

Transitioning the Transport and Land-Use System

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This thesis focuses on the question of how the application of theories and concepts from transition studies can aid in better understanding transformative change in urban areas and support attempts to address the urgent sustainability issues they are confronted with. In doing so, it concentrates on transport and land-use in particular. This thesis consists of three parts: the development of a heuristic framework, historic case studies of transport and land-use transitions in the urban regions of Munich and Zürich and the development and application of a reflexive planning approach in the region of Amsterdam. In transition studies transitions are the object of study. These can be seen as structured societal changes resulting from changes in intertwined systems that support each other (Grin *et al.*, 2010, pp. 1). Exactly this type of societal changes is receiving increasing attention in planning studies, but their conceptualisation and the development of methods and techniques to support them are lagging behind. In transitions studies, considerable research has been carried out dealing with these issues. As such, transition studies can contribute to planning studies. At the same time planning has the potential to contribute to the development of transition studies. The focus on space in planning studies offers the chance to address knowledge gaps in transitions with regard to the geography of transitions. Below, the motivation for this research is discussed, followed by a discussion of the knowledge gaps in (transport) planning and transition studies to which this dissertation aims to contribute. Subsequently, the research questions and the answers to them are considered. Finally, the contributions of this research on the knowledge gaps and possible avenues for future research are examined.

Sustainability as a societal and research challenge

The challenge of making urban regions more sustainable was the concrete and urgent societal motivation for this research. Urban regions are increasingly confronted with the issue of sustainability, both in terms of the environment and society. Many cities have undertaken action to address this (see sections 1.1.1 and 1.1.2). Transportation planning, where the realisation of sustainable urban mobility is at the forefront of attention, is no exception. Despite continued attention, only limited improvements can be observed. In the wake of criticisms of its focus to work within existing structures instead of challenging them (Albrechts, 2005; Beauregard, 2005), attention for transformative change in urban planning is increasing. In transport planning this can be seen in a shift in the scientific debate from a focus on the transport and land-use concepts that should be applied to improve sustainability (e.g. Transit-oriented development) towards the question how the transformative change that is necessary to meet the sustainability challenge can be brought about (see paragraph 1.1.2). Recent research shows that incumbent conceptual frameworks and approaches are insufficient. When discussing transformative change transformative primarily

concerns the outcome - a different configuration of the transport and land-use system than the current one – rather than the process. This can be more or less incremental. In planning, a number of knowledge gaps surrounding transformative change can be distinguished.

- 1) **Structural chances/challenges:** exogenous and system internal changes can result in structural chances or challenges for transformative change. Examples of the first are climate change or an economic crisis and of the second shortcomings in car centric planning approaches. The attention for such changes as something that can create the space for the development of new approaches has increased in planning (Dudley & Richardson, 2000; Curtis & Low, 2002; Albrechts, 2005; Healey, 2007, pp. 276; Filion & McSpuren, 2009; Pflieger *et al.*, 2009; Healey, 2015). However, the conceptualisation of these structural chances and challenges and knowledge regarding how they exert influence remains limited. This is important in understanding why and how transformative change takes place and to develop supportive strategies
- 2) **Bottom-up societal initiatives:** in planning, the attention for the role that initiatives of involved citizens and interest groups can play in bringing about transformative change has increased (Clifford *et al.*, 2005; Bartholamew, 2007; Filion & McSpuren, 2007; Banister, 2008; Harris & Moore, 2013; Hormighausen & Tan, 2016). In past transitions they have played an important role by challenging dominant paradigms, setting up experiments and exerting pressure for change (e.g. Blanc, 1993; Schmucki, 2001). Despite this, little knowledge exists about how these initiatives can attain influence in relation to established actors, the relation between their development and structural chances and their role in consolidating transformative change.
- 3) **The role of the practices of households and firms:** in planning studies policy processes are often the object of study. However, the sustainability of the transport and land-use system depends on households and firms making different locational choices and changing their mobility behavior. Their practices are embedded in lifestyles and preferences (Geels *et al.* 2012). As research dealing with practices (Shove & Walker, 2010; Shove *et al.*, 2015) shows, attention for practices can enable us to better understand transformative change.
- 4) **The impact of new insights in practice:** The body of knowledge regarding how planning practices should change to support transformative change in light of the complexity of the urban social system is growing steadily. Recent research focuses on the question

of how multi-actor knowledge co-creation can support learning and change in practice (Straatemeier *et al.*, 2010; Te Brömmelstroet, 2010; Tennøy, 2010; Næss, 2013; Soria *et al.* 2016; Tennøy, 2016). Despite this, two challenges remain: (a) finding a manner to address contrasting interests in such a way that makes it possible to exploit structural changes for change; (b) creating a learning environment in contact met practice, but avoids that established, and because of this powerful, ways of thinking and acting dominate.

Space and scale in transition studies

Knowledge and insights from transitions studies has the potential to address these knowledge gaps. This discipline focuses on transformative changes in so-called socio-technical systems. In socio-technical systems, such as the transport and land-use system in the urban region, technologies or psychical artefacts are intertwined with social structures and practices. Changes in the one goes (almost) always hand in hand with change in the other. When one does not change, it is difficult for change in the other to take place. In addition, change in the system is related to exogenous developments in the so-called landscape and novel structures and practices in niches. That said, focusing on urban transitions has the potential to (better) address two knowledge gaps in transition studies.

- 1) **The conceptualisation of space and scale in transitions:** Traditional conceptions of transitions are based on what is known as the multi-level perspective (MLP). Transitions result from interaction between the three levels in this perspective: niche – novel structures and practices; regime – established structures in related domains such as science, policy, markets; and the landscape- macro-developments at the long term such as climate change or economic conjuncture (Geels & Schot, 2007). The attention for the geography of tensions has increased in recent years (Coenen *et al.*, 2012; Næss & Vogel, 2012; Raven *et al.*, 2012; Binz *et al.*, 2014; Hansen & Coenen 2015; Murphy, 2015; Sengers & Raven, 2015; Truffer *et al.*, 2015; Affolderbach & Schulz, 2016). It has been acknowledged that transitions depend on the context in which they take place (Coutard & Rutherford, 2010; Coenen *et al.*, 2012) and that accounting for this can aid in better understanding why and how they take place (Hansen & Coenen, 2015, pp. 104). Raven *et al.* (2012) have developed a relational model where the levels of het MLP are defined based on various types of proximity: low proximity (niche), high proximity within a socio-technical system (regime) and high proximity across systems (landscape). Empirical research has shown the added value of this model with regard to networks between niche

actors which facilitate the exchange of ideas between geographic areas (e.g. Sengers & Raven, 2015). However, it remains limited. Attention is needed for: what the relationship between various types of proximity, why and to which end relations between scalar levels are relevant and how geographic aspects of the regime can be conceptualised (see Hansen & Coenen, 2015).

- 2) **The conceptualisation of urban transitions:** In recent years, critics have pointed out two challenges related to studying urban transitions. Firstly, the built environment. This is more stable than other technologies (van Schaick & Klaasen, 2011) meaning that a variety of artefacts from a number of periods of transition exist next to one another (Næss & Vogel, 2012). In some cases, these also have a historic or cultural meaning (Goss, 1988; Shove *et al.*, 2015). Although their use can change considerably (Shove *et al.*, 2015), it is not yet known how the built environment or infrastructure networks can influence the course of transitions. Empirical research has focussed primarily on technical sub-systems, such as transport technologies (e.g. Sengers, 2016). The second challenge is the delineation of the system. In the city, diverse systems are closely intertwined with one another through various relations and networks. This means that focused interventions such as increasing densities or traffic management could be counteracted by developments elsewhere in the city (Næss & Vogel, 2012). Therefore, a focus on the practices of household and firms (see Shove *et al.*, 2015) offers more potential than focusing on sub-systems.

Research questions and approach

By answering the following main research question, this dissertation aims to make a contribution to the knowledge gaps discussed above as well as to support practitioners working on urban transitions.

How can the conceptualisation of the transport and land-use system as a socio-technical system contribute to both understanding why and how transition takes place and facilitating current transition attempts?

This question was split into the following three sub-questions

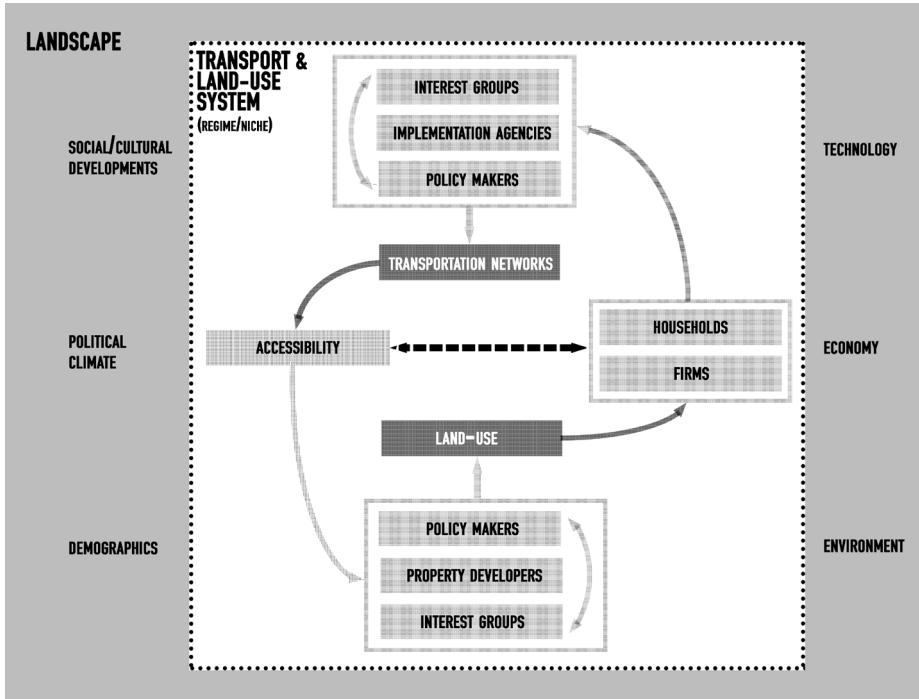
- 1) *How can the regional transport and land-use system be conceptualised as a socio-technical system?*

This question was answered by carrying out a literature study and a theoretical

synthesis of literature from transition studies as well as literature regarding the evolution of the transport and land-use system. The result was a heuristic framework combining the transport and land-use feedback cycle (Bertolini, 2009; Wegener & Fürst, 1998) and the MLP. The transport and land-use system is composed of structures and the related practices of different types of actors. More often than not these actors act in conformance to structures, but they can also deviate from them. Through action structures are reproduced or change. The actors and the physical structures, the so-called artefacts, are shown in the graphical presentation of the framework (see the figure below). The other structures include:

- Regulative rules: codified rules such as laws and regulations;
- Normative rules: tasks, obligations, responsibilities as well as behavioural rules and societal roles (e.g. social and organisational capital; vested interests, lifestyles and financial incentives);
- Cognitive rules: belief systems, problem agendas and search heuristics that are taken for granted and used unconsciously;
- Discourses: an ensemble of ideas, concepts and categories through which meaning is given to social and physical phenomena.

In the depiction of the framework no distinction is made between regime and niche. In the niche the same types of practices and structures are present as in the regime, but they are less structured and, because of this, instable. The landscape is seen as being composed of quasi-autonomous, or in the perspective of actors in the system, exogenous developments of culture or societal preferences, demographics, technology, political climate and the economy. In the framework the practices of households and firms play a central role in the development of the system. During a period of many decades, transition can take place. This is a result of the reflexive action of actors and groups and the interaction between practices and structures in niche and regime as well as developments in the landscape. The application of the framework to develop strategies supportive of a transition towards improved coordination between transport and land-use in the region of Amsterdam has shown its added value. This application resulted in new types of solutions that account for a broad scale of interests and connect to the changing practices of households and firms. In studying historic transitions the model was also useful. To make this possible the concept of 'troubles' was introduced to better identify the places where pressure on incumbent structures is present or can develop. Troubles are difficulties that people experience in their daily lives. A second addition to is the concept of proximity. The definition of regimes and niches based on proximity, where geographic proximity is but one type, has made it possible to better understand transition dynamics within and



Heuristic framework for transition in the transport and land-use system (adapted from Switzer et al. 2013)

between geographic areas.

Why and how does transition take place in the regional transport and land-use system?

This question was answered by carrying out a comparative case study of transport –and land-use transitions in the urban regions of Munich and Zürich in the period since the Second World War. These regions were selected for a number of reasons:

- 1) Based on secondary sources, a number of periods of transition can be distinguished since the Second World War: the first period where the modernisation of the city and the accommodation of the car were embraced followed by a break in the 1970s (second period) and a shift in practices (regionalisation and increasing bicycle use in Munich) since the 1990s, the third period. In order to gain insight in transition mechanisms, it was important that transitions or transition attempts had taken place.
- 2) In both regions the initial condition of the system was comparable;

- 3) Variation in regional and national context, which made it possible to account for contextual factors.

Using the heuristic framework and the concepts discussed in the first sub-question, qualitative research was carried out in 2012 in both areas. These case studies have resulted in the following three hypotheses regarding why transition takes place:

H1: Changes in the practices of households and firms create the pressure needed to realise transition (as captured by the emergence of foci of debate and conflict, or 'troubles')

The extent to which the pressure for change exists is dependent for a considerable part on changes in the practices of households and firms. An example is the first period of transition after the Second World War in both cases where increasing car use and suburbanisation resulted in increasingly visible problems as the distribution of road space in the cities remained largely unchanged. In these periods there was often mention of a traffic chaos and the general pressure for change was large. In the second period of transition from the 1970s little change in the practices of households and firms can be observed, which correlates to limited pressure for change.

H2: Interest groups interpret landscape change and changes in practices to legitimise structures creating the pressure on the regime necessary for transition.

The extent of pressure depends on the resonance of propagated cognitive rules with structures and discourses in the landscape or stable structures in the regime

This hypothesis means that the pressure ensuing from changing practices or from the landscape does not come into being on its own. Pollution, damage to the city, or residents abandoning the city first need to be problematised before they exert pressure on incumbent structures and practices in the regime. For example, in the 1950s journalists and researchers criticised the limited amount of space allocated to the car. In the 1970s young architects criticised the impact of the unquestioned pursuit of the modernisation of the city against a background of increasing awareness of the negative impacts of modern life. The case of Zürich illustrates well that what is considered a problem depends on the residents with broader discourses and problem definitions. Prior to the Second World War, the pressure to intervene in the land-use development of the region Zürich

and in Switzerland on the whole increased. After the war, however, a societal shift can be observed. In light of increasing tensions between the West and East everything which had an element of collectivism was seen as suspicious. As a result, the support for interventions in property markets decreased.

H3: The identity of the city is a powerful discursive element that, when used can legitimise or delegitimise structures and practices

In both regions, especially in the period from the 1970s onwards, we can observe that interest groups evoked the identity of the city to criticise then current practices. In Munich this focused primarily on the physical identity of the city. The modernisation was sometimes called die zweite Zerstörung Münchens, the second destruction of Munich. In contrast, in Zürich the social identity of the city as a place for residents was subject of debate as a result of increasing displacement by employment growth. This coincided with the referendum about the U-Bahn, upon which the plans for motorway construction and the modernisation of the city were dependent. In the subsequent referendum the combined U- and S-Bahn was rejected. As a result, policy makers were forced to reconsider solutions and problem definitions.

The fourth hypothesis relates to how transitions take place and reads as follows:

H4: Reaching shared cognitive rules enables change in the types of interventions in artefacts at the system level

A comparison of Munich and Zürich illustrates this hypothesis. In Munich we see that a change in artefacts and, with it, a further strengthening of the transition in the first period after the Second World War was only possible because broadly shared idea (cognitive rules) of the exact types of interventions which should be carried out in the built environment was present. In Zürich this consensus regarding the existing city was never reached. Because of this, interventions in the built environment remained limited and largely ad -hoc. In the region this was not the case. Here the S-Bahn in combination with an extensive motorway network was realised which contributed to a transition there. Two specifications regarding how these shared cognitive rules can be reached are:

- a) *Rules both open to conflict and effective when attempting to resolve it accelerate reaching shared cognitive rules*

The first period of transition in both regions supports this specification. In Munich legal regulations and social norms required coordination between

diverse interest in order to make progress in the development of the transport network. This resulted in initial delays, but ultimately, because of the extensive debate and the pragmatic approach of actors, in plans that were better attuned to the complexity of the city. Because of this, they were also more realistic in the end and attained broader support. In Zürich the absence of the initial conflict resulted from a combination of a strong desire to make rapid progress, rules and norms that required less interaction between various organisations and adaptations of rules to make rapid decision making possible. Following this, the plans faced problems in terms of feasibility and the criticism increased with time consuming changes a result. In both cities cases conflict resulted in stalemates. Pragmatism and the preparedness to move beyond short time interests and redefine interests is just as important to make progress. Examples of this include the preparedness of the municipality of Munich to allow the Deutsche Bundesbahn to realise an underground line to make progress on underground public transport or the decision to address transportation problems as a whole rather than narrowly focusing on maximising parking places.

- b) Interest coalitions are a way to exert pressure to achieve change in cognitive rules at other scalar levels*

The development of alliances around shared interests can be an effective way of exerting pressure on actors in other sectors or at other scalar levels. As such, hierarchical relations can be dealt with in order to reach consequences across a number of scalar levels. An example is the collations that were established by the mayor of Munich and colleague mayors to exert pressure on the national decision making.

How may the conceptualisation of the transport and land-use system as a socio-technical system be integrated in a planning approach to support transitions in this system?

This question was answered through a planning approach to support second-order reflexivity and the application of it in the planning process surrounding Transit-oriented Development in the Amsterdam region. This was done in a series of four workshops that took place between 2011 – 2014, which were organised with niche actors and progressive actors in established organisations such as government, interest groups, transport and property developers. Second-order reflexivity concerns that development of solutions for persistent challenges resulting from the unintended, or unexpectedly extreme, side-effects of solutions developed for earlier problems in such a way that prevents that new side-effects arise. The heuristic framework which was developed as an answer

to the first question was utilized to structure the reflection of participants. The approach was composed of four steps which can be carried out iteratively:

- 1) **The development of a future vision** of the transport and land-use system. This can function as a point of orientation when working out desired changes in the system. In the case of Amsterdam, the future vision was a system where functions are concentrated around highly accessible nodal points in the transport network so that a sustainable balance in mobility is achieved between individual and collective costs and benefits (see 5.4.1).
- 2) **System analysis.** The heuristic framework was used to identify the following: barriers, such as the revenue model of municipalities; threats, such as decreasing demand for office space; chances, such as declining demand for suburban living and neutral developments, such as the growth of collective particular commissioning of housing. These arise when niche, regime and landscape (do not) change.
- 3) **Redefining structures and practices.** This took place in two steps with the aim of developing congruent solutions that satisfy the needs of central stakeholders. First, strategies were developed that account for or exploit the barriers, threats, chances and developments identified in the system analysis. There were five types: (1) financial frameworks, such as an integral revenue model for municipalities; (2) governance strategies, such as a facilitating role for the government; (3) legal frameworks, such as more instruments for municipalities to steer development; (4) the combination of knowledge, such as the integration of knowledge about accessibility in locational policy; and (5) demand management. Subsequently, strategies were developed at the level of a public transport corridor and a station on the same line. These focused on the functional mix and the profiling along the line as well as the governance (e.g. multi-stakeholder platforms to facilitate station and corridor development).
- 4) **Assessment of strategies.** Here, interdisciplinary knowledge was used. In this case from transportation engineering, planning and transition studies, to reflect on the contribution of proposed interventions on the long term objective of sustainability.

Although the application remained limited to a series of four workshops during one year, the approach was seen as promising. In the area of urban planning it was innovative through the combination of abstract reflection and concrete interventions and the space that was afforded to new actors.

Contributions to knowledge gaps and avenues for future research

Below the contributions to the four knowledge gaps in planning concerning transformative change and the two knowledge gaps in transition studies are discussed. In some cases, avenues for future research are discussed.

- 1) **Structural chances/challenges:** The introduction of the levels of the MLP has made a more precise operationalisation of these changes and challenges possible. The usefulness of this was visible in the approach that was developed to answer the third sub-question. Participants were able to systematically identify relevant developments on the three levels and in other systems. An important note resulting from the historic case studies is that the importance is not a priori given, but rather depends on the resonance of problem definitions and the framing of problems. In both Zürich and Munich, the troubles which resulted in the highest pressure were of a local nature and resonated with stable structures (e.g the value of the city or the role of the state). For planning practice, this indicates the importance of making connections between large societal and local challenges in such a way that they become tangible.
- 2) **Bottom-up societal initiatives:** This research has shown the importance of initiatives or niches in bringing about transformative change in the city. That said, the borders of niches were much less clear than is sometimes assumed. In Zürich and Munich niches were also represented within established organisations, such as political parties or municipal departments. There they exerted influence. This supports a delineation of niches based on proximity in terms of the three types of rules. In addition, niches (and regimes) can transcend the local level. Coalitions between local niches were seen to exert important pressure for change. This is important for practice in two respects: (1) Cooperation between actors in established and new organisations can increase the chance that change will take place. The knowledge of new actors can lead to new insights among actors in established organisations, while actors in these organisations can play an important role in increasing support for change within them; (2) In light of the increasing importance of international decision-making, collations with like minded actors in other locales can increase pressure on incumbent structures and practices. In follow-up research this should receive more attention.
- 3) **The role of the practices of households and firms:** The explicit focus on this has made it possible to better understand how the pressure develops that leads to urban transitions. The planning approach and the attention for the needs of key stakeholders as well as the sociological

and cultural meaning of practices (e.g. biking or slow loving) are a good starting point. However, more interdisciplinary research attention for how practices change could make it possible to better understand transitions and develop more effective transition strategies.

- 4) **The impact of new insights in practice:** The reflexive planning approach developed to answer the third research question shows how, by being better attuned to societal developments and by challenging self-evident structures, planning can contribute to the development of solutions for sustainability challenges. It takes the needs of key actors as the starting point and focusses on the collective weighing of interests with the aim moving beyond short term interests that can stand in the way of transformative change.

Although the approach seems promising, there are four points of attention for future research:

- a. *Interdisciplinarity and work forms.* Interdisciplinarity remained limited to involving planners, transitions researchers and transportation engineers and the types of work forms was also limited. Per step a rich pallet of methods exists which can be further explored (see 6.4.4).
- b. *Conflicting interests and power.* The experimentation with the new planning approach stopped in an early phase. The historic transitions studies in answering the second sub-question show that transition is a contested and political process that is often initiated by new actors. Resent experiments with established actors (see Majoor *et al*, 2017; Hooijer *et al.*, 2017) show the types of challenges that can arise with regard to power when working with these actors. Incumbent roles, procedures and ways of working can endanger attempts to collaboratively learn and experiment. These issues are receiving increasing attention in transition studies (see 6.4.4.). In order that approaches such as the reflexive planning approach discussed here are able to contribute to transition, new ways of working will need to be developed to deal with power and conflicting interests;
- c. *Legitimacy.* Although the planning approach developed is more participative than traditional approaches, the risk of forced or voluntary exclusion of certain actors remains. The challenge is therefore to ensure that those who do not have the time, means or interest to participate are still represented and that more general societal interests that are not present in the area of city in which work takes place are accounted for. As has been emphasised in transition

studies, questions of legitimacy will also need to be subject of design and experimentation (see 6.4.4).

In addition, two more general points of attention remain: Firstly, the importance of these experiments with regard to the reconfiguration of the socio-technical system or as the starting point of broader systemic transitions, and, secondly, the upscaling of novel structures and practices (cf. Bulkeley *et al.*, 2015, pp. 23, 241).

The conceptualisation of space and scale in transitions

This research supports existing studies with regard to the place-specificity of urban transitions. The troubles that came about were of a local nature as well as the arguments that framed these troubles, the regimes and aspects of the landscape (demographics, culture and economic development). The concept of proximity offers a useful way of distinguishing between the structuration levels of the MLP and geographic scalar levels and to follow the exchange of ideas and the exertion of power between places and between niche and regime. For example, the exchange of ideas where social and cognitive proximity existed surrounding the transportation planning between the USA, Germany and Switzerland or the exertion of power between scalar levels as discussed in the explanation of specification b of the fourth hypothesis. Still, the overall influence of flows of ideas through networks on the course of transition seems limited. In the historic case studies, it was rather the case that major decisions were made based on regional and national debates and new ideas from elsewhere influenced the way in which these were worked out. For instance, the decision making with regard to motorways in Zürich. Further research is needed to better understand the exact influence of the flows of ideas through networks. The question is whether the awareness of troubles is primarily a local question of if it is influenced by these supra-local exchanges.

The conceptualisation of urban transitions

With regard to the role of artefacts, this research has shown what the normative importance of the built environment is in legitimising certain structures and practices (see hypothesis 3). This concerns the identity of the city or the historic and cultural importance of the built environment, but also the local socio-economic composition and the economic development. Still, the relative importance of drawing on the identity of the city seems limited. The argumentation used was only effective when it resonated with changing discourses or cognitive rules at a societal level. For example, the resonance of arguments for modernisation of the city with the growth discourse in the first period of transition or of arguments to limit changes to the character of the city with increasing criticism of the one-sided focus on growth at the cost of

the environment, health and quality of life in the second period. With regard to transition pathways, we see that urban transitions more often seem to follow a pathway where the use of artifacts changes rather than they are replaced. Experiments and initiatives that were observed in the historic transitions were more focused on the use of artefacts than purely on the development of new technologies. A second contribution of this research concerns the delineation of the system. This research saw changes in practices as the starting point and followed the related changes in structures. As such, a transition can be seen as more than changes in transportation technologies or increasing densities, but rather as an interrelated change in rules, artefacts, discourses and practices of households, firms and other actors.