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Can a rapid mobility transition appear both desirable and achievable? Reflections on the role of competing narratives for socio-technical change and suggestions for a research agenda

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As research on socio-technical transitions has repeatedly shown, positive or negative narratives can play a key role in galvanizing public support for or resistance against socio-technical transitions. In the mobility sector, many countries have recently seen some indications of beginning socio-technical change dynamics. In the case of Germany, key practices of a low-carbon transport system – such as cycling, substitution of travel through home office or 'shared mobility services' – are moving from niches to mainstream, while grassroots initiatives are successfully demanding improvements for cycling and walking. In this dynamic situation competing narratives of change begin to emerge, which claim to define what a transition towards 'sustainable' mobility should look like and how it could be accomplished. Against the backdrop of these recent discursive shifts the article highlights three key conflictual dimensions, along which competing narratives of a mobility transition in Germany, but also in other European countries, are likely going to diverge. The article suggests that research into mobility transitions should focus on the intensifying discursive struggles, in which different social groups with highly differing power will attempt to shape the broader socio-technical vision of a 'sustainable' mobility future.

Keywords: Mobility; transport; sustainability transition; narratives; socio-technical transition

1. Introduction

The transport sector in Germany, as in most industrialized countries, has for decades been marked by strong path dependencies. In a seminal article, John Urry wrote in 2004 that the currently dominant 'system of automobility' could 'not be disrupted by linear changes but only by a set of interdependent changes occurring in a certain order that might move, or tip, the system into a new path.' (Urry 2004). In 2012 Frank Geels, referring to the Netherlands, wrote that a sustainability transition in the transport sector seemed improbable within the near future (Geels 2012). According to the author, one of the few things which could change the path dependency of the socio-technical regime of automobility would be an increasing prioritization of climate policy: broader sections of the population

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would need to demand radical climate action, also in the transport sector. Today, there are some indications in Germany that the conditions for a mobility transition might be improving: In 2021, the German high court ruled that climate goals need to be tightened to protect the rights of future generations (Hummel 2021). The share of electric vehicles has reached over ten percent of new cars sold (Tagesschau 2021), while global environmental movements have been successfully influencing public discourse on a climate emergency (Schäfer and Blumenthal 2019). The concept of a mobility transition ('Mobilitätswende') has recently become a mainstream term in transport policy discourse, both on a local and national level.

Against this backdrop, Germany may arguably be moving towards a 'tipping point' for a substantial shift in the socio-technical regime of mobility as envisioned by Urry. Yet there are many questions regarding the actual direction such a transition will take (Sittel et al. 2020). In this context of accelerating change dynamics, competing narratives of mobility transitions are beginning to emerge. As research on socio-technical transitions has repeatedly shown, positive or negative narratives can play a central role in galvanizing public support for transition policies and socio-technical projects. In particular, narratives can lend credibility and traction to specific visions of change by spelling out why a new technology or solution should be seen as both desirable (in regard to broader societal goals such as economic growth or ecological sustainability) and achievable (spelling out which specific technological solutions are necessary to make the vision attainable) (Jasanoff and Kim 2016; Canzler 1996).

As transition dynamics unfold, different actors will increasingly try to influence public opinion and policy decisions by communicating which visions and pathways of sustainable mobility should be deemed both desirable and achievable. For example, automobile manufacturers in Germany for a long time supported a narrative that battery electric vehicles (BEV) were unattractive for consumers (Welt 2019) – until manufacturing newcomer Tesla demonstrated that consumer preferences could indeed shift towards these vehicles. While today the transition to BEVs is in full swing in Germany, the debate has shifted to whether a future mobility system with fewer private cars can be deemed desirable (Völklein 2022). There are indications that visions of car-free cities appear desirable to many inner-city residents of larger cities (Ruhrort, Zehl, and Knie 2021). Yet, narratives spelling out how car-light lifestyles could also work beyond central urban areas have yet to emerge. To gain broader support for this vision, its proponents will need to address the issue of achievability.

As radical change is increasingly being discussed as a realistic option, tensions between different narratives – e.g. between narratives of 'green growth' versus 'transport sufficiency', come into sharp relief. Against the backdrop of these recent shifts the article suggests three conflictual dimensions as useful starting points for research into the dynamics of mobility transitions. Focusing on the example of Germany, section 2 presents some background on recent accelerating change dynamics in the mobility sector. In section 3 the article draws on theoretical accounts from Science and Technology Studies (STS) and Sustainable Transitions Research (STR) to highlight the key role of narratives in socio-technical transitions. The theoretical approaches show that shared visions of socio-technical futures play a central role in driving (or hindering) socio-technical change. They also show that conflicts between competing narratives of change can be seen as a characteristic and even a necessary stage in accelerating transition dynamics. Against this backdrop, section 4 highlights three conflictual dimensions which are likely to take center stage in the next phase of a mobility transition in Germany: The first regards the tension between paradigms of 'green growth' versus '(transport)

sufficiency'; the second relates to the role of new mobility services as commercial services or public goods; the third relates to the tension between urban and suburban mobility cultures. These conflictual dimensions are highlighted as promising avenues of further research regarding the role of narratives in transition dynamics. In conclusion, section 5 argues that building overarching narratives which attempt to bridge the three conflictual dimensions may proof to be a key prerequisite for actors trying to build coalitions for a mobility transition in Germany.

2. Background: accelerating change dynamics in the socio-technical regime of mobility in Germany

For decades, the transport sector in Germany has been strongly car-oriented. Both overall transport demand and the number of cars on the road have been growing, with the number of passenger cars reaching 48.000.000 in 2020 (Umweltbundesamt 2021). Roughly 75% of miles were being traveled by car in 2018 (Nobis and Kuhnimhof 2018b). Safeguarding the growth of the automobile industry, which employs around 800.000 people, is a central goal of the German federal government (Canzler and Knie 2018). Public transport as well as cycling and walking also play a major role in everyday mobility, but are far less dominant in terms of their corresponding economic structures and political representation.

In spite of these path dependencies, some 'cracks' in the established socio-technical system of mobility have recently begun to appear (Ruhrort 2020; Haas 2020). Key practices of a low-carbon transport system (Banister 2008) – such as cycling, substitution of travel through home office and tele-meetings or using 'shared mobility services' – are moving from niches to mainstream. In many cities such as Berlin, Munich or Cologne the modal share of car trips has stagnated or has been slightly reduced, the modal share of cycling has increased, public transport demand has been stabilized, and new mobility services have emerged (Gerike et al. 2020). In Berlin, for example, the modal share of the car has been reduced from 30% in 2013 to 26% in 2018 – mostly due to an increased share of cycling (from 13% to 18%), while public transport and walking shares have been roughly stable.

Also, the 'cultural hegemony' (Brand and Welzer 2019) of the car seems to have become somewhat contested (Haas 2020): Public debate over transport policy has intensified in many cities. The German Association of Cities recently observed that in many cities, public discourse has shifted in favor of a re-distribution of public street space, e.g. through the creation of protected bike lanes on important roads (Deutscher Städtetag 2021). Since 2016, several cities have seen successful initiatives for cycling referenda, with grassroots initiatives demanding improvements for cycling and walking (Schneidemesser 2021). For example, in 2016, the grassroots initiative 'Referendum Initiative for Cycling' ('Volksentscheid Fahrrad') successfully collected roughly 100,000 signatures to demand improvements of the cycling infrastructure in Berlin. Many of its demands were later signed into law by a newly elected left-wing and green party government in 2017: the Berlin Mobility Act (Schneidemesser 2021; Becker, Bögel, and Upham 2020).

Although most of these developments have so far been concentrated in larger cities, the concept of a mobility transition ('Mobilitätswende') has become a mainstream term in transport policy discourse both on a local and national level (NPM 2021). In this context, efforts to improve alternatives to private car travel also in suburban and rural areas have been intensified. For example, the federal government recently introduced substantial means to improve cycling infrastructure especially in suburban and rural areas

(DStGB 2021). In some federal states, substantial financial support is granted to municipalities which implement flexible on-demand bus services to improve public transport access in rural and suburban settings (Ministerium für Verkehr 2020). Also, referendum initiatives for better cycling infrastructure have recently been successful in a number of smaller cities, such as Kaarst, Weimar or Lüneburg (Changing Cities 2022). Beyond local politics, the years 2018 and 2019 were marked by a growing societal awareness for climate change (Gössling, Humpe, and Bausch 2020). In a seminal ruling, the German High Court recently ruled the government's climate policy plan unconstitutional, forcing the government to formulate more radical pathways for a rapid transition to complete decarbonization (Hummel 2021).

Beginning in 2020, the Covid-19-pandemic had disrupting effects on transport demand all over the world. In some European countries, the effects interfered with ongoing transition dynamics in complex and contradictory ways (Boons et al. 2021). In Germany, public transport demand was severely reduced, while the modal share of walking and cycling increased significantly in many places (Knie, Zehl, and Schelewsky 2021). At the same time, the overall number of cars increased even during the pandemic (Statista 2022).

From the perspective of transition research, the mobility sector in Germany, while being marked by strong path dependency, has thus begun to show some signs of beginning change dynamics, especially in urban areas. Recent developments during the pandemic interfered with these dynamics, and the long-term effects cannot yet be gauged. Nonetheless, the trends described above give some indication that public debate over a mobility transition in Germany is likely to intensify in the near future. The next section suggests that discursive struggles over different visions of 'sustainable' mobility could play a key role in shaping future transition pathways.

3. Theoretical background: the role of narratives in socio-technical transitions

One of the most prominent frameworks to study the dynamics of sustainability transitions is the Multi-Level-Perspective on socio-technical transitions (MLP) (Geels 2002), which has previously been used to study sustainability transitions in the transport sector (Geels 2012; Whitmarsh 2012). At the center of the concept is the idea that socio-technical systems, such as the automobile system, are stabilized in the form of a socio-technical regime which is marked by high (dynamic) stability and strong path dependencies, thus generating high barriers for fundamental change. Despite their high level of stability, socio-technical regimes can come under pressure from two sides: On the one hand, changes in the broader societal environment of a regime, called 'sociotechnical landscape' can threaten the stability of regime structures (Geels et al. 2018). On the other hand, niche actors constantly work on innovations which can challenge the regime. It is often difficult for niche innovations to break through into mass markets, because the institutional structures of the regime are designed to support the dominant technological solutions (Geels 2014). Under certain circumstances, multi-level dynamics can open up windows of opportunity, which allow niche innovations to gain momentum and threaten the dominant regime, leading to changes in regime structures or to the establishment of a new socio-technical regime.

As research on socio-technical transitions has repeatedly shown, narratives can play a key role in negotiations over competing socio-technical pathways, which can lead to shifts in socio-technical regimes (Roberts 2015). As simplified conceptualizations of complex socio-technical projects, narratives play a central role in connecting technological

innovations with societal goals (Roberts 2015). Hajer (1995) defines 'story-lines' as '*narratives on social reality […] that provide actors with a set of symbolic references that suggest a common understanding'* (62). According to sociological approaches to technological development, alternative socio-technical futures need to be translated into 'socio-technical imaginaries' which connect technological vision to broader societal goals (Jasanoff and Kim 2016). In a similar vein, the German concept of 'Leitbild' specifies that such imaginaries need to make changes appear both desirable and achievable in order to gain financial traction and political support (Canzler 1996). From a constructivist perspective, what appears technologically or economically 'feasible' needs to be socially and discursively constructed by drawing on a repertoire of culturally shared values or meanings:

> Any social interpretation [of a technological project] must be embedded in this repertoire of social collective narratives. It is this repertoire that limits the ability of political actors–policy-makers, civil society and social movements–to make meaning of proposed policies and thus limits the space of the "politically feasible". (Hermwille 2016, 240)

In contrast to other types of discursive representations of reality, narratives can be defined as '*simple stories that describe a problem, lay out its consequences and suggest (simple) solutions*' (Hermwille 2016). Narratives can thus be seen a specific kind of element in discourses surrounding socio-technical change. They often contain references to specific actors or technologies underlining their role as 'heroes' or 'villains' in causing a certain set of problems or solving them (Gadinger, Jarzebski, and Yildiz 2014). They are thus more complex than mere slogans or descriptions, but are also more focused than the collective visions described by the term 'socio-technical imaginaries'. As such, not one narrative defines any given discourse or socio-technical imaginary.

Empirically, narratives can be extracted from broader discourses using methods of discourse analysis. For example, Roberts (2015) reconstructs specific narratives from the overarching public discourse surrounding the status of American railroads in the late nineteenth and early twentieth century using sources from newspaper opinion journalism, rail magazines, presidential speeches and congressional debates. Referring back to methods of literary studies (Gadinger, Jarzebski, and Yildiz 2014) the concept of narratives thus focusses on the realm of explicit verbal communication in the form of written or spoken statements. Interpretative methods of discourse analysis are needed to identify key narratives as recurring themes within a broader discourse.

From a critical perspective, narratives can be seen as central elements of 'hegemonial discourse', framing the goals pursued by powerful social groups as concordant with the 'common good' (Haas 2020). From a more neutral perspective, narratives can be regarded as necessary for galvanizing support for specific socio-technical visions. On a cultural level, they can contribute to a process of 'socio-technical embedding', through which alternative technologies become entrenched in social practices and lifestyles (Kanger et al. 2019). For example, as Paterson (2007) has shown, narratives formed a central element in the 'cultural politics' which ensured the dominance of private mass motorization.

Drawing on structuration theory, Hermwille (2016) argues that narratives play a key role as a link between a societal macro-, meso- and micro-level and thus between structure and agency (see also Ruhrort and Allert 2021). On a macro- and meso-level, narratives function as a 'structure of legitimation', lending meaningful explanations to (political)

decisions and existing social orders (Hermwille 2016). On a meso-level specifically, narratives can function as shared visions coordinating the efforts of multiple actors. Deuten and Rip (2000) show that a 'narrative infrastructure' can reduce complexity and uncertainty in product development processes, while Reuss (2008) argues that simplifying 'techno-tales' are used strategically by engineers when presenting technological projects to the public. On a micro-level, narratives are drawn on by actors in everyday life as a 'collective repertoire' of meaning. In everyday conversations, people draw on narratives to explain or contextualize their actions or opinions (e.g. the choice to cycle or to take the car), thus reproducing a given 'structure of legitimation' which stabilizes a given socio-technical regime (ibd.).

At the same time, Hermwille (2016) also stresses that particular narratives correspond to the perspective and the material interests of specific social actors and groups: '*Narratives stress a particular framing of a system and its dynamics, and suggest particular ways in which these should develop or transform to bring about a particular set of outcomes.'* (239) Importantly, particular narratives can '*favour certain development pathways and conceal others.'* (ibd.) In the context of political processes relating to socio-technical transitions, Roberts (2015) stresses the role of narratives, or 'story-lines' for coalition building, thus highlighting their political function: '*Story-lines facilitate different kinds of discourse coalitions, which have different perceived interests, and respond differently to political and social controversies*.' (ibd., 35) As historical studies have shown, the rise of the automobile regime was facilitated by such narratives, which helped to bring together powerful coalitions of actors (Paterson 2007; Kanger et al. 2019). As Roberts (ibd.) specifies, favourable story-lines about a regime may be deliberately crafted by regime actors to win support from the public, policy actors or other important stakeholders. For example, Henderson and Gulsrud (2019) show how liberal and right-wing political parties in Copenhagen defend the car-centric policies against left-wing cycling-oriented transport policy by drawing on a narrative depicting private cars as a necessity especially for families with children.

In transition processes, proponents of alternative socio-technical solutions will try to push narratives competing with the dominant 'hegemonial' discourse: '*Niche-technologies also require story-lines, since they are dependent on protective space that is discursively constituted. Niche actors will therefore attempt a similar simplifying exercise, aimed at encouraging story-lines about their new technology that are as promising as possible*.' (Roberts, 36) Importantly, narratives can be both 'positive' or 'negative': supporting alternatives or aiming at undermining the socio-technical status-quo (ibd.). 'Negative' narratives, if successful, may '*erode the legitimacy of incumbent industry regimes, affect financial resource flows, destabilize industrial regimes through changes in consumption patterns.'* (Hermwille 2016, 240)

As this brief overview has shown, narratives are regarded as key drivers in socio-technical transition processes. In the struggles between a socio-technical status quo and alternative socio-technical solutions, different actors and social groups will craft competing narratives to support their respective interests. This perspective highlights the fundamentally political nature of socio-technical change processes: Socio-technical change, whether in the direction of (ecological) sustainability or increasing unsustainability, depends on successful coalition building. Narratives can play in key role in bringing together different social groups by making a specific socio-technical project appear both desirable and achievable or in de-legitimizing the socio-technical status-quo.

4. Analyzing conflicting narratives of a mobility transition: suggestions for a research agenda

The theoretical considerations on the role of narratives for socio-technical change presented in section 3 make it possible to analyze the recent emergence of competing narratives of a mobility transition in Germany. As was shown in section 1, developments in the direction of a mobility transition have recently accelerated, bringing the issue of sustainable mobility to the forefront of public discourse. In this context, tensions between competing narratives of change become more apparent. For the case of Germany, other authors have already pointed out the tensions between three different conceptions of transitions towards ecologically sustainable mobility: Manderscheid (2020) differentiates between (a) a 'propulsion engine transition', focusing on decarbonization of the transport sector through new technologies such as BEVs, (b) a 'transport transition', focusing on a modal shift towards cycling, walking and public transport as well as new mobility services such as carsharing and (c) a 'mobility transition' which focusses on transport sufficiency and a reduction of travel demand (for similar differentiations see Köhler et al. 2009; Haas 2020). Building on this distinction, the following sections will point out three conflicting dimensions which are likely to play a key role in accelerating transition dynamics: relating to the question of 'green growth' versus 'transport sufficiency'; relating to the role of new mobility services in relation to public transport; as well as relating to the relationship between mobility cultures in urban centers versus suburban and rural areas. None of these issues is new to the debate on pathways to sustainable mobility. Indeed, all of these issues have been regarded as crucial by many transport scholars from the beginning of the discourse on sustainable mobility (Schwanen, Banister, and Anable 2011; Holden, Gilpin, and Banister 2019; Hesse and Lucas 1991). Yet, as I will argue, the acceleration of transition dynamics and the growing public awareness on the issue of sustainable mobility may bring these questions increasingly into the limelight of public discourse.

4.1. *Green growth versus transport sufficiency*

As the topic of sustainable mobility is increasingly being discussed in public and media discourse, a tension becomes apparent between narratives of 'green growth' versus narratives of 'mobility sufficiency' in the transport sector. Narratives of green growth stress the role of technological innovation for reaching the climate goals. An example can be found in narratives of 'sustainability through innovation' put forward by the conservative party (CDU) which also until the beginning of 2022 headed the ministry of transport (CDU 2019). This perspective, while acknowledging the importance of climate mitigation, stresses that climate goals can be reached while safeguarding the growth of the German mobility-related industries. While the terminology of a mobility transition has been adopted across the political spectrum, this narrative highlights the potential of technological innovations, such as hydrogen or connected cars, to solve the transport sustainability problems while safeguarding the growth of the German car industry (ibd.). While the conservative minister of transport has recently demonstrated increasing interest in cycling, the overall structure of the narrative does not challenge the automobile system nor the overarching paradigm of continuous growth of travel demand.

Schwedes (2011) sees this narrative of growth as a key factor in explaining the discord between ecological goals and actual transport development in Germany in the last decades. According to the author, national transport policy in Germany has for decades

been marked by a set of competing policy goals: increasing mobility as a prerequisite for economic growth and individual 'freedom' on the one hand and mitigating or reducing the harmful side effects of transport (especially climate emissions and air pollution as well as other forms of environmental degradation) on the other: '*The now hegemonic scientific transport discourse [in Germany] […] follows the idea of a sustainable development through sustainable growth*.' (17). Transport policy especially on the national level has been marked by a 'two-tracked' strategy: supporting public transport as part of a basic provision of mobility ('Daseinsvorsorge'), while at the same time massively supporting private car travel and mass motorization (Schwedes and Ringwald 2021; Haefeli 2008). Narratives of green growth can be seen as an expression of the political economy of the transport sector, in which transport policy and industrial policy are often closely intertwined (Mattioli et al. 2020). In Germany the automobile industry is in the center of attention (Sittel et al. 2020; Brunnengräber and Haas 2020), but narratives of green growth also relate to other industry sectors, such as the chemical industry (hydrogen) as well as the electro-technology (autonomous vehicles).

By contrast, scenario studies by or for the German Federal Agency for the Environment (UBA) as well as other institutions stress that an overall reduction in travel demand and in the number of vehicles sold will be necessary to reach the climate goals (Zimmer et al. 2016; Blanck et al. 2017; Agora Verkehrswende 2018; Prognos, Öko-Institut, and Wuppertal-Institut 2020). There is also a broad literature which stresses the necessity of reducing travel demand and resource intensity of the transport sector (Regling et al. 2020; Holden, Gilpin, and Banister 2019; Hesse and Lucas 1991; Schwedes 2019, 2020).

To the extent that climate goals demand a reduction of overall travel demand, they challenge some of the most fundamental paradigms of modern capitalist societies. A broad literature from sociology and human geography has highlighted the role of deep-rooted social structures in the form of systems of production and consumption, institutional settings and power relations to explain the persistence of ecologically unsustainable travel behavior (Götz, Deffner, and Klinger 2016; Manderscheid 2020; Mattioli et al. 2020). This critical view resonates with a more general critique of paradigms of economic growth. Critical scholars have stressed that Western societies are based on a system of constant growth of production and consumption, which is ecologically unsustainable (Raworth 2017; Stiglitz, Sen, and Fitoussi 2010). Recently, critical approaches from different social sciences have doubled down on this by stressing the role of overarching paradigms of economic growth as barriers to a sustainability transition in the transport sector. For example, Dörre et al. (2020) argue that the ecological crisis caused by growing emissions in the transport sector needs to be seen in the context of multiple crises, which are triggered by the inherent tensions of capitalist market systems (Dörre et al. 2020). Ecologically conscious behavior, e.g. buying fewer cars or traveling less, would directly challenge the foundation of this model of growth, especially in Germany, where the automobile industry is focused on building luxury cars (Canzler and Knie 2018). From the perspective of cultural sociology, Rosa (2005) sees the continuous growth of (travel) consumption in modern societies as the expression of a culture of constant acceleration, which individuals experience as as social norms of constant self-optimization and self-expansion (Blättel-Mink 2020). In this perspective, growing transport demand results from societal norms, which demand individual maximization of opportunities (Ruhrort and Allert 2021). Deviating from this norm, e.g. by seeking slower modes of living or by renouncing opportunities to travel, faces high barriers (Paech 2019). Brand and Wissen (2017) describe the dominant lifestyle of Western societies as an 'imperialistic lifestyle', which normalizes resource intensive consumption

such as car use in the form of dominant social representations of 'the good life' (Feola 2020). The solution is seen in reducing (mobility) consumption by embracing new concepts of a 'good life for all' with drastically reduced resource consumption (Brand and Wissen 2017; Göpel 2016).

As public debate on climate change intensifies and different pathways for a mobility transition are being debated in Germany, the fundamental question of growth versus sufficiency will become increasingly prominent in competing narratives of change. It remains to be seen if alternative narratives can bridge the gap between these different conceptions of a mobility transition. An integrative narrative may form a necessary basis for organizing the political and cultural coalitions which can push for transformative policies. A fruitful direction for future research lies in studying how different social groups, with highly unequal political and economic power, work on constructing narratives to promote green growth versus sufficiency for the transport sector. Also, it is necessary to study how narratives could be used in attempts to downplay or bridge the divide between two extreme positions, in order to build coalitions for change (Sittel et al. 2020). One recent example can be found in a position paper developed by a coalition of environmental NGOs together with several trade unions such as IG Metall as well as social welfare organizations (Bündnis sozialverträgliche Mobilitätswende 2021). The coalition explicitly acknowledges the environmental problems of the transport sector and points out the problem of excessive resource consumption and growing travel demand. Yet, no specific targets to reduce the number of vehicles produced or miles traveled are being named, thus avoiding to directly tackle the growing tension between a growth-dependent economic system and ecological sustainability goals.

4.2. *The role of new mobility services: public goods versus commercial services*

A second unresolved question in current narratives of sustainable mobility regards the role of new mobility services in relation to public transport in a future mobility system. Scenario studies estimate that in order to reach the climate goals the modal share of public transport needs to be doubled by 2050 (Regling et al. 2020; Prognos, Öko-Institut, and Wuppertal-Institut 2020). This means decreasing the modal share of private car travel from around 75% today to 50% in 2050 (ibd.). Such a strategy could entail a substantial expansion of the role of the public sector in the field of transportation. Potentially, this could lead to a process of a (partial) 'commoning' of mobility (Nikolaeva et al. 2019), withdrawing parts of the transport sector from the private market sphere.[1] The concept of a partially non-commercial transport system can build on a long tradition in Germany. As Schwedes and Ringwald (2021) have shown, public transport in Germany has from the beginning of the twentieth century been understood as a public service ('Daseinsvorsorge'), with regulatory conditions enabling municipalities to keep local public transport in the hands of municipal companies. The role of the public sector could be substantially strengthened in a climate-neutral mobility system.

At the same time, this vision leads to the question of what a future public transport system should look like: which elements and services will constitute 'public transport' in 2030 or 2050? In order to ensure high levels of mobility, many studies argue that traditional public transport will have to be transformed into a 'multioptional' transport system, combining elements of traditional bus and train service with a whole range of 'on-demand' mobility services such as car- and bikesharing as well as on-demand microtransit services (Canzler et al. 2018; International Transport Forum 2017). But there is currently no unified narrative regarding the role of these new services for sustainable mobility

(Ruhrort 2020). Unresolved questions regard the scale of these services as well as their character as either integral parts of a public transport system or as services offered by commercial actors (Pangbourne et al. 2020). As transition dynamics accelerate, the tension between public sector versus private sector led mobility futures could become increasingly prominent. The role of new mobility services in relation to traditional public transport will be a key element of emerging socio-technical imaginaries of a future public transport system.

With the recent market growth of new mobility services (Ruhrort 2020), this debate is only just beginning. Some new services such as e-scooter-sharing often feature in local media discourse, sometimes being criticized for 'littering' public space as well as for their platform-based business models (Ruhrort 2020). Other critique relates to the fact that commercial market actors increasingly engage in a sector formerly regarded as a domain of public transport as a public service (Wissen 2019). Proponents of traditional PT stress that the new services should only be allowed to complement PT in times and places of low demand (Regling et al. 2020).

On the other hand, some scenarios stress the important future role of new mobility services such as carsharing (Prognos, Öko-Institut, and Wuppertal-Institut 2020; Blanck et al. 2017; Canzler et al. 2018; Umweltbundesamt 2017). The idea of an 'individualized public transport' in the form of flexible rental services as a complement to traditional public transport goes back to the beginning of the sustainable mobility discourse (Hesse and Lucas 1991). Proponents argue that these services are necessary to adapt the concept of traditional public transport to the demands of a society accustomed to private cars. This position argues that classical PT alone will not be attractive enough to induce a major modal shift away from private car travel (Canzler et al. 2018). Potentially, such as diversified public transport system could become a new 'hegemonial project' which could galvanize support from different actors, strengthening the chances of its realization.

Regulatory reforms in Germany have recently begun to tackle the future role of new mobility services, but these show high levels of ambiguity. In 2017, the federal government passed the carsharing act, enabling cities to reserve parking spaces for carsharing vehicles. The state of Berlin, on the other hand, in 2021 passed a law which exempts free-floating services from the 'common' use of public space, making licenses mandatory and allowing authorities to limit the number of vehicles and to charge operating fees (Tagesspiegel 2021). A recent reform of the passenger transportation act (PBefG) allow shared 'on-demand' services to be offered both as part of publicly funded public transport as well as outside of it as a commercial service (BMVI 2021). This opens the gates for commercial operators to potentially seek new business models close to traditional public transport. At the same time, these services will be highly regulated, with the aim of ensuring protection for traditional public transport (Ruhrort 2021).

Behind the debate on new mobility services lies the broader question which role private market actors should play in a sustainability transition: Can private interests be 'harnessed' to push for ecological change? Or can climate goals only be reached with a transport system more exclusively geared towards public interests? In an ideal vision of 'commoning mobility' (Nikolaeva et al. 2019) new services should only be allowed as part of the PT network controlled by municipalities and federal states (Regling et al. 2020). This would ensure maximal equity as well as minimal competition to traditional public transport (Wissen 2019). On the other hand, this strategy could stifle innovation, which might otherwise help to make a future public mobility system more competitive in comparison to the car systemand offer business opportunities beyond the production of cars (Ruhrort 2020). In a more liberal scenario, private market actors could find

successful business models as an element of a mixed system of public service and commercial services regulated by municipalities (Ruhrort 2021). The debate on commercial mobility services resonates with the broader discourse on the role of private versus public sector in (ecological) innovation processes. As Mazzucato (2018) has shown, the public sector has often played a crucial but underestimated role in innovation processes. In the context of the climate crisis, Göpel (2016) argues for a re-valuation of the economic contribution of public sector services such as health-care and environmental protection. She also argues for a new framework to foster economic activity which increases instead of depletes environmental commons as the ultimate source of resources and wealth (ibd.).

In the transport sector, this complex debate is only just beginning. The underlying tension between different positions will increasingly become visible in competing narratives of change, e.g. from private mobility service providers versus municipalities. Further research should focus on how different actors' narratives frame the role of new mobility services as 'friends or foes' of public transport, cycling and walking. Research should also look more deeply into the scale of these services envisioned in competing narratives: only as 'complements' of public transport in times and places of low demand or as central elements of a future mobility system? Which actors are envisioned to provide these services: only public actors, mostly private commercial actors or a mixture of both? These different options are likely to play an increasingly prominent role in narratives of change in the mobility sector.

4.3. *Urban versus suburban and rural mobility cultures*

A third dimension of controversy in narratives of a mobility transition regards the growing differences between urban and suburban as well as rural mobility practices. In Germany, there have long been major differences between travel behavior and mode shares between cities, agglomerations and rural areas (Nobis and Kuhnimhof 2018a). Modal shares of car traffic as well as motorization rates tend to be much higher in suburban and rural areas (ibd.). Public transport plays in major role mostly in large cities. In recent years, some of these differences have become more pronounced. Modal shares of cycling have increased substantially especially in the large cities, but have decreased in many rural settings (Nobis 2019). In the major metropolises such as Berlin, Hamburg and Munich there are more car-free households, while the overall motorization rate in the country has increased (Nobis and Kuhnimhof 2018b). These trends have spilled over into local transport policy discourses in many cities (Schneidemesser 2021; Changing Cities 2022). With public debate on sustainable mobility intensifying, tensions between cities and less densely populated regions are likely to increase. Narratives of change which could galvanize broad support from diverse social groups will need to spell out how a transition to less car traffic could also work beyond metropolitan areas. As yet, there is a lack of comprehensive narratives showing how a mobility transition could unfold in suburban and rural areas.

With climate and transport policy receiving more public attention, political plans to improve public transport access also in rural areas are being put forward. Some recent studies argue that there is substantial potential for a modal shift also in smaller towns and suburban areas if public transport access in improved (Regling et al. 2020). One suggestion is to introduce mandatory minimal standards for public transport accessibility for all municipalities (Herget, Sommer, and Gies 2021). Yet, there are reasons to doubt if improvement of traditional line-based public transport service will be able to compete

with the car in these regions. Using the example of cycling in the UK, Shove et al. (2012) have shown that social practices may be harder to revive once they have fallen beneath a critical threshold. This may well be true for the use of public transport in many rural areas. On the other hand, studies argue that cycling may have a large potential especially in smaller towns, but also in rural settings, pointing to a large share of short trips in these areas (Nobis and Herget 2020). Substantial improvements in cycling infrastructure could make e-bikes play a larger role also for longer trips (Nobis 2019; Behrendt et al. 2021; Rérat 2021). As Rérat (2021) has shown for Switzerland, e-bikes tend to be used more in suburban and rural as opposed to urban areas. Also, technological trends could substantially improve the possibilities for developing integrated transport systems for suburban and rural areas. A number of studies by the International Transport Forum demonstrated how on-demand shared-taxi-services combined with traditional public transport could make its quality comparable to car travel also in wider agglomerations (International Transport Forum 2017). In the long-term, some studies point out the potential of autonomous vehicles as part of an integrated public transport network, which could improve access also in low-density areas (Infras et al. 2018). Peer-to-peer carsharing as well as peer-to-peer ridesharing, if rolled out at scale, could potentially transform millions of cars in rural areas into parts of a public transport network (Shaheen, Martin, and Bansal 2018). Yet, so far, incentives for sharing car trips in rural areas have remained low.

Thus, while substantial potentials for developing an alternative transport system suitable for suburban and rural areas exist, the challenges for a modal shift in these areas will continue to be much bigger than in urban areas (Regling et al. 2020). With transition dynamics accelerating in cities, this could lead to growing social tensions, which narratives of transitions will have to address. From a sociological point of view, Reckwitz (2020) points to a growing divide between a culturally leading 'new middle class' which is overrepresented in urban centers and a (subjectively) devalorized 'old middle class' which is overrepresented in rural settings (Reckwitz 2018). The rising political support for a less car-oriented mobility development in large cities could be seen as an expression of typical 'new middle class' values which may increasingly clash with the political and mobility preferences of the more car-dependent 'old middle class'. If a mobility transition is to be supported by broader segments of the population, narratives of change will have to provide visions of alternative mobility solutions which can also appeal to non-urban settings (Sittel et al. 2020). Future research should study more closely how the urban-rural divide is tackled in narratives of change for the transport sector. Potentially, this divide can be used to stress that cars will remain important and to downplay the potential of public transport and cycling as the backbone of a future mobility system. Successful coalition building for a transport transition may depend on narratives which argue that sustainable mobility is also possible beyond city centers.

5. Conclusions

The previous sections have presented three conflictual dimensions which are likely to play a central role in the next phase of a mobility transition in Germany, but also in other European countries. As transition dynamics accelerate, a broad spectrum of social actors is working on different narratives, spelling out pathways for a transition to a more sustainable transport system. As the theoretical accounts presented in section 3 have shown, such narratives could play a key role in galvanizing support for a mobility transition and the related political agendas. Yet, at the moment, the socially embedded meaning of this

transition is still undefined in major aspects. While some actors push narratives of 'green growth', in which new technologies such as automated vehicles, drones or hydrogen-powered vehicles will leave overarching paradigms of economic growth intact, competing narratives stress that a future mobility system needs to aim at decreasing travel demand and the overall number of vehicles. Some narratives stress the important role of new mobility services such as carsharing for a future transport system. As commercial services, these would offer business opportunities for old as well as new players in the emerging market of 'mobility as a service'. Competing narratives see the opportunity for a deep-rooted de-commodification of the transport sector through the rise of traditional public transport, cycling and walking. As a third unresolved issue in current narratives of a mobility transition, the article pointed to the growing divide between urban versus suburban and rural mobility cultures. Current narratives have not yet been able to convincingly spell out a vision of future mobility which might make a transition appear both desirable and achievable also in less densely-populated areas.

On this basis, the article argued that emerging narratives of a mobility transition will increasingly have to address all three of these divides. The aim of the article was to show that this opens up fruitful avenues for further research into emerging competing narratives of mobility transitions. As transition dynamics accelerate, it will be important to map out the emerging 'discursive battle ground' of mobility politics. It can be expected that political parties as well as other social groups will intensify their efforts to build coalitions to steer a beginning transition into one or the other direction. Research on socio-technical transitions in this field should increasingly focus on the different sets of actors and their vastly differing power to shape those narratives (Beck et al. 2021) – the automobile industry being an example of a powerful actor pushing narratives of 'green growth'. Competing narratives of change may play a central role in deciding which version of a future mobility system will gain broad political support and become reality.

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Note

1. This also has implications for the future role of automated vehicles – either as parts of an expanded public transport system or as private vehicles (Canzler, Knie, and Ruhrort 2019).

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