3: Integrated MLP model for "Urban Sustainability Transformations"



Adopted from the theoretical framework laid out in figure 2 and "Factors for Implementing Urban Sustainability Transformations".

In this context, a transformation in sustainability means replacing the existent regime, which an innovative policy may do, if it can incorporate all four factors hindering or driving the implementation: On the one hand, financial capacity of municipalities and conventional governance structures hinder, on the other hand, local "frontrunners" and polycentric decision-making and power drive a sustainability transformation.

2.3 Transferability of "Best Practices"

After successfully implementing an UTL as a policy, the sustainability potential has not been unfolded directly. The following theoretical framework serves to answer the second part of the research questions "*Which implications can be made regarding the transferability potential to other municipalities within Germany?*". Aderhold et al. (2015) assume that another driving factor for sustainability transformation is the potential for a project to be replicable to other contexts. This notion is of similar character to the one of horizontal interdependencies by

Haarstadt (2016), for example by the "Deutsche Städtetag"[1]. Municipalities orientate themselves among other municipalities, which have a high reputation for sustainability, and mimic their actions (Heinelt & Lamping, 2014). Municipalities often assume that replicating "best practices" from other municipalities into their own is associated with lower costs and engagement (Nagorny-Koring, 2018). Therefore, as it is argued, mimicry can count as a governance technique.

Governing climate change at the local level, though, has to acknowledge context-specific factors which underline the framing of climate change policies. Municipalities may place different emphasis on their responsibility, the communicative argument, and the policy contents (Heinelt & Lamping, 2014). Thus, an emphasis in the mimicry of "best practices" is not put on the outcome of the specific project, but on the practicality of its processes and experiences (Nagorny-Koring, 2018). The advantage of UTLs lies within the context-bound knowledge of engaged stakeholders, which can be diffused.

The title "best practice" or "lighthouse" of sustainability is based on the assumption that communities can be understood as real laboratories, where learning processes add to an understanding of local dynamics. However, the factors for the transferability of "best practices" is empirically understudied. Most decisions, as it is argued by Nagorny-Koring (2018), are made intuitively and do not follow from a specific set of indicators evaluating the practice. Thus, the dissemination of "best practices" cannot be based on the assumption that such practices underlie equal processes and circumstances. In regard to circumstances, both social, economic, and political factors should be taken into account (Stead, 2012).

Additionally, to view "best practices" as "best" is highly contested because such projects are often associated with special promotion from government, private companies, research grants, or election campaigns (Nagorny-Koring, 2018). Therefore, the term "best practice" or "lighthouse" is not viewed as "best" in the sense of being extensively better than other projects in this thesis, but in the sense of serving as a practical guidance for other German municipalities.

[1] The "Deutsche Städtetag" is an association for German municipalities, where municipal tasks are discussed (Deutscher Städtetag, n.d.). The "Deutsche Städtetag" is the unified voice of German municipalities for self-government.

The proposed theoretical framework for “best practices” is tested on the basis of the findings of the integrated MLP model and the four implementation factors illustrated in figure 3. Recommendations for the transferability for other municipalities are then concluded. Due to the scope of this work, these recommendations cannot yet be applied to another municipality.

3 Methodology

3.1 Evaluation Research

The research on Darmstadt's sustainable mobility UTL is embedded into an evaluation study, in which the mechanisms of the city's policy-making processes are examined. The adequacy of evaluation research is based on the assumption that respective policies are created purposefully to achieve (more) sustainable mobility through UTLs. Therefore, the success of implementing an UTL is empirically examined through the application of various research methods (Flick, 2016b). As the examined solutions have already been implemented to a great extent, the evaluation is performed ex-post. The sustainability is still unfolding, however, and can only be taken into account this far. Thus, it can be claimed that this research aims at generating new knowledge in the field of urban sustainable mobility by evaluating "the effectiveness with which existing knowledge is used to inform and guide practical action" (Clarke, 2011, p. 3). After all, evaluation studies can be situated within a practical background, trying to improve existing mechanisms through applied social sciences research (Clarke, 2011b).

An evaluative research design can be summative or formative (Clarke, 2011b). Clearly, this research – as stated above – aims at improving processes by regarding their strengths and weaknesses, rather than simply examining their outcome. As a result, it can be argued whether other municipalities or Darmstadt should continue to implement its policies in the same pattern. Therefore, this process-based approach can be classified as a formative evaluation. However, in practice, elements of a summative approach may overlap because the evaluator is an independent person, which is typical for a summative evaluation.

According to Clarke (2011), the main idea behind evaluation research is to find a cause-and-effect relationship between processes or activities and outcomes. This perspective of linear relationships between independent and dependent variable is refused by Pawson & Tilley (1997), requiring "realistic evaluation". The authors claim that mechanisms stimulate causal effects, calling for "context-mechanism-outcome pattern configurations" (Pawson & Tilley, 1997, p. 77). Therefore, this research does not use the language of variables, but the language of processes underlying causal chains, which is suitable for the context-specific research interests.

The idea of configurational thinking is more extensively elaborated by Blatter & Haverland (2014) within the technique of causal-process tracing (CPT). Similar to Pawson & Tilley

(1997), the authors acknowledge the effect of multiple factors on a specific outcome, that these outcomes can be traced through different processes and, that the causal factors can be context- and combination-specific (Blatter & Haverland, 2014). Also, processes have temporal and spatial elements, which are bunded in an outcome, so called "comprehensive storylines" (Blatter & Haverland, 2014, p. 111). They form the empirical evidence for causal relationships (Blatter & Haverland, 2014). On the basis of the CPT-approach, inductive research is conducted through generating theories about the conditions under which implementation processes in Darmstadt succeed in developing sustainability potential.

A potential danger of evaluation research is the fact that the analysis derives from the interactions between various actors, which may require a mixture of different research methods (Flick, 2016b). The conduction and the examination of adequate research methods requires high competences from the researcher. Through CPT, however, adequate research methods are predefined, such as narrative interviews (Blatter & Haverland, 2014). However, interviews and other qualitative research methods are usually time-consuming approaches, requiring adequate management.

Due to the scope of this bachelor thesis, the research question is approached in a single-case-study. Hereby, the case is the sustainability potential of the mobility concept in the Lincoln settlement. As Darmstadt's policy-makers are assumed to succeed in implementing the respective policy, the processes are viewed as a "best practice". Nevertheless, it has to be noted that "best practice" processes might be highly contextual and limited in their sustainability potential beyond the implementation.

Single-case studies can possess high degrees of internal validity, but lack external validity. Through predominant use of qualitative research methods, findings cannot be generalized to other cases, which is taken into account in the conclusion. This side-effect cannot be avoided, as the examination of further possible cases would exceed the scope of this work. Through the formulation of recommendations, though, the research can serve as a model for future research and then extent its external validity.

3.2 Description of the Case and Sampling Method

As stated above, the selected case for the bachelor thesis is the sustainability potential of the mobility concept in the Lincoln settlement. This small-N population is typical for single-case

studies (Flick, 2016a). Because single-case studies lack external validity, internal validity will be promoted. Blatter & Haverland (2014) outline the significance of accessibility to data in the CPT approach. This is the main argument why Darmstadt is chosen as a setting. The selection of two cases would have exceeded the scope of the bachelor thesis, as the research design requires in-depth examination of the mechanisms and processes at site. Not all cases can be studied due to the unavailability of data and a limited time span.

Another selection criterium is the constantly increasing, but medium-sized population in Darmstadt (S. Frank & Krajewsky, 2018). Other cities in Germany, such as Frankfurt, tend to have higher populations. Even though cities with stronger rates of urbanization may be interesting to study, the complexity of such cases cannot easily be grasped by the CPT approach, as more data would have to be collected to gain a realistic image. This argument also builds on the time-consuming criterium mentioned under 3.1. Additionally, the city has to fulfill the characteristic of being "sustainable" in mobility to some extent. A location within Germany is necessary due to data accessibility and cultural barriers to interviewees, such as language. The abovementioned selection criteria are based upon sampling methods in qualitative data analysis, which state that samples need to be chosen for a purpose and on the background of theory (Miles, Huberman, & Saldaña, 2013).

Even though a cross-case analysis might enhance generalizability and strengthen the building of theory, a within-case analysis is chosen on the assumption that the time used to grasp a real-life image of two cities could exceed the available time (Miles et al., 2013). Therefore, the analysis of this case does not have the primary focus to examine whether patterns can be generalized to other cities. However, recommendations for generalizability are addressed in the analysis and conclusion.

3.3 Data Collection and Data Analysis Methods

As stated above, evaluation research can be conducted using various research methods (Flick, 2016b). Nevertheless, there are no rules determining which data collection methods are supposed to be used (Clarke, 2011a). As this research focuses on gaining information qualitatively, according to the CPT technique, the instrumentations are desk-research, based on secondary data, and semi-structured interviews, based on primary data[2] (Blatter & Haverland,

[2] Time- and research-constraints have had an influence on the selection of data collection method

2014). In order to reconstruct the policy-making processes in Darmstadt, academic and non-academic literature on Darmstadt will be collected, such as policy papers and strategic papers. The literature will be from public sources, such as the website of the city of Darmstadt, and from the archive, a semi-public source. In order to address the horizontal perspective of Haarstadt's (2016) *Assemblage* model, public sources about Darmstadt's memberships and local partnerships will be examined.

Second, semi-structured interviews will be conducted with policy-makers and personnel from the respective departments of the municipal administration, more specifically stakeholders involved in the sustainable mobility UTL, in order to find storylines about how the policy was adopted and in which contexts this was done. Even though narrative interviews require the interviewee to ask open questions, for the clarification of the policy processes, MLP in combination with the *Assemblage* model will be applied. Policy-makers will be specifically asked about Darmstadt's goals and intentions in sustainable mobility, causes of sustainable mobility problems, and the consequent policy – the mobility concept – adopted. It will be further asked what the interests in the adoption of the UTL are and whether the adopted policy led to the expected outcome. The guideline for the interviews can be viewed in the appendices (Appendix D).

The qualitative data from desk-research and from the transcribed interviews will be processed through a descriptive coding scheme to provide relevant passages for each facet of the conceptualizations (Miles et al., 2013). Jottings may be added where needed. Non-narrative elements of the interviews will be eliminated for clarity reasons (Flick, 2016c). In a second coding cycle, pattern coding will be used to classify frequent words and phrases. The pattern coding will be categorized according to the conceptualizations of the integrated MLP model, the four implementation factors, sustainable mobility, and the "best practice" potential. Coding will be assisted through the Computer Assisted Qualitative Data Analysis Software (CAQDAS), atlas.ti. Since the aim of a within-case analysis and realistic evaluation is to get a fundamental sense of reality, the collected information will be displayed visually. For this reason, networks, which are arranged according to the operationalizations, will be created.

Finally, an event-state network will be designed, which arranges events chronologically and links them with conditions (Miles et al., 2013). Events are represented as boxes, whereas conditions are represented as bubbles. Through this method, actions (events) and conflicts or

rationales (conditions) contribute to explaining which mechanisms led to the implementation (outcome). Based on the event-state network, particulars will be clustered and finally subsumed into the general in order to develop a general construct (Miles et al., 2013). Here, the question is if broader constructs can put the facts and processes together. Moreover, it remains questionable whether the respective theory fulfills applicability to other cases. In order to address generalizability, the extent of transferability could be investigated in other cases, but this will remain in the interest of future research due to the scope of this thesis.

3.4 Operationalization

In order to operationalize the theoretical concepts, the sustainability potential of an UTL will be examined in regard to 1) the MLP model (with the extension of social innovation and local partnerships), 2) the four implementation factors (*persistence of conventional governance structures, local "frontrunners", polycentric decision-making and power*, and *financial resources*), 3) its sustainability, and 4) its "best practice" potential for other municipal contexts.

Integrated MLP Model. The MLP is addressed through three dimensions, the landscape, the regime, and the social innovation. Hereby *landscape* is operationalized by "urbanization" and "climate change". *Regime* is operationalized by "political practices and structures", "social practices and structures", and "technical practices and structures". "*Local partnerships*" accounts for the horizontal perspective of the regime. *Social innovation* is operationalized by "innovative concept", "change agents", and "windows of opportunity".

Local factors for the Implementation of Sustainability Transformations. The four identified factors driving or hampering the implementation of sustainability policies and thus transformations are *old governance structures, local "frontrunners", polycentric action and power,* and *financial resources*. Hereby, *old governance structures* are operationalized by "non-reflexive governance" and "formal institutions as a driving force". *Local "frontrunners"* are operationalized by "individual pioneers" and "political landscape". *Polycentric decision-making and power* is operationalized by "actor constellations", "bottom-up processes", "regular evaluation mechanisms", "actors on supply side", "actors on demand side", and "policy divergence". *Financial resources* are operationalized by "municipality's financial resources", "marketing of sustainable mobility concept", "public-private partnerships", and "allocation from research funds".

Sustainability. Due to the assumption that sustainability policies focus more on the environment and the society than on economy, it will only be examined whether an evaluation of environmental and social outcomes is integrated into the policy. The social dimension is already addressed in the World Business Council for Sustainable Development's (2004) definition. Thus, *social sustainability* is operationalized by "freedom of movement", "accessibility", and "relationships and communication". "Trade" is left out as it is not applicable to the case in this study. *Ecological sustainability* is operationalized by "ecological sustainability".

"Best Practice" Potential. Because empirical knowledge about factors enhancing the transferability of UTLs is lacking, it can only be looked at recommendations for the "best practice" potential based on the analysis of the abovementioned three conceptualizations and their respective operationalizations.

4 Background Information about the Case

In order to answer the first sub question of this research "How does Darmstadt articulate sustainable mobility?", some background information about the case will be provided in regard to its administrative structures and articulations, as well as its local council's voting results.

4.1 Structure of the Municipal Administration in Darmstadt

In Germany, municipalities are embedded into a multi-level system, consisting of three layers: national, federal, and municipal (Bogumil & Holtkamp, 2006). From a constitutional perspective, municipalities are on the same level as federal states (Bogumil & Holtkamp, 2006). They have the obligation to self-govern the respective area in terms of creating policies and adhering to national and federal laws. As federal states may decide on their own laws, such as environmental conservation efforts, municipalities in Germany vary to a great extent in terms of sustainability policies. Besides the abovementioned functional responsibilities, municipalities carry significant societal relevance carrying democratic values. Through geographical proximity, citizens are directly involved in policy-making processes and, thus, have the potential to shape policies and administration in a qualitative way. Moreover, municipalities implement up to 90% of national policies. Even though the significance in these three functionalities is without doubt, issues are predominant in regard to the financial, political and administrative equipment. In particular, the budget at the municipal policy level has long been under criticism. In order to fulfill its obligations and voluntary tasks, the municipality needs to allocate financial means in the form of taxes or administrative fees, which are often not entirely sufficient for covering the expenses.

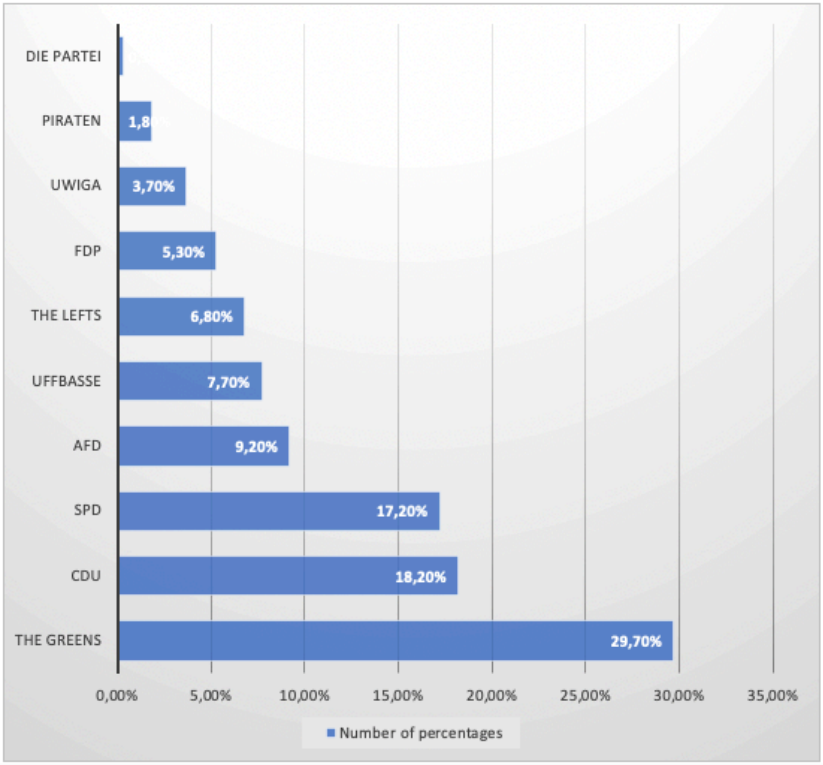
In Darmstadt, the "Hessische Gemeindeordnung" (HGO) regulates the powers, responsibilities, and rights of communities and their respective internal political system's organization (Land Hessen, 2005). In the federal state of "Hessen", municipalities are organized according to the "Unechte Magistratsverfassung". Citizens of the respective municipality vote for the local council[3] in five-year terms and for the mayor. The local council has strong resemblance to a parliament, but actually carries executive functions, as the city itself cannot adopt laws. However, the local council is the main organ of the administration and carries out decisions (E. Frank, Hildebrandt, Pardon, & Vandamme, 2017). It also elects department heads and staffs several committees (Land Hessen, 2005). Routinely obligations are executed by the parish

[3] The local council may also be called city council assembly.

council, which is also elected by the local council. The chairman of the parish council is the mayor of the city. He is obliged to lead and control the municipality's administration (the parish council) and externally represent the municipality as a whole.

The local council in Darmstadt is ruled by a majority coalition of "Bündnis 90/ Die Grünen" (the Greens) and the Christian Democratic Union (CDU) (Wissenschaftsstadt Darmstadt, 2016). The voting results are shown in the diagram below:

Figure 4: Voting results of the local council election in 2016



Adopted from Wissenschaftsstadt Darmstadt (2016)[4].

The political background in Darmstadt may be of central importance for policy-making, as sustainability transformations develop through 20 to 30 years-lasting policies, as Köhler et al. (2009) find. This assumption means that a temporarily steady governance of the Greens can enhance sustainability, as the party is dedicated to environmental sustainability.

[4] Abbreviations for parties used in the diagram: Social Democratic Party (SPD), Alternative for Germany (AfD), Independent Fraction of Free Citizens Upright Spontaneous Subcultural Headstrong (UFFBASSE), die Linken (the Lefts), Free Democratic Party (FDP), Independent Voter Community Arisen of the IG Seawage (UWIGA), the pirates (Piraten), the party (Die Partei).

4.2 Addressing Sustainable Mobility by Darmstadt's Administration

As already introduced above, climate change and sustainability are categorized as voluntary municipal self-government responsibilities, where Darmstadt can chose whether and how it wants to implement respective policies (Fliedner, 2017). Darmstadt has been trying to pursue climate protection management as a strategy (Sinning, Steil, & Kreft, 2011). Since the city's mayor and the parish council cannot execute all administrative tasks, several specialized departments are created as working groups to support sustainability objectives (E. Frank et al., 2017). Departments have commissionaires, who are part of the parish council (Wissenschaftsstadt Darmstadt b, n.d.). The departments relevant for this thesis are department V, which is officially responsible for environment tasks, and Department III, which carries out building control.

The department of the environment has guided the creation of an indicatory document for the city, the climate protection concept, which encompasses advice on renewable energy, energy efficiency, and mobility (Wissenschaftsstadt Darmstadt d, n.d.). Additionally, the department has staffed a climate protection manager, who is responsible for the implementation of projects and measures (Wissenschaftsstadt Darmstadt e, n.d.).

Other formal, but non-public institutions, which are responsible for climate change policies encompass the advisory board for the climate protection concept (ABCPC) of the city (Wissenschaftsstadt Darmstadt c, n.d.). It decides on climate goals and their implementation. So far, the ABCPC together with the department of the environment has adopted the climate goal to be carbon neutral until 2050, after progressively lowering the carbon dioxide emissions to 10-15% until 2030 (Klimaschutzbeirat, 2013). Hereby, it is spoken of carbon neutral in the sense that use of a fuel or other human activity does not have an impact on the GHG emissions of the atmosphere. Moreover, an Agenda-21 group has been formed around the topic of climate protection and develops new projects (Wissenschaftsstadt Darmstadt a, n.d.).

5 Description of the Mobility Concept's Configurations

The mobility concept in the Lincoln settlement is embedded into other policy documents created by the municipality of Darmstadt. Its administration is in the process of creating the "Masterplan DA2030+" (Wissenschaftsstadt Darmstadt f, n.d.). This strategic document discusses the city's future and gives specific guidelines. It is accompanied by a mobility strategy "Mobilitätskonzept DA2030+", which will replace the current mobility concept "Verkehrsentwicklungsplan" from 2006. Both strategies aim at creating a sustainable city, whereas in the mobility strategy, focus will be put on modern and sustainable mobility development. The current "Verkehrsentwicklungsplan" addresses possible instruments to encounter the amount of traffic in Darmstadt, but is not up-to-date with current developments (StetePlanung & Habermehl+Follmann Ingenieurgesellschaft mbH, 2006). It is assumed that the city needs more integrity to minimize the disadvantages of high amounts of MIT. The minimization of negative effects caused by MIT is supposed to be addressed by Lincoln's mobility concept.

In this section, a description of implementation process of the case of the sustainability potential of the mobility concept in the Lincoln settlement is given, which is guided by the theoretical integrated MLP model, as laid out in figure 3 of section 2.2.3. With the help of this model, it is expected that new insights into the processes and mechanisms are generated from coded policy documents, newspaper articles, statistics, and interview transcripts. In the end, a full-fledged event-state network according to section 3.3 will be created.

5.1 The Landscape

According to Geels & Schot (2007), the landscape level of a sociotechnical transition consists of social developments and can affect the existent sustainable mobility regime. Darmstadt's sustainable mobility regime is characterized by two main developments at the landscape level: urbanization and climate change/ fine dust pollution (see network 1 in the appendices). The growth of inhabitants is due to Darmstadt's attractive educational and working environment. Urbanization leads to an increasing demand for housing and an increased amount of MIT, which both have to be organized around the availability of space. Parallelly, the level of fine dust pollution and carbon dioxide (CO2) emissions is steadily. For the municipality, these issues are not manageable by redirecting existing MIT to other streets with less traffic density. Thus, urbanization indirectly affects the amount of chemical bonds in the air, having an impact on climate change.

5.2 The Regime

Besides these pressures from the landscape, the existent local sustainable mobility regime is characterized by common political, social, and technical practices and structures, which have been hindering a sociotechnical transformation (see networks 2, 3, and 4 in the appendices).

The Political Regime. The political dimension of the municipal sustainability regime is influenced by (inter-) national policies (see network 2 in the appendices). A main trigger for the adoption of climate goals was the Paris Agreement, which aims at lowering the Earth's temperature, but does not provide specific instruments for national states and thus municipalities to implement the agreement. The German government acknowledges the inevitability to govern climate change as a central task for the future and has thus introduced climate goals, such as a 40%-reduction of GHG emissions until 2020 by focusing on renewable energy. The German Ministry of the Environment assumes that traffic can only account for 3% of the reduction of GHG emissions, but experts claim that the potential amounts up to 40%. The multiple interests in managing traffic are a reason for this significant difference in percentages. Unlike assessments about the available instruments to transform the current traffic system in Germany show different potentials of its contribution to climate change mitigation.

To reach its climate goals, a transformation in German traffic is inevitable and has not been achieved yet. Instead, the German state promotes the use of individual cars by indirectly subsidizing citizens with tax advantages. German politics contribute their part to the debate, as the increase in traffic and thus the reduction of cars moving or inactive on the streets is only discussed marginally.

These national political structures and practices are reflected on the municipal level by a missing regional traffic concept, a thinning public transportation network and expensive tariffs, as well as an under-elaborated infrastructural system. However, Darmstadt has adopted the climate goal to be carbon-neutral until 2050 within its climate protection. Hereby, the city supports the aim of the German government to reduce 40% of its GHG emissions until 2020. Also, the "Masterplan DA2030+" serves as a theoretical foundation to reduce traffic and shift the modal split to an increased usage of public transportation modes. According to the "Masterplan DA2030+", traffic management instruments and infrastructure are central to a reduction of MIT, which eventually promotes the use of public transportation modes and alternative mobility offers, such as sharing communities. The extension of the public

transportation network is backed up by the argument that the maximum load of public thoroughfare has been reached within the city of Darmstadt. Besides stimulating the society to use alternative modes, the respective concept aims at changing structures of the municipal administration.

The implementation of these goals is generally criticized by the financial deficits of municipal administrations. For example, if municipal works, meaning public utility companies, introduced electric busses, which are priced at a higher rate than busses with internal combustion engines, then the municipality automatically would create more financial deficits. Instead, municipalities try to decrease their debts, which renders the introduction of electrically powered vehicles contested.

However, public transportation operators are supposed to pursue sustainability objectives laid out in the economic strategy of the municipality Darmstadt, connecting economic welfare with public welfare. Within this strategy, municipal works are obliged to provide services for the citizens of the city without compromising Darmstadt's environmental climate protection goals. Thus, the companies are supposed to assist in achieving a reduction in CO2, GHG, nitrogen dioxide (NO2), and sulfur dioxide (SO2) emissions, as well as noise, and land consumption.

This gap between theory and reality becomes evident as Darmstadt still has to manage its traffic more adequately. The clean air plan of the federal state of "Hessen" requires less GHG and fine dust emissions through providing limitations of respective climate- and health-damaging chemical bonds, but does not explicitly provide instruments to address the issue. As Darmstadt has repetitively exceeded the limits, it had to create a low-emission zone in 2006, which automatically bans the most hazardous vehicles from entering the city. In close linkage to the clean air plan is a noise protection plan, also issued by the federal state of "Hessen".

The Social Regime. Common social structures and practices (see network 3 in the appendices) reflect the political situation on sustainable mobility. In Germany, nearly 18% of GHG emissions are from traffic. The amount of emissions is steadily increasing in comparison to 1990, while decreasing in all other sectors. Even though the emissions per vehicle decrease, the distances people drive extend. Also, personal traffic has increased about 25% in the last twenty years. The regular use of MIT for longer distances and the general increase of MIT traffic by German citizens provides demand on the car market, whereas the tenure of vehicles with

internal combustion engines has been increasing from 2017 onwards. Specifically, the possession of petrol vehicles has risen, whereas diesel vehicles received some concession in 2019. These numbers reflect on the non-willingness of society to renounce MIT, specifically high-emission internal combustion engine vehicles. The modal split of German citizens, especially the driven kilometers with MIT (54.8%) in contrast to the times people have used a car to span a distance (42.8%) in 2008, support the thesis that people tend to drive longer distances by car. The national share in the ecological compound (public transportation, foot traffic, and bicycle traffic) amounts to 42.2%. The assumptions that the car loses its significance as a status symbol and that carsharing is becoming more common cannot be supported with these findings.

In comparison to the national average of MIT, Darmstadt's share in the ecological compound (63%) outweighs the share in MIT concerning the frequency a specific transport mode has been used in 2018. Cars only account for 37% of the frequency, which can be explained through the high number of students, who normally do not possess a car. These percentages are typical for other student-characterized cities, such as Münster and Freiburg im Breisgau. Additionally, Darmstadt is described by a dense physical infrastructure. Errands can regularly be run in the near distances, especially in the pedestrian zone in the center of the city. Even though Darmstadt's density and its good topographical conditions explain these high percentages of bicycle (17%) and foot traffic (28%), it is questionable why the percentage is still not as high as in other student cities.

The exceedance of NO2 emission limitations in Darmstadt do not reflect the relatively low car use by the city's residents. However, the number of commuters contributes to traffic density. This is based on the reason that the city offers an attractive economic environment, providing employment and trainee positions. Additionally, the local public transport system lacks infrastructure and frequency, which is why many people chose the car to overcome distances in the regional area. For very short distances within the city, the public transportation system is used more frequently. Also, Darmstadt is geographically based in the metropolitan area "Rhein-Main", which accounts for high amounts of transit traffic.

Moreover, the steady growth of inhabitants creates a tense housing market in Darmstadt, which offers possibilities, as well as challenges to sustainable mobility. On the one hand, the city is physically restricted to the existent area, as development potentials are limited in the regional

area. Additionally, the increase of moving MIT leads to an increase in demand for inactive areas, which again limits the amount of available space for housing. The decrease of the average household size in Darmstadt contributes to the issue, which is accounted for by the economic development of the region. The city has not experienced major structural breakages in the last twenty years – it has even made its location more attractive for scientific institutions – and the average income of the individual has increased. Thus, more residents are able to afford housing.

The Technical Regime. The common technical practices and structures are characterized by two main trends, which follow the pathways of the social and political regime: Germany as a highly motorized country and the increasing demand on respective technologies (see network 4 in the appendices). It is not uncommon that Germany is directly associated with its car industry. In 2016, 98% of new registrations were made for vehicles with internal combustion engines. Technical advancements argue that the CO2 emissions of these vehicles have significantly decreased, which is why the car industry continues to invest in the production of diesel and petrol cars. Also, the industry does not progressively focus on the technical development of hydrogen combustion engine vehicles and electric vehicles. The inability of these recent technologies to contribute to the national achievement of climate goals leads Germany's car industry in a possible stymie. If politics demanded that no new registrations for internal combustion engine vehicles should be allowed anymore, the car industry would be forced to provide possible MIT alternatives and new mobility concepts.

The Horizontal Perspective. The existent regime is influenced by other municipalities, with which Darmstadt has local partnerships (see network 5 in the appendices). Even though the city obliges itself to reduce CO2 emissions in associations, such as the climate confederation, whose aim is to halve CO2 emissions per resident until 2030, these climate associations do not place emphasis on the topic of sustainable mobility. However, Darmstadt takes part in the Agenda-21 process at the local level and has created a task force for mobility and traffic. Within this process, municipalities aim at increasing sustainability based upon the declaration of the UN "Agenda 21". Hereby, municipalities keep in contact about sustainability approaches.

From the analysis of the political, social, and technical dimensions laid out above, it is evident that Darmstadt as a city is punctually active in creating a sustainable mobility future, specifically through climate protection strategies imposed upon itself and voluntary work. Nevertheless, the car remains a significant mode of transport for German citizens and a symbol

for Germany's progressive economy and car industry, which is difficult to circumvent for several reasons.

1) Multiple interests in and assessments about the contribution of MIT to achieve climate goals
2) Regressive investment and development of sustainable mobility alternatives by the German car industry
3) Unpopularity of the political debate about a transformation in traffic
4) Missing policies with hard measures and political direction from the national government
5) Missing regional mobility concepts and insufficient development of public transportation networks
6) Lacking sustainable public mobility modes due to financial deficits of the municipality
7) Socio-geographic location of Darmstadt with high number of commuters and freight traffic
8) Growth of residents with more MITs, but less available space for streets, parking spaces, and housing

5.3 The Social Innovation

As the existent sustainable mobility regime fundamentally lacks achieving sustainability, an innovations had the potential to replace the existent regime and steer fundamental change among society (Geels & Schot, 2007). The sustainable mobility concept in the Lincoln settlement was specifically adopted to reduce the number of MIT in the area. The "change agents" responsible for the adoption and implementation of the concept were political actors (see network 6 in the appendices). The local council decided for the conversion in 2014, the main responsibility of the implementation of the sustainable mobility concept lied in the hands of the parish council. The executers were the "Bauverein AG" (Bauverein), a building society of the municipal works in Darmstadt, and the urban planning department. The Bauverein had specifically created and transferred the project development to its 100% subsidiary company "BVD New Living GmbH & Co. KG" (BVD New Living).

The concept of the Lincoln settlement integrates the conversion of a former United States American military area, which was abandoned in 2008, with a mobility concept. The concept could be adopted with the help of two main "windows of opportunity" (see network 8 in the appendices). First, the increased popularity of the climate change discourse with the inevitable

need for a transformation in traffic has been stimulated by the diesel affair and movements such as “Fridays for Future”. Parallelly, a non-governmental association, the German “Umwelthilfe”, which engages in the protection of national resources, filed a lawsuit against Darmstadt for exceeding the limits of NO2 emissions of the clean air plan by the federal state of “Hessen”. As the thoroughfare is already non-expandable, but the number of residents keeps increasing and the housing market becomes tenser, the city had to reflect on its traffic management. As a first step, it introduced a low-emission zone in the whole city district in 2016.

Second, the European Commission adopted a decision about Art. 106 II Treaty on the Functioning of the European Union in 2011, which regulates state benefits for companies that provide services with universal economic interests. Hereby, it was decided that state benefits are legitimate if the buying party guarantees that it will provide services of economic public welfare and that these services cannot be offered under the conditions of the current market. This decision allowed the municipality of Darmstadt to purchase the former military area from the state for a reduced price. At the same time, the decision by the German parliament concerning first accesses to properties indispensable by the German state, such as former military areas, played into Darmstadt’s hands. The decision allows privileged direct sale of state-owned properties to parties qualified for first accesses, namely regional administrative bodies. However, in linkage with Art. 106 II Treaty on the Functioning of the European Union, the purchasing party needs to bindingly declare to build housing for socially disadvantaged people within six months after the offer. The Federal Agency Office for Property Tasks (BImA) could thus sell the property of 24 hectare with a price-reduction of 25,000€ per new social housing unit.

Through these two “windows of opportunity”, the innovative concept could gain momentum and become part of the existent sustainable mobility regime. The primary focus of the mobility concept was to shift the percentages in the modal split by offering mobility alternatives to MIT, hereby promoting independence from individual vehicles (see network 7 in the appendices). By purchasing the area, the city of Darmstadt had the opportunity to build a car-reduced settlement for about 5,000 residents in about three kilometers distance to the city center. The development plan was first initiated in 2005 for the whole region, where the settlement is placed – “Rahmenplan Bessungen Süd”. The actual development of the conversion area started in 2005, and after the purchase contract with the BImA was signed in 2014, the local council could decid

on the adoption of the concept. First students were able to move into the housing for socially disadvantaged people in the same year. In 2016, the mobility concept's development plan was finalized and took effect. The main argument for linking the conversion of housing to a mobility concept was that most distances people span are based on the mobility supply at their homes. Because of these supplies, people decide which transportation modes they use for which distances. Therefore, it is inevitable to link housing with mobility.

The whole development plan of the settlement is legally manifested in three documents: the urban planning contract (2015), the confinement declaration (2016), and the agreement of implementation (2017). The urban planning contract partly deals with the mobility concept in §6, whereas the agreement of implementation is of central significance for the implementation of the concept. The agreement has been signed according to public law, §§54 ff. HVwVfG (legitimacy of a contract governed under public law), where a municipal administrative body entrusts another party with an administrative act.

The central element of the concept is a reduced car spaces distribution key, where only 0.65 car spaces per housing unit exist. The 0.65 distribution key refers to collective garages at the entry of the settlement, whereas in the nearest distance to the housing units, a distribution key of 0.15 is set. These spots are primarily available to mobility disabled people and residents using (electric-)car-sharing offers. Additional 100 car spaces for visitors are distributed in the public streets. Parking in public spaces is obliged with fees. The public parking spaces are controlled, which is supposed to stop residents and visitors from parking on the streets.

Alternatively, the settlement's concept offers ecologically sustainable transportation modes. The predominant focus is put on bicycle and foot traffic, which received the densest infrastructural network. The bicycle roads to the city center will were improved. Additionally, 2.4 bicycle spaces per housing are available in theft- and weather-protected sidings. If the residents wish to use an public alternative transportation mode, a tram line directly connects the settlement at two points to the city center, the central station, and other neighborhoods. The reachability is extended through frequent timing. Foot and bicycle traffic are directly connected to the two tram stations. In the future, the public transportation system is supposed to be expanded with an electric, autonomously driving bus, which connects the residents to the social infrastructure of the settlement and the near area on-demand.

Next to MIT, bicycle traffic, as well as foot traffic and public transportation, the mobility concept offers other multimodal, sharing possibilities. “Book-and-drive” is the local car-sharing-provider, which offers twelve cars. “Mein Lincoln mobil” is the provider of the ecologically powered electric-car-pooling system and provides one Renault electric vehicle per housing block. Booking “Mein Lincoln Mobil” is free for Lincoln’s residents in a four-hour time-span per week. The use of electric cars is specifically promoted in the concept, as 5% of the collective garages need to provide charging points. After one hour of charging, the vehicles can drive up to 130 kilometers. Residents can book the offer via an application. Besides, the mobility concept provides bike-sharing and cargo bicycles. The “call-a-bike” stations are set up at the mobility center, which will be referred to later, and the student apartments. “Heinerbike” is the sharing system for the cargo bicycles. Through these multimodal mobility offer, the concept of small distances, and the comprehensive social infrastructure of the settlement, residents are supposed to be stimulated to live independently from their individual motorized vehicle.

The decoupling of living and parking spaces is supposed to attract the car-averse society, who is further stimulated by the initial setup of a mobility management, which has been in operation since 2016. The mobility management is placed in an interim mobility center. Here, the city of Darmstadt has arranged its local public transportation provider, “HEAG mobilo GmbH” (HEAG mobilo) to operate the center in cooperation with civil servants from the city. The main task of the mobility management is to stimulate residents for alternative transport modes by communication and thus, achieving the aim of a low-car-traffic settlement without compromising convenience. The management provides information about mobility options, advice on mobility behavior in regard to costs and time through an analysis “MobiCheck”, as well as “Welcome Sets” to simplify the access to the mobility concept. In a next step, residents can book every mobility offer of the concept directly through the mobility management. Furthermore, medial public relations fall under the obligations of the management. Other than the (in-)direct communication with residents, HEAG mobilo forms an advisory panel, together with representatives from the city and landlords from the Lincoln area, where they decide on the distribution of car spaces and the work of the operator HEAG mobilo. Transparent, universal criteria are used for the distribution of car spaces.

5.4 Factors for the Implementation of the Mobility Concept

The sustainability potential of the mobility concept was further affected by four factors, as identified in section 2.2.2. Aderhold et al. (2015) and Kemp et al. (2007) claimed that the persistence of conventional governance structures, which are driven by formal institutions and irreflexive instruments, are a central obstacle for sustainability policies. Another hindering effect can be caused by the deficient financial capacity of municipalities, as argued by Lubell et al. (2009) and Raco (2005), which can be overcome by public-private partnerships.

Persistence of Conventional Governance Structures. Following from network 10 (see the appendices network 10), the municipal administration was the most active part in implementing the decision to convert the Lincoln area with a mobility concept. As mentioned under 5.3, the local council adopted the respective decision in 2014, transferring the future political responsibility to the parish council. The city mainly cooperated with its municipal works. This shows that formal institutions were the main drivers of the implementation process.

However, the mayor of the city claimed that the concept had been created with new governance tools. A clear analysis of the respective area through the assessment of existent traffic and utilization of the main roads gained new insights about traffic management. Though the concept was developed on the basis of this assessment, it is questionable what is specifically reflexive about an a priori assessment as a governance tool. Additionally, as the implementation of such policies is bound to the public procurement law, the measures taken are still relatively static, being written down in a contract, which is only supposed to be dissolved when one of the parties – the city of Darmstadt or BVD New Living – cannot fulfill its obligations anymore. What remains as a flexible instrument in one of the contracts, however, is the regular, five-year interval evaluation. Thus, although obliging to the usual procedures of urban development, the concept overcame conventional governance structures in one aspect.

Financial Resources. It is found that the municipality of Darmstadt allocated financial resources in four distinct ways: marketing of the mobility concept, allocation from research funds, national and federal subsidies, and public-private partnerships. The promotion of the mobility concept as a sustainability strategy indirectly allocated financial resources, whereas prices and scientific research attracted attention. For example, in 2018, the integrated mobility and housing concept received the German traffic planning price, which specifically encourages urban planning, but without prize money. However, with increased attention, the settlement was

represented as a prototype for car-reduced housing with a focus on mobility management, car-spaces organization, and (electric-)car-sharing. With this advantage, the city was able to participate in the scientific research program “central initiatives future city” of the German Ministry for Research and Education.

Moreover, the municipality was able to generate financial assets through participating in Germany’s national development plan. For example, it participated in the national project “climate protection in bicycle traffic” with its comprehensive infrastructure of bicycle traffic in the settlement and won the advancement award with a prize money of 800,000€. Additionally, it applied for “short distances for climate protection” by the Federal Ministry of the Environment with “heinerbike”, where cargo bicycles can be hired for free. This engagement with research funds shows that the political stakeholders and the BVD New Living were eager to allocate financial resources by these means.

As already assumed above in *Polycentric Decision-making and Power*, the city’s economy provided significant opportunities for the municipal administration to realize its policy. Through the awarding of contracts under the public procurement law, Darmstadt’s administration was able to be economical. Especially, the awarding of contracts to the Bauverein with the Lincoln settlement vested the administration with increased financial possibilities. The Bauverein carried the costs of the former military area’s purchase. After all, the implementation of the mobility concept depended on the cooperation between administration and municipal works, which are not directly public-private partnerships, but privately ruled companies under the possession of the municipality and thus obliged to stay competitive on the free market.

The role of BVD New Living becomes more evident when looking at the urban planning contract. Under §6, it is regulated that the building society shares the start-up financing with the amount of 400,000€ with the municipality. However, as the municipality was not able to carry the whole costs of the conversion, the company has obliged itself to invest 15.4 million € in the planning process, which was supposed to cover building the settlement park and several green belts. The start-up financing covers the operation of the mobility management, whereas the federal state of “Hessen” financially assists by providing the salaries for two employees. HEAG mobilo further receives part of the revenues from car spaces rent. However, the

municipal administration needed to invest in the expansion of the infrastructure (15-20 million €).

Public-private partnerships play an inferior role in the implementation process. Only the bidding processes of newly constructed areas generated money, which was used for other planning contracts. Landlords obliged themselves to carry the whole costs for building and maintenance under the regulations of the planning contract and the agreement of implementation.

Moreover, in section 2.2.2, Aderhold et al. (2015) and Nagorny-Koring (2018) detected local "frontrunners" to be a driving effect for policy implementation, supported by the political landscape surrounding them. Also, polycentric decision-making and power can enhance an implementation process (Swann, 2017); regular evaluations can increase consent among stakeholders (Kemp et al., 2007). Hereby, the integration of grassroot movements and citizens remains central for the acceptance of the policy (Köhler et al., 2009).

Local "Frontrunners". Clearly, the argument that the city's administration acted as a driving force means that the governing politicians were also the "frontrunners" in this case. The political landscape reflects this assumption because the local council is led by a majority coalition between the Greens and the CDU. As the Greens received the highest number of votes in Darmstadt in 2016, and the commissioner of the urban planning department is a member of the Greens, the approach of a sustainable mobility concept is no surprise.

The Greens could even push through their interests in the decision about the adoption of the concept in 2014. Back then, the coalition partner, the CDU, and the Free Democratic Party (FDP) supported the implementation of the mobility concept. Resistance was experienced from the oppositional parties. Especially, the Social Democratic Party (SPD) and the Left Party (the Lefts) opposed the reduction of car spaces in the settlement and the concentration of public transportation modes. Hereby, the SPD proposed to incline the car spaces from 0.65 car spaces per housing unit to one, which was rejected by the majority government. Generally, it doubted the success of the project and claimed that it would experience long-term stagnation. The majority government backfired on these propositions as well and stated that the SPD should not disrupt a concept into its components.

The individual pioneer in this case is the mayor of the city, who is also a member of the Greens. The mayor did not only stay in close contact with the chairman of the Bauverein, but also consistently promoted the mobility concept. Claiming that the Lincoln settlement will be the most modern district in Darmstadt, he tried to stimulate residents to use bicycles and electric vehicles. Clearly, the Greens and their individual pioneer played the central role in the implementation process.

Polycentric Decision-making and Power. From these observations, it can be claimed that polycentric decision-making and power were not drivers of the implementation. Even though the actor constellation of the sustainable mobility concept was four-fold with the BImA, the municipal administration, the municipal works, and a citizen participation process, the power was attributed one-sidedly.

Especially, the cooperation between the city's administration and the municipal works was strong, though it required integrative solutions. The public utility companies need to stay competitive on the market, while assisting the municipality in pursuing its interests. Nevertheless, these companies have committed themselves to carry out the economic strategy of the city. The strong municipal economy in Darmstadt explains why the power of actors on the supply side, in this case the Bauverein and HEAG mobilo, is relatively low. These companies pursue an economic strategy, but the strategy is placed within the interests of the municipality. Therefore, a relation between political goals, ideals, and entrepreneurial reality exists, which was also manifested through arrangements between the city of Darmstadt and the project developer, BVD New Living.

Because the administration could further entrust third parties with the obligations of the urban planning contract and the agreement of implementation, it was able to pursue its interests in implementing the mobility concept. For example, by signing the urban planning contract, the Bauverein obliged itself to carry high amounts of financial costs. The physical execution of the determined plan also lied in the hands of BVD New Living, whose parent company Bauverein had purchased the area from the BImA for 45 million €. The Bauverein maintained the existing buildings on the area, whereas newly constructed areas were sold to third parties in a bidding process.

The high procedural quality was further enforced by the political responsibility for the development and implementation carried by the parish council. The council assigned several departments with tasks. Executing organs were the urban planning, the civil engineering and the road traffic department, which are components of department III. The department of the environment in department V assisted department III in executing the policy, but had an inferior role by providing responses to the ecological sustainability of urban building plans.

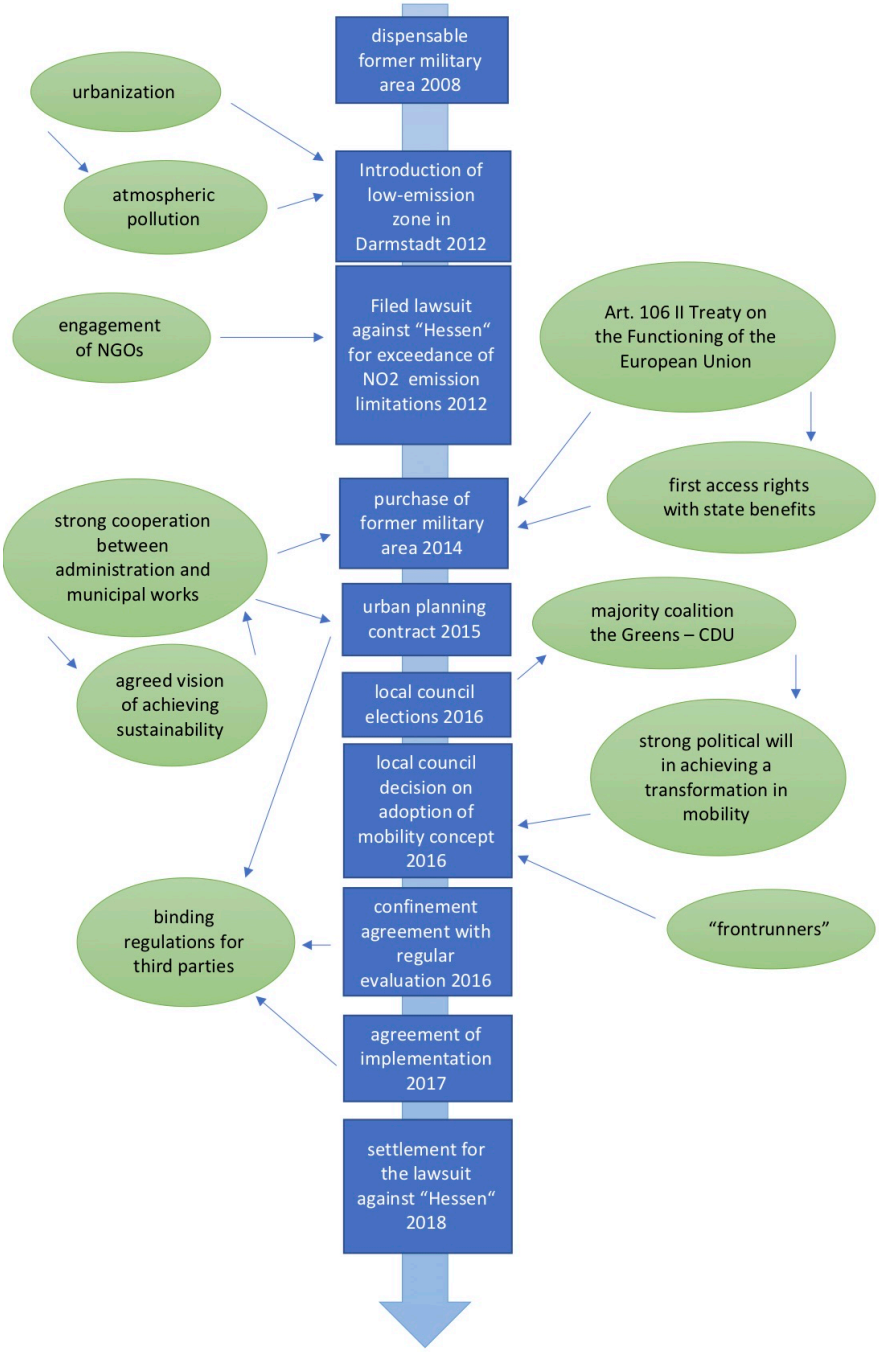
The role of citizens, however, seems to have been inferior in the implementation process. Citizens predominantly participated through information events of the administration, which was not only declared intention of the politicians, but also a statutory part in urban land-use planning. The mayor, additionally, promoted the participation process from the bottom. Officially, the bottom-up participation started in 2010 with the "Rahmenplan Bessungen Süd", where significant interest in the conversion of the area was shown. Since then, the city has held an open-door day, several informational meetings and two workshops, where citizens were invited to actively and substantively contribute their ideas about sustainable mobility. However, the suggestions were often seen as too idealistic, for example because citizens are unhappy with the reduced car spaces and suggest increasing its distribution key. Obviously, these suggestions found little appeal to the responsible politicians, since the distribution key has not been changed yet. The acceptance of residents is crucial to the success of the concept; therefore, it remains critical that citizens have just partially been integrated in the implementation and not initially in the development of the concept.

The municipal politics do not diverge from their position through trade-offs with Darmstadt's citizens. Also, they were able to push through their interests towards the Bauverein, which wanted to build relatively cheap and fast, whereas the municipality had the aim to build energy-efficiently. Here, the Bauverein moved away from its position, as a set energy-efficiency level of newly constructed buildings is agreed in the urban planning contract. However, cooperation with HEAG mobilo seemed to be problematic, as the municipality's aim to provide price-reduced public transportation tickets for Lincoln's residents has not been fulfilled yet. This might be due to the company's financial deficits, which it cannot increase further, as it already invests in the acquisition of expensive electric busses.

5.5 Event-state Network of the Mobility Concept's Configurations

Based on the above findings in 5.1, 5.2, 5.3, and 5.4, an event-state network as described in section 3.3 is created, illustrating the conditions under which the implementation process took place. The green bubbles represent the factors influencing the process of implementation. The blue boxes illustrate the events, which were influenced by the factors, but also affected them. The network is provided below:

Figure 5: Event-state network of the mobility concept



6 “Best Practice” Potential of the Mobility Concept

In this section, the second part of the analysis of the case of the sustainability potential of the mobility concept in the Lincoln settlement is discussed. On the basis of the findings of section 5 and coded policy documents, newspaper articles, and transcribed interviews, the sustainability potential of the UTLs is further defined. First, the concept will be reflected upon its sustainability, according to the framework in 2.1. Second, the transferability, as discussed from the primary and secondary data sources, will be highlighted.

6.1 Addressing Sustainability with the Mobility Concept

Following from the description above, the respective mobility concept is rendered some degree of sustainability. As stated by the World Business Council for Sustainable Development (2004) in section 2.1, sustainable mobility is a mobility, which is accessible, gives humans the opportunity to move freely and to communicate and maintain relationships (in: Nykvist & Whitmarsh, 2008, p. 1373). In addition, it does not comprise the convenience of the users, nor harm the environment.

The mobility offers in the Lincoln settlement are available to all residents, but with a return in the form of fees (see network 9 in the appendices). However, the use of an electric car is free for four hours per week. Charging points are provided in several areas. In the collective car garages, electric vehicles are preferred over motorized ones. As only one electric car per housing block is available, people may not be able to successfully reserve one. Instead, residents can use the tram, as it runs frequently to specific locations in the area. For longer distances and remote locations, residents have to switch to vehicles.

The guarantee that residents then have access to their individual car is complicated by the fact that not all residents are able to apply successfully for a car space under the terms of the confinement declaration. Even though the distribution key for car spaces is transparent, people who are dependent upon their motorized vehicle for other reasons than disability, are not considered. Electric vehicles, though, are not restricted for the car spaces. Since these vehicles are more expensive than motorized ones, this concept clearly prioritizes high-income households. Thus, the restricted availability of area for individual, inactive motorized vehicles reduces the ability of residents and visitors to have direct access.

The unavailability of car spaces further restricts the ability of residents and visitors to move freely. As the public transportation system is not expanded sufficiently and tariffs are expensive, residents are still dependent upon their car when spanning longer distances. “Book-and-drive” and “Mein Lincoln Mobil” offer alternatives, but the availability of an electric vehicle is limited, whereas “book-and-drive” vehicles emit the same amount of CO2 and fine dust as MIT.

Even though more ecological mobility offers exist, this aspect could have been supported more. The number of electric vehicles, with which people need to span longer distances and reach more remote destinations, is not sufficient for the number of residents, as long as the public transportation system is not expanded and improved. In the settlement, the residents have the clear responsibility to think sustainably in an ecological way – “only use the car when you need it” – which they could implement if a sufficient number of electric vehicles were provided for.

However, the reduction of car spaces in the public leads to more quality in foot and bicycle movement and abidance. Concerning relationships and communications, the concept offers a comprehensive social infrastructure, with public facilities in the near area. Also, the public and private network provide punctual connections to other neighborhoods and the city center. The settlement park in the middle of the area is car-free. Therefore, the abilities to move by bicycle and by foot within the settlement are sufficient, but the reduction of car spaces remains a difficult topic because the offer of alternative multimodal transport is restricted.

6.2 Transferability to other Municipal Contexts

Further recommendations for strengths and improvements of the mobility concept can be derived from the analyzed data sources. Network 18 summarizes the findings on the “best practice” potential of the sustainable mobility concept in the Lincoln settlement (see network 18 in the appendices). The overall model character of the concept is contested because, on the one hand, it is argued that the positive influences of the mobility management with its mobility offers already show. On the other hand, it is believed that a sustainable mobility transformation is unreachable if humans are being forced or ideologically influenced.

There are two main positive aspects of the concept. First, the cooperation between the municipal administration and the municipal works in achieving sustainability objectives, which has been laid out in municipal policies and the three contracts, is exemplary in achieving sustainability

objectives to which each party is obliged. The strong cooperation with the Bauverein enables the municipality to push through its interests, which would otherwise be hindered by financial deficits. Together with the multimodal mobility offer, the concept is a national pioneer for sustainable settlement development in these points.

Second, the reduction of car spaces directly influences the air quality in Darmstadt and can thus contribute to abide to the limitations of the clean air plan and to the health and life quality of citizens. The mobility management offers a full-fledged advice on individual mobility behavior, which allows car-averse residents to gain insights into multiple alternatives. For people, who are already willing to abstain from their cars for the sake of sustainability, this approach seems sufficient.

Despite these strengths, the mobility concept does not appeal to all citizens as the low occupancy rate shows. One aspect is the relatively expensive pricing of the free apartments and the recent announcement on the real estate market. Another aspect is the knowledge that you might not receive a car space, which is specifically problematic for people who are dependent on their car on a daily basis. Moreover, the findings from 5.4 in *Polycentric Decision-making and Power* illustrate that the municipality failed to initially integrate citizens in the development of the policy, which is confirmed by the observation that the concept does not mobilize residents to the extent that it was expected to. Bottom-up processes, however, are necessary in sustainability transformations through UTLs. The success of the respective project is directly dependent upon citizens.

Further, the findings from 6.1, which are namely the shift to mobility offers at the expense of convenience, accessibility, and the ability to move freely, support the arguments that a transformation is unreachable with the respective concept. In this regard, it is argued that the mobility offer needs to be placed differently. For example, the alternative mobility offers were not initially present when the first residents moved in and car-sharing needs to be promoted more extensively. Thus, it can be confirmed that a change to more sustainable mobility modes cannot be achieved, if the concept demands sacrifice from humans, but does not offer alternatives to their convenience.

7 Discussion and Conclusion

The present study explored the sustainability potential of the mobility concept in the Lincoln settlement. In the first part of the analysis, section 5, the processes and mechanisms of the implementation were explored according to the integrated MLP model and four implementation factors in figure 3. In the second part, the potential of the concept was unfolded according to sustainable mobility as defined in section 2.1, and additional insights from coded data sources. On the basis of the analysis, this chapter concludes which mechanisms rendered Darmstadt the opportunity to implement an UTL and if the mobility concept possesses "best practice" potential.

In the end, the findings will be carefully reflected regarding the limitations of the research and an advice for future research will be formulated.

7.1 Discussion of the Results

The insights in this research have been generated in three main steps: the background information about the case in section 4, the description of the mobility concept's configurations in section 5, and the "best practice" potential of the mobility concept in section 6. This discussion highlights the findings from the three sections in regard to the sub-questions.

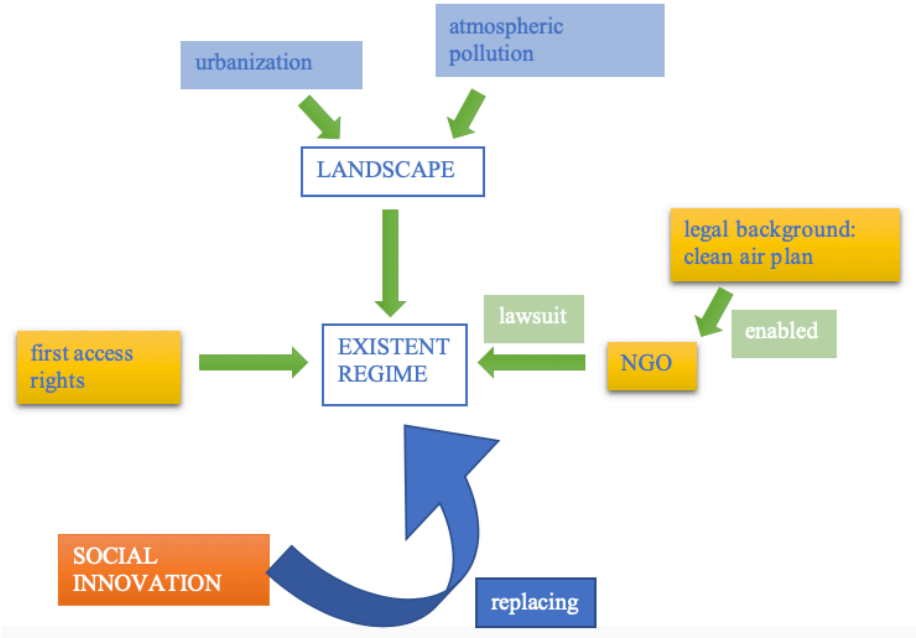
In section 4, addressing the sub-question "*How does Darmstadt articulate sustainable mobility?*", it was found that Darmstadt has the primary advantage to be strongly represented by a party, which is climate change-dedicated and supports environmental sustainability. Through its several departments and the ABCPC, a climate protection concept was developed, which addresses mobility. The engagement of the municipality in sustainable mobility is further shown by the creation of a strategic document, dealing with management of traffic in a sustainable way. Practically, the mobility concept in the Lincoln settlement remains the most recent policy.

In section 5, the second sub-question "*How did Darmstadt's mobility concept in the Lincoln settlement develop? Which actors were involved and under which conditions was the settlement created?"* was approached. In two steps, the implementation process was analyzed. The extended MLP model in figure 2 showed that the implementation of the innovative mobility concept in the Lincoln settlement by the municipal administration of Darmstadt has succeeded due to two main windows of opportunity with relevance for the local context (yellow boxes in

figure 6). On the one hand, the acknowledgment that the existent modal split in Darmstadt is not bearable anymore and that a transformation in traffic is needed. These insights have been primarily generated by the exceedance of the NO2 emissions in the clean air plan of "Hessen" and the a priori assessment of the traffic situation in the area of the settlement. On the other hand, the first access rights with state benefits allowed the municipality to purchase the area.

The application of the model further revealed insights into the relationships between landscape, regime, local partnerships, and innovation. The social innovation was indirectly stimulated by changes and the landscape level. Urbanization and atmospheric pollution at the landscape level exerted pressure on the existent regime (blue boxes in figure 6), which was then stressed by the lawsuit from the "Umwelthilfe", a non-governmental organization (NGO). The "change agents" then had the opportunity to push the mobility concept through in the local council and partially replace the existent sustainable mobility regime. These initial developments are illustrated in the figure below.

Figure 6: Initial development of the mobility concept

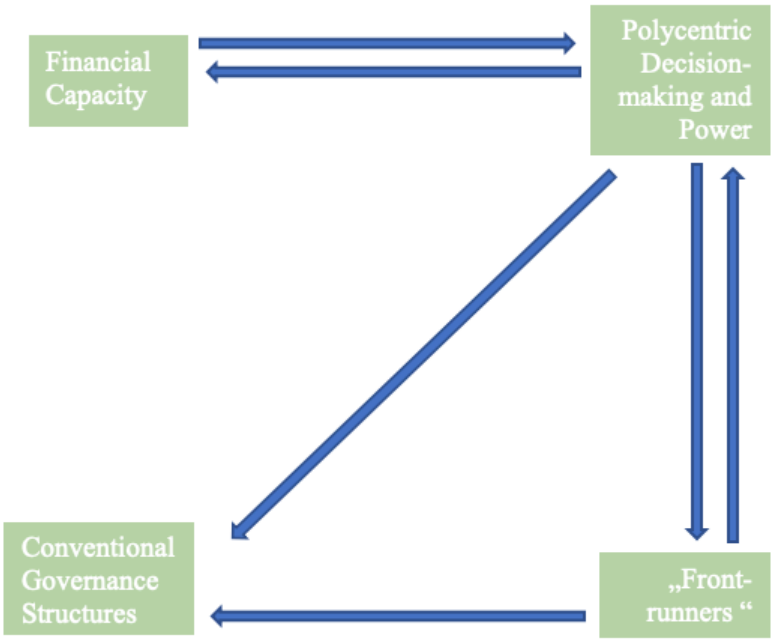


After applying the MLP mode, these configurations were further extended by four implementation factors, *conventional governance structures, local "frontrunners", polycentric decision-making and power*, and *financial resources*, which addressed the third sub-question "*Which factors contributed to the implementation of the respective settlement?"* in section 5. An event-state network was created, showing the conditions under which the implementation

process took place (figure 5). In the context of Darmstadt, the main mechanisms leading to the implementation, besides the two "windows of opportunity" and urbanization and atmospheric pollution, were that the transformation in traffic was supported by the local council and other important individual political personalities, that a strong cooperation between the municipal administration and municipal works exists, where municipal works relieve the financial deficits of the administration and are eager to implement agreed sustainability objectives.

It was further found that all four factors had an influence on the implementation. but that some factors can be grouped together, such as *local "frontrunners"* and (*polycentric) decision-making and power*. The relations between the factors are shown below:

Figure 7: Relations between the implementation factors



Monocentric decision-making and local "frontrunners". The analyzed interests between actor constellations in *Polycentric Decision-making and Power*, specifically on the demand and on the supply side of resources, were balanced between the municipal actors, the municipal administration, the Bauverein, and HEAG mobilo. Sustainability objectives are determined in the city's economic strategy, as well as in the agreement of the implementation and in the urban planning contract for the mobility concept. Thus, the municipality has an advantage to push through its interests even with solely private actors by an agreed process claim, which all parties have to adhere to. As already assumed above, the municipal administration and the municipal works were the local "frontrunners" since politics in Darmstadt are remarked by the high

percentage of the Greens representatives. The mayor of the city, for example, maintains relationships to chairmen of the municipal works, who are often members of the Greens as well.

Insufficient, though, is the extent to which citizens have been actively involved in the project from the beginning. Informational sessions maintained their interest, but suggestions about the car spaces distribution key by citizens made by citizens were not considered in the implementation process. Hence, politics did not deviate from their positions, which illustrates that the political "frontrunners" primarily tried to realize their interests. Additionally, perspectives from oppositional parties to reflect about the car spaces distribution key were not taken into account by the political power holders in Darmstadt. This means that "polycentric decision-making and power" is not inherently polycentric in Darmstadt, as the idea, the decision, and the implementation is initiated by actors with common "green" interests.

Monocentric decision-making and power, local "frontrunners", and *conventional governance structures.* The findings about *local "frontrunners"* and *polycentric decision-making and power* are also resembled within *conventional governance structures*. As the power of the implementation is distributed one-sidedly within the municipality's politics, this also means that formal governance structures are the driving forces. The lack of an integrative bottom-up process confirms these findings.

However, the fact that the municipal political parties are the driving forces does not implicate that the new policy inherits inflexible governance structures. Even though the process of the implementation and the entrustment of obligations to another party than the municipal administration itself requires executing these procedures under the prerequisites of public law, the municipality is free in choosing innovative mechanisms to monitor the implementation process. Here, a regular evaluation of the acceptance of mobility offers is expected. Ex-post evaluation of a policy's adequacy is innovative for municipalities. Thus, conventional governance structures are at least overcome in one procedural aspect.

Financial Resources. The municipal administration could also allocate financial resources through its strong cooperation with the municipal company Bauverein and through the decreased "power" of this supplying actor in pushing through private interests. The Bauverein originally provided the possibility to purchase the respective area and to invest in the implementation of the sustainable mobility concept. Here, money is predominantly generated

from the bidding processes for newly constructed areas. Hence, one-sided power structurers reflect in the availability of financial resources within the municipality of Darmstadt.
Without doubt, the high quality of procedures according to the public procurement law allowed a successful implementation. The sustainability potential of the mobility concept, however, is on another sheet. This issue was addressed in the first part of section 6, approaching the fourth sub-question "*Is the respective mobility concept sustainable?"*. The analysis of the concept "sustainable mobility" showed that residents are restricted in their accessibility to their individual motorized vehicle by the reduced amount of car spaces on the one hand. On the other hand, only residents with the corresponding financial means have access to car spaces by buying their individual electric vehicle. The number of collective electric vehicles is too low to offer a proper solution for the remaining residents.

Inevitably, this results in inconveniences and a restricted freedom of movement for three reasons. First, both the use of public transportation and of collective motorized vehicles is charged with a fee. Second, the insufficient public transportation network prevents people from reaching remote and distant locations. Third, the car spaces distribution key may be transparent, but the distribution in the near surroundings of the housing does not take into account other factors than disability and the possession of electric vehicles.

Finally, the second part of section 6 approached the fifth sub-question, namely *"Does the mobility concept have a "best practice" potential and can a more general theory for the transferability to other German municipalities be developed?"*. The transferability of the sustainable mobility concept is constituted by the processes and conditions illustrated in the event-state network in figure 5 and the findings of the first part of section 6 . After all, it can be claimed that the sustainability potential of the mobility concept in the Lincoln settlement can be divided into two steps: First, the implementation process, and second, the sustainability potential.

The mechanisms facilitating the implementation process were laid out above. By the means of these implementation prerequisites, the concept can further unfold a sustainability potential if 1) initial integration of citizens into the development plan took place, 2) an a-priori assessment of the traffic situation at site was made, where drawn consequences follow ecological sustainability values, but do not comprise individual person's convenience, accessibility, or freedom of movement, 3) binding contracts for all parties (an agreed process claim) stabilizes

the future implementation, 4) a dense and sufficient street network promotes the use of bicycles and feet and allows the maintenance of a social infrastructure, 5) an adequate car spaces distribution key exists, which renders residents the ability to directly access their individual car, 6) the ability to reach out to alternative multimodal transportation modes is given, especially the connection to the public transportation system, the reach of the public transportation system, and the connection via foot and bicycle to locations in the near distance, 7) a sufficient number of electric-car-pooling vehicles is provided for, 8) (financial) incentives to use non-motorized transportation modes exist, such as a completely free use of an electric car, which is incorporated into the rental contract, or price-reduced tariffs for public transportation, and 9) the use of flexible governance tools, which regularly evaluate the effects of the mobility management on residents, monitor the future process of the sustainability potential.

7.2 General Conclusions

On the basis of the discussion, the research question *"Which mechanisms drive the implementation of municipal policies in the field of sustainable mobility in the city of Darmstadt and which implications can be made regarding the transferability to other urban contexts within Germany?"* can be answered.

The implementation process initially set off because a transformation in traffic was required after the filed lawsuit by the German "Umwelthilfe", whereas the exceedance of the NO2 emission limitations were caused by urbanization and respective atmospheric pollution of motorized vehicles. As a coincidence, the municipality had purchased a convertible area through granted first access rights by the BImA. The process itself was mainly driven by monocentric decision-making power, where the Greens were eager to implement the mobility concept in the Lincoln settlement and succeeded in doing so, as they are a majority in the local council. The strong cooperation with municipal works relieved financial burdens and drove the physical implementation process. This relationship is further enhanced by an agreed sustainability vision, laid out in the municipal economic strategy. Further, the high procedural quality simplified the implementation process, as all parties were entrusted with the obligations in the contracts. One reflexive governance tool was integrated into the contracts, which has not been applied yet. Darmstadt allocated financial means through participating in research projects and marketing the mobility concept. Public-private partnerships played an inferior role in the implementation process, as did citizen participation.

However, through the monocentric decision-making and power distribution, citizens felt neglected in participating in the development and implementation process. This is the main insight derived from the four the implementation factors *polycentric decision-making and power* and *conventional governance structures*. They are not inherently needed to implement a sustainable mobility UTL, but they might be required to unfold the sustainability potential. It was found that the respective potential was limited by nine main factors, which can be subsumed into three main groups: Individual consent, procedural consent, and physical and financial incentives. The individual consent is required in terms of co-evolutionary and consensual development of UTLs, which integrates different ideological perspectives without restricting the convenience of each individual in the actual implementation. This aspect is linked to providing physical and financial incentives for the use of alternative multimodal transportation (initially), by a sufficient number and reach of these alternatives. Procedural consent is achieved through high procedural quality, in which each party is obliged to fulfill its tasks, and a regular evaluation of the execution of these tasks.

With these prerequisites, it is assumed that the mobility concept in the Lincoln settlement can unfold its sustainability potential and attract citizens which are inherently car-averse. On part of these conclusions, a process of co-evolution should be supported more extensively by the political actors in order to successfully stimulate a sustainability transformation in mobility. This is the most significant requirement for achieving sustainability.

As seen by these findings, the sustainability potential of an UTL is dependent upon very context-specific mechanisms operating in the context of Darmstadt in the process of implementation, which cannot be subsumed into a more general construct or guidance for other municipalities. What can be claimed is that a high procedural quality can entitle parties to behave responsibly and that the sustainability potential is initially dependent upon the acceptance by citizens, which can be achieved by initial integration of diverse demographic groups.

In the case of this mobility concept, the research theoretically contributes to reflecting the adequacy of socio-technical transition models for examining sustainability transformations. In respect to the MLP, it is suggested that the model needs integration of social acceptance factors, which may influence sustainability potential. Furthermore, it is suggested that *conventional governance structures* needs to be operationalized to a greater extent, as governmental actors

often consist of an essential element in urban planning, and thus imperatively are driving forces. The findings have shown that the implementation of sustainable mobility concepts is context-specific. Thus, the specific character of a city should be incorporated.

7.3 Limitations and Recommendations for Future Research

This research claims to be internally valid and have gained a realistic image of the situation in Darmstadt. The validity, however, might be restricted by personal bias, for example through the selection of the case and the analyzed data. This bias can have an impact on the external reliability of this research, which has been tried to avoid through explicit description of data collection and analysis methods. However, the sampling was biased, as some people were not available for the time frame of this thesis. Additionally, external validity is lacking, as the findings cannot be transferred one on one to another case. However, this research generated new insights into the research field of sustainable mobility transformations, as sustainability potentials were found to be highly context-specific and non-transferable.

Moreover, this research field is still in its beginnings, which restricts the researcher to revert to theories of sustainability transformations. Even though this study was theoretically feasible, it has to be noted that the research could have been extended in its internal validity if exclusive literature on sustainable mobility was used. Additionally, the MLP model is a frequently used model for examining sustainability transitions, but its adequacy is limited for dynamic social transformations. Even though this research aimed at integrating a social and horizontal component to the model, its main elements were still constituent.

Moreover, the reliability of the research findings could have been extended through a cross-case exploratory comparison, which would have intensified the research quality of the transferability potential. However, due to the scope of the paper and the aim to provide an in-depth image of the processes, only a single case study was feasible. Additionally, the sustainability conceptualization is inherently normative, which limits the research in its objectivity. A different definition could have produced a different result on the sustainability potential of the mobility concept. However, a respective study about sustainable mobility cannot be objective, as sustainability facets will all have to be fulfilled, but then again be weighed differently.

Future research might be interested in analyzing the respective findings in multiple cases and applying a theoretical model accordingly to a more specified research interest. In regard to "best practice" potentials, it should be observed whether the policy is of symbolic character, simply stimulating other municipalities to engage with climate change, or if it has a functional purpose, where processes are evaluated substantively and replicated.

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