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Transport Planning beyond Infrastructural Change: An Empirical Analysis of Transport Planning Practices in the Rhine-Main Region in Germany

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Abstract: The transport system in Germany is characterised by a dominance of individual automobility. Acknowledging the necessity of a transition in the transport sector towards a more equal and sustainable transport system, the paper takes a closer look at how local and regional transport planning actually responds to the demands of the transition. Following a practice theoretical approach, the empirical analysis of local and regional transportation planning in the Rhine-Main region aims at an understanding of planning actions that go beyond infrastructural and technological change. Based on document analysis and interviews, the analysis highlights spatial and material changes promoted by transport planning, normative aims, and assumptions followed by transport planning and skills and competencies supporting transport planning in the Rhine-Main region. The paper identifies two overarching transport planning practices that shape the way the transport transition is addressed in the Rhine-Main region: the expansion of sustainable transport networks and the redistribution of road space. The empirical results are discussed with regard to the potential for change in local and regional transport planning.

Keywords: transport transition; transport planning; planning practices; sustainable transport; urban mobility; practice theory

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1. Introduction

The transport system in Germany—as in other countries—is characterised by a dominance of individual automobility, which leads to high energy consumption [1], high consumption of land [2,3], and the exclusion of non-car users [4,5]. Despite agreed-upon reduction targets, greenhouse gas emissions (GHG emissions) in the transport sector continue to rise in Germany [2,6], in the European Union [7], as well as worldwide [8,9]. In addition, many urban citizens suffer from noise and air pollution caused by traffic [3,10–12]. However, in Germany, the "current system of taxes, duties, levies, fees and subsidies favours frequent drivers and high-income households, promotes urban sprawl and long distances, and wastes resources and raw materials" [6]. In fact, national travel data show that distances travelled per day and car-ownership rates in Germany have been rising from 2002 to 2017 [13]. This is particularly evident in commuting: car use in Germany is particularly high on commutes and commuting distances on average are becoming longer [4]. The Rhine-Main region stands as an example of an urban region with increasing commuter traffic in Germany [14,15].

At the same time, global trends such as climate change and growing social inequality put the current transport system under pressure [5]. The necessity of a transition in the transport sector towards a more equal and sustainable transport system is increasingly acknowledged by scientists [1,7,16] as well as state agencies [2,17,18]. At the core of the discussion about this transition—the so-called "Verkehrswende" in Germany—is how to establish a sustainable, accessible, and efficient transport system [1,4,5,19]. First,

it is considered necessary to reduce GHG emissions to protect the climate [9,20,21] and enable climate neutrality [22]. Second, the transition is supposed to be socially inclusive [4,5,16], fair [23,24], and spatially balanced—addressing rural areas as much as urban contexts [16]. Third, transport means and infrastructures are to be used in an efficient way. Digitalisation and automation, as well as the introduction of shared mobility services (e.g., car-, bike-, and e-scooter-sharing), in this regard open up new—partly challenging—opportunities [5,16,18,25]. In addition, the health benefits, e.g., of more active mobility, are increasingly acknowledged [26,27].

Three strategies are promoted to support more sustainable transport: (a) avoiding unnecessary traffic and reducing mobility demand, (b) shifting to more environmentally friendly transport modes, and (c) improving the transport system to handle unavoidable traffic in a compatible way [1,16,18]. The avoidance strategy most frequently relies on compact settlement patterns, land-use mix, and short distances, as well as the substitution of travelling by digital communication [9,28]. The shift strategy is usually supported by an expansion of alternative transport modes, e.g., public transport, walking, and cycling [1,4,16]. The improvement strategy mostly addresses a switch from fossil-fuel drives to battery-electric cars [5,16]. In this context, the networking and automation of vehicles for more efficient use of transport infrastructures are also discussed [16]. Beyond infrastructural and technological changes in the transport system, more sustainable urban and regional mobility, according to Kesselring et al., requires changes in mobility behavior and a "new mobility culture" [1].

The resulting demands on local and regional transport planning are manifold. At the same time, the local and regional level of action is important for the implementation of measures that support more sustainable transport development [29]. According to state and federal state law, municipalities and districts in Germany are legally responsible for the construction, maintenance, and management of transport infrastructures (e.g., local and regional streets). In addition, local and regional planning authorities shape the spatial conditions for shift and avoidance strategies through land use planning [28,30]. They regulate access to space—a resource that most transport services need [5]. Local and regional planning authorities are supposed to know about the place-specific transport needs as well as other needs concerning the transport infrastructure (e.g., urban streets). Moreover, local and regional planning authorities have direct local accountability and can act more agile than the national level [26]. Nevertheless, there is a discrepancy between the requirements for a transition in the transport system at the European and national levels and the implementation of corresponding measures at the local and regional levels, e.g., with regard to the legal framework and the necessary balancing of interests [16].

Against this backdrop of diverse requirements and responsibilities, this paper takes a closer look at how local and regional transport planning actually responds to the demands of the transport transition. The empirical analysis of local and regional transportation planning in the Rhine-Main region gives weight to the perspective of local and regional transport planners as well as locally and regionally negotiated planning documents. The study aims at an understanding of planning actions that go beyond infrastructural and technological change and takes into account the normative aims and assumptions as well as the skills and competencies. Applying a practice-theoretical approach, this paper asks:

1. What are the spatial-material arrangements, the normative aims and assumptions, and the skills and competencies transport planning in the Rhine-Main region is based on?
2. What overarching transport planning practices shape the way the transport transition is addressed in the Rhine-Main region?
3. What potential for change in local and regional transport planning do the practices show?

In Section 2, we describe our analytical perspective more in detail. In Section 3, we outline the empirical material and the methods used. In Section 4, the empirical results are presented on the basis of the above-mentioned research questions. We identify two transport planning practices that shape the way the transport transition is addressed in the

Rhine-Main region: the expansion of sustainable transport networks and the redistribution of road space. In Section 5, we discuss how these two practices and the elements that constitute them go beyond conventional transport planning.

2. Analytical Perspective

Analytically, we follow a practice-theoretical approach. Practice theories are an analytical perspective from the field of social and cultural theory [31,32]. According to Schatzki, "a practice is a set of doings and sayings organized by a pool of understandings, a set of rules, and a teleoaffective structure" [33]. In this interpretation, practices (e.g., farming) comprise various actions (e.g., building fences). These actions, according to Schatzki, are linked by common understandings of what makes sense (e.g., knowing how to build a fence) and explicit rules and directives (e.g., instructions on how to build a fence). The teleoaffective structure can be understood as notions of what is acceptable and correct to do (e.g., building a fence to protect the livestock) [33]. In their focus on routinised and collective patterns of action, practice theories try to overcome the dichotomy between structure and agency [31,34].

In the field of transport research, practice theories are valued as they help to overcome both an overly individualistic and an overly structuralistic understanding of transport behaviour [35]. In addition, practice theories enable a perspective that places transport in the context of other everyday practices, e.g., living, working, and parenting [35]. One strength of the practice theoretical approach is to highlight the complexities that emerge from the interrelatedness of these practices [35]. Another potential of the practice theoretical approach is to point out change and continuity [35].

The practice-theoretical perspective is increasingly applied to the analysis of sustainability transitions and the transport transition, in particular [9,35,36]. In the context of the transport transition it has been applied to mobility practices of certain groups of society, e.g., elderly people [37] or commuters [15,38,39], to various transport modes, e.g., cycling [40] or car-sharing [41], as well as to the role of transport providers [36] and the development of transport scenarios [9].

The CommuterLab project combines the analysis of commuting practices and the analysis of planning practices in the Rhine-Main region [14]. Planning practices are here understood as routinised action in dealing with spatial issues—in particular with transport development. We follow Shove et al. in their understanding that practices emerge and persist when elements of three types—materialities, meanings, and competencies—are connected [42].

Drawing on Schatzki, we operationalise materialities as spatial-material arrangements, including humans, artifacts, land, and nature [43]. We add the term "spatial" to underline that the positioning of material elements in space matters to us as well. Based on our field of research—transport planning practices—we consider built environments, transport infrastructures, vehicles, and road users to be part of the spatial-material arrangements. Schatzki's statement that "practices and arrangements are co-constitutive" [43] is particularly relevant for planning practices. According to Schatzki, spatial-material arrangements prefigure planning practices in the way of rendering possible paths of action "easy and hard, obvious and obscure, tiresome and invigorating, short and long" [43]. At the same time, planning actively seeks to shape and change spatial-material arrangements.

According to Shove et al.—similar to Schatzki's teleoaffective structure—meanings can be symbolic, emotional, and motivational [42]. In our study, meanings are operationalised as the normative aims and assumptions that explicitly and implicitly underlie transport planning actions. These can be legally or politically defined planning principles, place-specific visions, as well as general action principles. Competencies, according to Shove et al., include skills and know-how, i.e., both the knowledge of what is appropriate and the ability to perform in an appropriate manner [42]. Competencies in our study include professional expertise as well as individual skills.

Practices are carried out by so-called practitioners or carriers of practice [42]. In the moment of enactment, i.e., the moment when a practitioner physically performs an action that belongs to a practice, the practice is referred to as "practice-as-performance" [42]. Beyond this enactment, practices are referred to as "practices-as-entity", emphasising the regularity of the practice and its persistent or evolving character over time and space [42]. Practices are basically dynamic. They change as new materialities are designed, new meanings emerge, and new competencies are learned. According to Shove et al., careers of practices, i.e., the emergence, the reproduction, and the abandonment of practices, depend on the groups of practitioners that carry those practices—so-called "communities of practice" [42].

In conclusion, planning practices, in our understanding, are based on specific spatial-material arrangements (e.g., transport infrastructures and settlement patterns), normative objectives (e.g., planning goals and models), as well as skills and competencies (e.g., professional expertise and methodological knowledge). Following the understanding of "practices-as-entity", our analysis of transport planning practices focuses on patterns of planning action beyond singular planning decisions.

3. Materials and Methods

The Rhine-Main region in Germany, as defined by the CommuterLab-project, includes five major cities (Frankfurt, Offenbach, Darmstadt, Mainz, and Wiesbaden) and eight neighbouring districts [14]. The region is characterised by a high density of jobs—in large but also medium-sized cities—and experiences both population and economic growth [14,44]. Furthermore, accessibility within the region is high both by public transport and car [14,44]. The spatial delimitation of the region takes into account the commuting relationships [14]. Frankfurt alone has experienced an increase in inward commuting from 300,000 to 390,000 between 2000 and 2020 [14]. Consequently, the study region is exemplary for urban regions with an increasing transport demand.

For the analysis of transport planning practices, two major cities, two districts, and four medium-sized cities in each of the two districts were selected. The selected cities are connected along two rail corridors and differ in terms of population size, location within the region, and commuting balance, i.e., the respective ratio between inward and outward commuters. In this way, different conditions for commuting within the urban region are represented in the analysis. In addition, two regional planning authorities were included in the analysis.

In the first step, urban and transport planning documents from the selected cities and districts, as well as from the regional planning authorities and the state of Hesse, were analysed, e.g., urban and regional development concepts, local transport plans, and local and regional mobility concepts. In total, 23 planning documents, which were completed between 2014 and 2021 and made publicly accessible by the respective planning authorities, were included in the analysis [44]. The documents were analysed following the content-structuring approach to qualitative content analysis by Kuckartz [45]. All of the documents were coded with the help of the MaxQDA software. In a first deductive coding process, the material was structured based on thematic categories derived from the research interest. Thematic categories included potentials and challenges of transport development, objectives, guiding principles and target groups of transport development, strategies and approaches to transport development, instruments and methods of transport development, and aspects of integrated action (i.e., participation of different stakeholders, spatial integration, cross-sector integration). In a second inductive coding process, subcategories were formed based on the empirical material following joint discussions in the research team.

In the second step, urban and transport planners from two major cities, five medium-sized cities, one district, and two regional planning authorities were interviewed. The interviewees were chosen based on their formal responsibility for urban or transport planning in the respective city, district, or region. In total, 14 interviews (11 single, 2 double,

and 1 group) were conducted mainly online between November 2021 and February 2022. The semi-structured interviews followed an interview guideline (see Appendix A) and were recorded and transcribed verbatim. The interview transcripts were coded using MaxQDA following qualitative content analysis by Kuckartz [45]. After thoroughly reading and summarising the transcripts, they were coded based on the categories developed in the document analysis. The results were discussed with the research team.

In the third step, the results from document analysis and interviews were combined and condensed on the basis of the research questions. The focus here was on strategies and approaches to transport development (spatial-material arrangements), objectives and guiding principles of transport development (normative aims and assumptions), and aspects of integrated action (skills and competencies).

4. Results

Planning documents and interview partners characterise the Rhine-Main region as a region of proximity and high accessibility between cities. The traffic volume is considered high, and capacity constraints are being noted for rail and road networks. Noise and air pollution, as well as rising GHG emissions, are depicted as problematic in planning documents and interviews alike. To promote more sustainable transport development, planning authorities in the Rhine-Main region adopt various approaches, such as the extension and modernisation of the passenger rail network, the creation of expressway connections for cyclists, and the establishment of intermodal transfer points. Additionally, planning documents and interviewees pay attention to the allocation of road space for cycling and pedestrian traffic, the reorganisation of parked traffic, and traffic calming. Following a practice-theoretical perspective, these approaches are characterised further with regard to the spatial-material arrangements they promote, the normative aims and assumptions they follow, and the skills and competencies they rely on.

4.1. Spatial-Material Arrangements Promoted by Transport Planning in the Rhine-Main Region

On a regional scale, transport planning in the Rhine-Main region aims to create a regional transport system that allows people to travel quickly and comfortably from point A to B. The rail network is to be transformed into a dense and less centralised network. According to planning documents and interviews, this means an expansion of the rail network with special emphasis on the closure of gaps in the existing network and additional tangential links. The existing rail network is to be upgraded for an increased frequency of service, and the electrification of the rail network is to be expanded, e.g., along the Taunusbahn. With regard to cycling, planning documents and interviews promote a continuous cycling network that connects cities within the region. Expressway connections shall enable cyclists to travel longer distances, e.g., to encourage commuters to cycle to work. Another crucial element of the regional transport network in the Rhine-Main region is intermodal transfer points. Transport planning aims for so-called mobility stations, i.e., rail stops with additional mobility services such as car or bike sharing, that enable the transfer between different modes of transport. Mobility stations are to offer access to the regional transport network close to where people live. A district representative stresses the need for mobility stations in municipalities without train stations: "so that it is also easy there to move around without your own car".

At the city level, transport planning in the Rhine-Main region addresses the use of road space. Road space is to be redistributed in favour of cycling and pedestrian traffic. As a transport planner from a medium-sized city explains with regard to limited road space: "We do not create any added value for cycling if we do not address motorised traffic". Planning documents and interviews advocate for road cross-sections that guarantee more space for pedestrians and cyclists and less space for cars. Road space may be permanently rededicated or temporarily reused. A key issue is the reorganisation of stationary traffic. Planning documents and interviews point to a reduction of parking space, especially in public spaces. Parking space management is to increase the costs of parking in the

inner cities, and neighbourhood garages are to limit on-street parking in newly developed residential areas. Traffic calming and traffic management are to reduce speeds and traffic volume, especially in inner cities. The redistribution of road space is rarely addressed with regard to public transport. Rather, individual interview partners point out possible conflicts between measures for traffic calming and acceleration in public transport (e.g., express busses).

4.2. Normative Aims and Assumptions Followed by Transport Planning in the Rhine-Main Region

In terms of normative aims and assumptions, transport planning in the Rhine-Main region relates to the notion of mobility for all. Planning documents and, to a lesser degree, interviews stress that transport services need to be affordable and accessible for all groups in society regardless of income and physical abilities. Documents and interviews alike call for transport services that meet people's needs. Furthermore, transport planning in the Rhine-Main region strives for regional accessibility. Though accessibility between cities is already perceived as being high, it is to be strengthened further. The overall guideline promoted by a regional planning agency is the "5-min region" [46]. People living or working in the Rhine-Main region shall have access to transport services other than a private car within 5 min from any place in the region. This demands an increase in public transport services, an increase in shared mobility offers, and improved connections between these transport offers.

Transport planning in the Rhine-Main region wants to create attractive transport services. Referring to the use of transport modes other than the private car, a transport planner from a medium-sized city says: "It has to be sexy and it has to be fun". Planning documents elaborate further that transport services, e.g., public transport and shared mobility, need to be easy to use, comfortable, and safe and that staying and moving in public space should be pleasant, stimulating, and safe. At the same time, transport services are geared towards efficiency. They are expected to be quick and reliable. The use of transport infrastructures is to be optimised, e.g., by the use of digital technologies.

An additional reference point of transport planning in the Rhine-Main region is the political aim of climate neutrality. Several planning documents express the requirement to reconcile transport needs and climate protection. The main focus here is the reduction of GHG emissions, e.g., through electromobility. Planning documents and interviewees agree widely on reducing the use of private cars. This goes hand in hand with the notion of "city-friendly" transport. In the first place, this refers to the reduction of traffic-related noise and air pollution. Legally defined limits are an important reference here. Additionally, "city-friendly" transport, according to some planning documents and interviews, does not restrict other uses of public space.

Partially, transport planning in the Rhine-Main region is oriented towards an equitable distribution of (road) space that supports the equality of different road users. Changes in motorised traffic may result in saving traffic space that can then be redistributed to active transport modes and other uses of public space as well as greenery. An urban planner from a medium-sized city wishes to "upgrade street spaces into spaces for quality of life". Additionally, planning documents and interviews agree on the aim to reduce the number of fatalities and serious injuries in road accidents—by some interviewees named "vision zero". Traffic safety is considered particularly relevant for pedestrians and cyclists.

4.3. Skills and Competencies Supporting Transport Planning in the Rhine-Main Region

Transport planning in the Rhine-Main region, according to the interviews, requires visionary thinking, i.e., the ability to imagine and communicate about possible transport futures. Recent mobility strategies and guidelines in the Rhine-Main region address this need—more are to follow under the Sustainable Urban Mobility Plan (SUMP) guidelines, e.g., in the city of Frankfurt. Several interviewees underline the necessity to agree on strategic aims in the transport sector as agreed-upon guidelines help them to manoeuvre in volatile political contexts. One urban planner is counting on more constructive discussions

with the city's politicians "if I can create a basis that can be agreed upon and that I can refer to when it comes to a concrete design".

At the same time, interviewees explain that translation skills are needed, i.e., the ability to translate professional expertise for a non-expert audience. Planning practitioners at local and regional levels conceive their task as preparing possible solutions for political decision-making. This includes the extension of decision-makers' focus and the sensitisation to various people's transport needs. As one transport planner points out: "I have to explain to this group sitting there, which definitely does not represent the cross-section of the population—not at all, way too male, way too old (. . .)—I have to explain to them that there are other realities of life". Translation skills, according to the interviews, are equally important for the interaction with residents, e.g., to increase the comprehensibility of decisions through transparent evaluation criteria.

To coordinate transport services across transport modes, willingness to cooperate is crucial for transport planning in the Rhine-Main region. Planning documents stress the necessity to consider the transport system as a whole and to link different modes of transport and mobility services, e.g., bus and rail services, public transit, and shared mobility, to support inter- and multimodal travel behaviour and to cover the entire path chain. Interviewees make it clear that coordinating different modes of transport and mobility services and cooperating with an increasing number of service providers is a key challenge.

Furthermore, regional action is needed to create a continuous transport system across administrative borders. Planning documents highlight the need for regional cooperation with regard to cycling and rail networks as well as intermodal transfer points. Municipalities partly cooperate to connect and develop joint transport infrastructure. At the same time, interviews show that traffic is a conflict issue between cities, e.g., with regard to intermunicipal traffic induced by newly developed commercial or residential areas. Regional planning authorities in the Rhine-Main region in the field of transport are limited to strategic planning and support as the formal responsibility for transport planning lies with the municipalities.

Last but not least, transport planners in the Rhine-Main region ask for more readiness to experiment. In established routines, transport planners sometimes become caught in endless loops of proposal and review. A transport planner from a medium-sized city, for example, proposed a possible solution for an inner-city cycling route to political decision-makers and was repeatedly asked to review further solutions—leading to no change so far. Traffic experiments, e.g., the temporary closure or redesign of a street, are seen as an opportunity to test and evaluate transport solutions in real life and make possible changes tangible for residents and road users. One transport planner describes it as follows: "To show that if we take away a lane here (. . .) the city won't go down and it won't collapse. No one believes that for now. So we have to show it and try it out".

4.4. Similarities and Differences between Transport Planning Practices in the Rhine-Main Region

Viewed from a practice-theoretical perspective, the different approaches to promote more sustainable transport development in the Rhine-Main region can be interpreted as expressions of two transport planning practices: the expansion of sustainable transport networks and the redistribution of road space. Figure 1 shows how the spatial-material, normative, and competence-oriented elements described above are linked to one another. The extension and modernisation of the passenger rail network, the creation of expressway connections for cyclists, and the establishment of intermodal transfer points are linked to different spatial-material arrangements and (partly) different sets of normative aims and assumptions as well as skills and competencies than the allocation of road space for cycling and pedestrian traffic, the reorganisation of parked traffic and traffic calming.

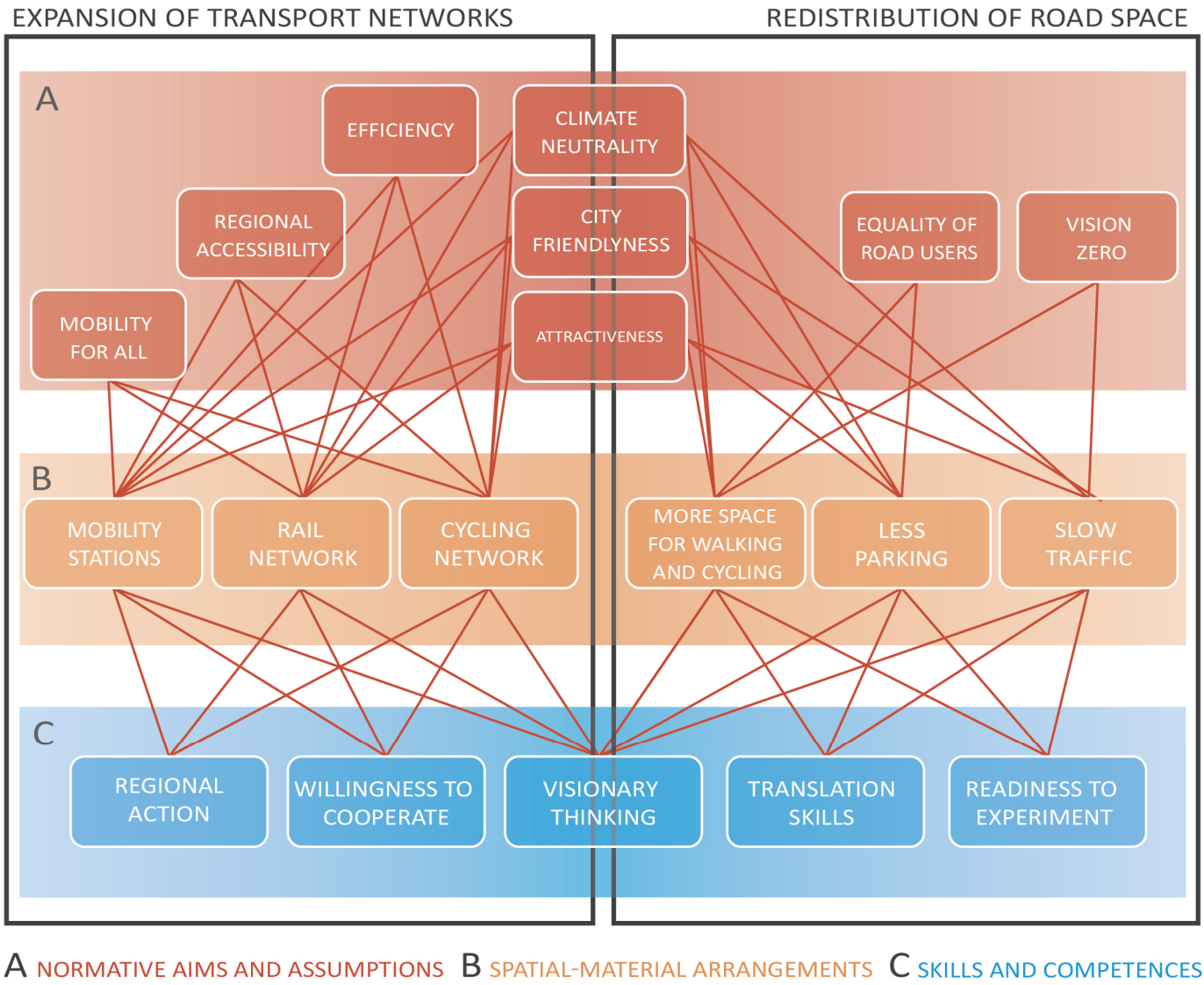

Figure 1. Elements of transport planning practices in the Rhine-Main region.

The expansion of sustainable transport networks with regard to spatial-material arrangements shapes a regional rail network that is connected to other mobility services through mobility stations and a regional cycling network that provides expressway connections for cyclists. With regard to normative aims and assumptions, the expansion of sustainable transport networks is linked to the notion of mobility for all, regional accessibility, and efficiency. All three of them may be considered established notions in public transport provision but are here extended to cycling and shared mobility. At the same time, the expansion of sustainable transport networks—such as the redistribution of road space—is linked to ideas of attractiveness, climate neutrality, and city-friendliness. Particularly noticeable is a strong positive charge of environmentally friendly transport modes. Skills and competencies that support the expansion of sustainable transport networks are regional actions, the willingness to cooperate, and visionary thinking. Regional action corresponds to the regional focus on the expansion of sustainable transport networks, and the willingness to cooperate corresponds to the multimodal character of the envisaged transport networks.

The redistribution of road space in material terms is linked to more space for walking and cycling, less parking space, and slower traffic. With regard to normative aims and assumptions, the redistribution of road space—just like the expansion of sustainable transport networks—is linked to ideas of climate neutrality and city-friendliness and partly to

attractiveness. Specific to the redistribution of road space are notions of equality and traffic safety. While the latter appears well established in planning documents and interviews alike, the former was addressed particularly in the interviews. Skills and competencies that support the redistribution of road space are visionary thinking, translation skills, and the readiness to experiment. The last two underline that the redistribution of road space is a conflictual field with high demands on balancing interests and promoting acceptance.

When looking at similarities and differences between expansion and redistribution practices in transport planning, it becomes clear that the expansion of sustainable transport networks shapes spatial-material arrangements by adding new infrastructures and improving the utilisation of existing infrastructures, e.g., increased frequency on railway lines. The redistribution of road space primarily shapes the use of space. Infrastructural changes can be part of this second practice, but what changes most is the arrangement of vehicles and road users in an already existing road space. An overlap between the two practices can be seen in the approaches addressing walking and cycling. Cycling networks and more space for walking and cycling are nevertheless considered expressions of different practices based on the logic of action (i.e., expanding networks vs. redistributing space) and the spatial scale (i.e., regional vs. local).

Despite the spatial-material differences, expansion and redistribution practices in transport planning have in common that they relate to ideas of climate neutrality and city-friendliness. These are the normative orientations that are most strongly standardised by laws and political objectives. Local and regional transport planning can hardly act outside this framework. Attractiveness as a normative aim is linked to all transport modes despite the private car. It is equally promoted in expansion and redistribution practices and is often connected to the attempt to address people's transport choices, i.e., making alternatives to the private car more attractive. Moreover, justice is addressed in both practices but in different interpretations. While mobility for all refers to questions of equal access, equality of road users opens up discussions on distributional equity.

Further similarities and differences can be observed with regard to skills and competencies. The expansion of sustainable transport networks asks for coordination skills in the face of a variety of stakeholders and complex responsibilities (i.e., regional action and willingness to cooperate). The redistribution of road space asks for moderating skills in the face of conflicting interests (i.e., translation skills and readiness to experiment). Visionary thinking supports both practices.

5. Discussion

According to Kesselring et al., "aiming for sustainable urban mobility (. . .) does not work with business as usual" [1]. In this section, we, therefore, discuss our results with a special emphasis on the potential for change and signs of continuity in local and regional transportation planning. The transport planning practices described in this paper are not fundamentally new but rather capture local and regional transport planning in the Rhine-Main region in a state of flux. Potentials for change and signs of continuity become equally visible.

5.1. Evolution of Spatial-Material Arrangements

In spatial-material terms, continuity is most evident. The spatial-material arrangements addressed in the approaches to promote sustainable transport development correspond to well-established fields of action in transport planning. In particular, the expansion of sustainable transport networks and the corresponding spatial-material arrangements (i.e., passenger rail network and cycling network) aims to increase the capacities to accommodate an increasing transport demand. In this regard, the expansion of sustainable transport networks follows a well-established logic of adaptation planning, i.e., adjusting infrastructures to an increasing transport demand [47]. Rather than designing profound change, transport planning in this orientation is "managing the status quo" [48]. However, the specific qualities (i.e., expressway connections for cyclists and mobility stations) indicate an evolution

of the spatial-material arrangements and the targeted solutions. The expansion of sustainable transport networks—different from conventional transport planning—addresses a multimodal transport demand, as the inclusion of mobility stations shows.

The redistribution of road space can be read more clearly as an opposition to adaptation planning. It aims to reduce automobile traffic and thus restricts some transport modes (i.e., car use) while enhancing others (i.e., walking and cycling). The redistribution of road space frees up space for other uses, e.g., greenery and open spaces for retail or recreation, and may have health benefits by reducing air pollution and noise levels [49–51]. Thus, the redistribution of road space may help cities make sustainable transport more attractive and increase the acceptance of changes in the transport system among the population [49].

Both the expansion of sustainable transport networks and the redistribution of road space are intended to improve the conditions for a modal shift from private cars to more environmentally friendly transport modes. However, the described transport planning practices do not necessarily contribute to a reduction of transport in the sense of the avoidance strategy. Thus our findings confirm the tendency that public policies rarely address traffic avoidance [1]. Here it can be discussed that more courage is needed by practitioners to address the push factors in transport planning, e.g., reducing space for cars.

5.2. Accumulation of Meanings

The normative aims and assumptions show some flexibility. New meanings have been incorporated (e.g., climate neutrality and attractiveness), but old ones continue to be relevant (e.g., efficiency). Conventional transport planning is assumed to favour combustion engines and automobility over alternative transport means [1]. In the urban context, the model of the car-friendly city and the spatial separation of living, working, and recreation stand for this orientation of urban and transport planning [52,53]. The normative aims and assumptions followed by transport planning in the Rhine-Main region indicate that the preference for the automobile is fading—at least in local and regional transport planning.

Alternative transport modes (i.e., public transport, cycling, but also shared mobility) are charged with positive meanings such as attractiveness. The modal shift from private cars to more environmentally friendly transport modes in the Rhine-Main region is thus supported by a shift in the representation of transport means and greater consideration of the perspective and needs of road users. The described transport planning practices in the Rhine-Main region are therefore compatible with the aims and principles of the EU-funded SUMP that place mobility needs at the centre and aim to improve accessibility and quality of life [54].

At the same time, local and regional action to promote more sustainable transport development is broadly based on the notion of efficiency, e.g., the efficient use of rail corridors or the speed of cycling connections. The logic of eliminating congestion through technical solutions—commonly an expression of transport planning that is focussed on motorised individual transport [55]—is here applied to other transport means. Similar to Shove's discussion on energy efficiency, it would be important here to critically reflect on whether efficiency-oriented measures contribute to lower resource use or lead to the perpetuation of unsustainable lifestyles [56].

5.3. Competencies Make a Difference

In terms of competencies, the questioning of established patterns of action and interaction in transport planning is most evident. The competencies described as important in addressing the transport transition go beyond conventional transport planning in Germany, which is criticised for not being integrated [57]. Integrated transport planning, according to Schwedes, is "normatively, politically, professional and spatially coordinated and involves the various actors from the various sectors in the planning process, on an equal footing" [48]. The presented competencies hold the potential to strengthen integrated transport planning.

First, visionary thinking, which appeared relevant for both the expansion of sustainable transport networks and the redistribution of road space, may be considered a key

competence for more sustainable transport planning. A broader vision of future mobility systems that considers the needs of public space, e.g., road space, in view of a more liveable, social, and sustainable city, can expand and specify the assessment for specific spatial tasks. It supports normative integration, which means being explicit about the values, communicating planning goals transparently, and acknowledging the political character of planning processes [48]. Creating a vision for sustainable transport and liveable cities is also elsewhere considered a key step towards more sustainable urban and transport planning [3].

Second, transport planners in the Rhine-Main region stress the importance of translation skills, i.e., the ability to communicate technical content to non-professionals. Translation skills may support political integration, which stands for the involvement of various stakeholders in decision-making processes [48]. The need for the involvement of citizens in urban and transport planning is widely accepted [3,58]. Additionally, SUMP builds on this principle and requests the participation of citizens and stakeholders [54]. Further inspiration may be drawn from projects outside the study region that use before and after images to show other functions of streetscapes (e.g., more greenery, seating options, and more space for cyclists and pedestrians) to form public perception and consequently gain support for transformation processes. Initiatives such as "senf.köln" in Cologne, political actors such as the green party in Vienna under the label "Grüne Visionen" (green visions), and the state ministry for mobility in Baden-Wuerttemberg via "aktiv-mobil-bw.de" are promoting the benefits of sustainable mobility via visualisations of streetscapes.

Third, the willingness to cooperate and regional action—two competencies supporting the expansion of sustainable transport networks—reflect the requirement for professional integration. Professional integration stands for the recognition of transport needs as an important dimension of transport planning and the resulting integration of different transport-related disciplines (e.g., infrastructure construction, demand management) as well as the integration of neighbouring disciplines (e.g., urban planning, public health) [48]. Spatial integration recognises the fact that transport development stretches beyond municipal boundaries and across spatial scales (i.e., local, regional, national, and international) and requires the cooperation of respective stakeholders [48]. An integrated perspective on urban and transport development—that was not the focus of this part of the analysis—can additionally help to alleviate bottlenecks in transport development. Guiding principles such as transit-oriented-development would then have to be discussed [59,60].

One competence that goes beyond the discussion on integrated transport planning and that appeared relevant in the empirical analysis is the readiness to experiment. Experimentation is a way to try out possible design solutions under real conditions and to increase awareness and transparency in participation. Temporary interventions in public space and tactical urbanism highlight the scope of possibilities to discuss street transformations and to promote changes in public perception [61–63]. The German road traffic regulations allow the use of temporary traffic experiments, e.g., for researching traffic behaviour and testing traffic safety measures. In addition, temporary road "closures" are being tested in the context of events or demonstrations. Examples such as the bicycle promotion in Paris or summer street programs in Helsinki, Munich, Nuremberg, and New York City show that temporary measures can lead to quick successes and encourage further transformation.

5.4. Drivers of Change

Local and regional transport planning practices cannot be changed easily, as they are embedded in a complex interplay with spatial, political, and financial conditions and the practices shaping those conditions. The practices described in this paper should not obscure the fact that prevailing conditions, such as the availability of parking spaces and commuter tax allowances, promote continued stability of car use [15]. Restructuring infrastructures that have been built over decades takes time [47]. In addition, financing transit infrastructure is beyond the scope of local and regional transport planning and depends on a broader transformation in transport policy [64]. Alternative ideas for funding

transport infrastructure and transit systems have been discussed for several years [65–67]. Nevertheless, three drivers of change became evident throughout the research: changes in the self-perception of transport planners, societal changes with regard to transport and mobility, and changing political priorities.

Transport planners in the Rhine-Main region describe a shift in their tasks towards more coordination and communication. Some describe their role in transport development as that of a mobility manager rather than a transport engineer. This change is reflected in the skills and competencies described above, which go beyond the existing range of tasks and require transport planners to expand their field of action. From a practice-theoretical perspective, changes in self-perception—from transport engineer to mobility manager—can be interpreted as a step towards a new community of practice. However, it has to be made clear that the two practices described in this paper do not represent the full range of tasks planners need to respond to in their day-to-day work. Transport engineering tasks such as the optimisation of junctions, planning of bypasses, and road maintenance remain important components of municipal transport planning. From a practice-theoretical perspective, transport planners may thus be considered carriers of various practices.

Planning documents see changes in travel behaviour and mode choice, e.g., due to increasing digitalisation and an increase in environmental awareness. Multi- and intermodal travel, shared mobility, and a higher demand for cycling are assumed to be major trends. Interviews—conducted under the impact of the pandemic—pose further questions on how transport and mobility will change, e.g., with regard to the expansion of mobile work and work from home. In addition, interviewees report changing political priorities. Previously rejected projects aiming at the expansion of the transport networks, e.g., tramway extensions, were discussed anew only after the lawsuits of Environmental Action Germany for clean air in 2015 and cycling referendums in several German cities. The redistribution of road space, however, is confronted with continued reluctance, e.g., to reduce parking space.

5.5. Strengths and Limitations of the Research Approach

The practice-theoretical perspective allowed us to highlight spatial-material arrangements, normative aims, and assumptions, as well as skills and competencies that local and regional transport planners in the Rhine-Main region draw on when dealing with the requirements of the transport transition. By showing links between these elements, we have been able to cluster different approaches to promote more sustainable transport development into overarching practices. The two practices described in this paper—the expansion of sustainable transport networks and the redistribution of road space—rely on specific sets of materials, meanings, and competencies. Going beyond the material dimensions and considering meanings and competencies was helpful in broadening the understanding of transport planning action. The expansion of sustainable transport networks and the redistribution of road space are not considered mere material interventions but practices that rely on specific normative aims and competencies.

It has to be made clear, however, that not everything that the planners describe has already been implemented. It corresponds to the function of planning documents to formulate planning goals and outline planned measures. In the interviews, planning objectives were given high priority in order to get closer to the normative dimension of planning activities. The planners were also asked what changes they expect in their field of activity in the future. The study focused on transport planning practices that address the requirements of the transport transition. Inherent in this approach is thus a future-oriented uncertainty. Longitudinal analyses would be desirable to further track changes in transport planning practices.

The analysis focuses on the perspective of local and regional transport planners. The perspective of other stakeholders, e.g., local politicians or transport companies, is left out. Bringing the different perspectives together and contrasting them with each other is a possible subject for further research. Furthermore, transport planning practices need to be set in relation to mobility practices. Stein et al., based on a qualitative study on commuter

practices in the Rhine-Main region, make it clear that travel choices are deeply embedded in various routines from household organisation (e.g., childcare) to working arrangements (e.g., working hours) [15]. Local and regional transport planning can create environments that support sustainable travel choices, but these environments alone will not be sufficient to achieve sustainable mobility.

6. Conclusions

In a nutshell, this paper aimed to analyse transport planning practices beyond infrastructural change on an empirical basis in Germany. The two major transport planning practices identified in the Rhine-Main region—the expansion of sustainable transport networks and the redistribution of road space—show two courses of action to address the demands of the transport transition on a local and regional scale. The two practices complement each other and are both linked to major objectives of the transport transition in Germany, i.e., to enable climate neutrality, increase the city-friendliness of traffic, and create an attractive transport system. The practice theoretical analysis made clear that change in transport planning practices may occur not only on the basis of infrastructural change but also with regard to meanings and competencies. The change in competencies appears strongest.

The analysis of transport planning practices provides an important insight into the requirements of the practical work of local and regional transport planners. It becomes clear that a range of different skills and competencies are needed to tackle the challenges of transforming the transport system and promoting sustainable transport behaviour. In addition to qualifications in traffic engineering transport, planners need to develop skills for a more integrated look at transport systems, e.g., to effectively balance mobility needs and other uses of urban space. Transport planners need to expand their skills in visioning as well as moderation and translation of complex relations in spatial settings. This broader view on transport development shifts local and regional transport planning towards mobility and demand management.

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Appendix A Interview Guideline

Introduction

- How would you describe your position and what are your tasks in the city/county/region?
- Potentials and challenges in spatial and transport development
- What are the most important spatial and transportation features that characterize the current situation in the city/county/region from your point of view?
- Control question: What spatial and transport developments do you expect in the coming years? Where do you see the city/county/region in 20–30 years?
- Control question: What are the potentials in terms of spatial and transport development in the city/county/region from your point of view?
- Control question: What challenges do you see with regard to spatial and transport development in the city/county/region?

Objectives of spatial and transport development

- What are the general goals and values that you pursue in terms of spatial and transport development?
- Control question: Are these goals linked to a specific guiding principle? Which one is that?
- Control question: Which future users or residents do you have in mind thereby?
- Control question: What is your idea of future mobility and what does this mean for future commuting mobility?
- Control question: How are the goals and guiding principles embedded in higher-level goals of urban and regional development?

Opportunities for action in spatial and transport development

- What strategies are you pursuing to shape spatial structure and transport development in the city/county/region?
- Control question: How important are traffic avoidance, modal shift, and compatible traffic design from your point of view?
- Control question: What importance do you attach to changing built structures and influencing individual mobility behavior?
- Control question: In your view, what are the most important instruments for shaping spatial structure and transport development in the city/county/region?
- Control question: What are the most important projects and measures that have been implemented or are currently pending in the city/county/region?
- Control question: Who are the most important partners for shaping spatial and transport development in the city/county/region from your point of view?

Final questions

- How do you expect problems, objectives, and opportunities for action to change in the coming years?
- Is there anything else you would like to add to the topic that has not yet been mentioned?

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