8. Mapping destabilization journeys in urban mobility systems

The case of Hamburg

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Introduction

Positioned at the juncture between the persistent forces for transformative change and the obduracy of established systems, urban areas are increasingly understood as promising yet highly contested spaces for transformation towards sustainability (Bulkeley et al., 2014; Rutherford and Coutard, 2014). The growing tensions between the lock-ins inherited from the past and the ambitions for a different future are particularly present when considering urban mobility systems. At the centre of these tensions is the car. During the 20th century, riding on the back of promises of freedom and progress, planners set about transforming urban environments into car-centric cities: cities designed and built around the personal motorized vehicle as the dominant, and in some cases the only legitimate, mode of transportation (Sheller and Urry, 2000). In recent decades, these promises seem to have faded, while the ubiquity of the car in urban life appears to have stabilized as part of the 'system' (Urry, 2004) or 'regime' (Böhm et al., 2006) of automobility, along with its many consequences. In Europe, there is an estimated €409 billion in externalized costs of car and motorcycle usage annually, mainly due to their disproportionate contribution to 'accidents', but also to local air pollution, climate change, noise pollution, and habitat damage (Heinrich-Böll-Stiftung, 2021). However, car hegemony also has far-reaching consequences that extend beyond those that are easily quantified, such as the segregation and the fragmentation of social practices that once occurred in shared public spaces (Sheller and Urry, 2000).

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Despite a growing understanding of these issues, car hegemony prevails in most urban areas globally. This paradox has inspired a vast body of literature to understand how and why the car maintains its privileged status despite its built-in antagonisms (Sheller and Urry, 2000; Urry, 2004; Böhm et al., 2006). Yet due to changes in recent decades, it appears that the privileged position of the car is under pressure. Researchers highlight the emergence of 'cracks' in the regime (Geels, 2012; Ruhrort, 2020) and challenges to the car's culturally hegemonic status (Haas, 2020; Ruhrort, 2022). This pressure is particularly present in urban areas, with the emergence of concepts for more sustainable, liveable, and healthier cities (Nieuwenhuijsen, 2021). These alternative urban mobility futures seem to be more and more incompatible with the prevailing automobility imaginary (Braun and Randell, 2023), creating conflicts between the locked-in material, institutional, and cultural arrangements of the past and the aspirations for more just and sustainable urban futures.

In light of these changes, to what extent can it be said that the locked-in arrangements around car-based automobility are becoming destabilized? This question is aligned with an emerging strand of research that responds to a prevailing overemphasis on novelty and innovation in transformation-oriented research (Shove and Walker, 2010; Turnheim and Geels, 2012). However, a growing body of research is engaging with questions around how technologies, social practices, the use of particular substances, etc. decline or are discontinued or how the socio-technical systems that hold them in place become destabilized (Shove et al., 2012; Turnheim and Geels, 2012; van Oers et al., 2021; Koretsky et al., 2023). Contributing to these emerging debates, I argue for a need to place an emphasis on the importance of multi-scalar investigations of processes of destabilization and make a case for investigations into these processes on the local level. As Fuenfschilling and Binz (2018) argue, investigations into socio-technical change are influenced by an implicit methodological nationalism: a tendency to take the nation-state as the unit of analysis to investigate socio-technical change. I contend that, like investigations into innovation journeys, there is value in a multi-scalar understanding of destabilization processes. There is a contradiction in calling for a multi-scalar investigation into destabilization processes and proceeding to explore exclusively the local scale. However, whilst still appreciating that automobility regimes extend beyond the local scale, I argue that the local level can be a helpful starting point and/or additional perspective to shed light on the emerging tensions between locked-in arrangements and ambitions for desired socio-technical change and consider potential avenues for unlocking car-based automobility. The spatial diversity

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in aspects such as pressures to transform, population density, access to alternative transport modes, levels of car dependency, engaged civil society, etc. is highly place-specific. While conflicts and their underlying drivers extend beyond the local, they are experienced locally and these experiences can be an important source of political mobilization. Therefore, as is the case for other foci on socio-technical change, place, space, and scale matter when considering destabilization (Hansen and Coenen, 2015).

This chapter aims to explore the utility of investigations into processes of destabilization of urban car-based automobility in one particular urban context: the city of Hamburg, Germany. Through historical reconstruction, I map central changes in the local arrangements that have governed urban mobility in the city since an identified historical turning point in the late 1970s. Building on concepts from Turnheim (2023), I identify mounting *pressure fronts* (as quasi-manifestations of conflicts) within the prevailing arrangements and corresponding *incumbent responses* to the mounting pressures. Methodologically, the research attempts to operationalize these concepts to assess their usefulness for investigating the broad contours of socio-technical destabilization processes. Drawing on changes to the incumbent responses, I identify five phases which help map the changing strategies of incumbents to *accommodate*, *ignore*, *mobilize*, *divert*, and *transform* the mounting pressure fronts. Empirically, the research exposes underappreciated historical developments in the governance arrangements around urban mobility in Hamburg.

From innovation to destabilization journeys in socio-technical systems

Growing awareness of the gravity of the multiple social and environmental crises that humanity faces, combined with the insufficiency of the hitherto societal responses, has given rise to diverse research communities crossing multiple disciplines that focus on questions of transformative change. What these communities typically have in common is an understanding that grand societal challenges cannot be effectively tackled through incremental changes or technological solutions alone, but require deeper and more fundamental shifts in how humans exist. One such community, working under the banner of 'sustainability transitions', sees value in centring investigations into transformative change on the 'meso' level of socio-technical systems (Geels, 2004). This means (1) appreciating that social and technological systems are

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so deeply intertwined that it is more helpful to consider them collectively and (2) considering that systems of provision (food, mobility, housing, etc.) can be a productive analytical focus to conceptualize and identify the mechanisms through which radical transformations can take place in the way these systems of provision are organized (Köhler et al., 2019).

On the flip side of this work are questions around why such transformations are *not* taking place despite the growing pressures for change. There have been helpful conceptualizations of so-called *path dependencies* and *lock-ins* (Unruh, 2000; Seto et al., 2016): These forces dynamically stabilize the prevailing arrangements, holding (often unsustainable) arrangements in place. Whilst these are helpful concepts, all too often they are considered primarily as an obstacle along the path of some predefined innovation journey (Turnheim, 2023). To compensate for this bias, researchers have begun to shift their perspective towards the mechanisms and agency underpinning the stability of locked-in constellations and improving conceptualizations of the power at play in the reproduction of such lock-ins as well as avenues for their unlocking (Stirling, 2019; Kok et al., 2021). One manifestation of this shift in perspective can be seen in the increased interest in socio-technical destabilization.

Turnheim (2023) offers an overview of the core notions in the emerging work on socio-technical destabilization. He describes it as a 'longitudinal process by which otherwise relatively stable and coherent socio-technical forms […] become exposed to challenges significant enough to threaten their continued existence and their "normal" functioning triggering strategic responses of core actors within the frame of existing commitments (preservation) and in certain circumstances away from such commitments (transformation)' (Turnheim, 2023: 45). To understand the sources of stability, investigations into destabilization will typically start by identifying the prevailing structural and enacted forms of lock-in and path dependency. While previous work has exposed many forms of lock-in and path dependency, certain formations – particularly those with strong political, institutional, and cultural dimensions – remain particularly difficult to pin down (Simoens et al., 2022; Turnheim, 2023). Without playing down the power of such forces, it is important to recognize that *un*locking does occur (Turnheim, 2023). Sources of destabilizing change could constitute '(1) technical dysfunctions, technological discontinuities or performance erosion, (2) social and political mobilization, delegitimation, the emergence of new rules or the breakdown of existing

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rules, and (3) challenges by new actor coalitions, the disbanding of existing coalitions or the accumulation of poor strategic choice' (Turnheim, 2023: 48).

Turnheim (2023) also emphasizes the role of those who hold positions of power within socio-technical arrangements: the so-called incumbents. The notion of the 'incumbent actor' is often used as a shorthand for powerful actors that stand in the way of desired socio-technical change (Turnheim and Sovacool, 2020). Powerful actors do play a central role in bringing about and inhibiting change. However, there are different forms of power to be considered through which arrangements are challenged and reproduced (Avelino and Rotmans, 2011). Therefore, the prevailing arrangements are maintained and challenged by many types of actors in many areas of social life (Stirling, 2019). Another common misconception about incumbents is that their role in transition processes is strictly to buffer the pressures to inhibit change. However, strategies employed by incumbents can be more extensive and can range from purely resistive positions to more proactive approaches and can differ greatly from one actor to another (Turnheim, 2023).

These insights provide a helpful starting point for investigations into processes of socio-technical destabilization. They do not provide a clear theoretical framework that can be easily applied to investigate such processes. On the contrary, they remind us that such processes are highly complex and context-specific, and that if analytical scopes are set too narrowly, important factors can be lost. The sources of (de)stabilization can be more or less structural, enacted, and/or elusive, and these can change over time. Therefore, there is a trade-off between getting the kinds of high-resolution perspectives that are necessary to trace the processes through which destabilization occurs and appreciating the (likely broad) spatial and temporal sources of destabilization.

Case and methods

The city of Hamburg is Germany's second-largest city, with a population of just under 1.9 million in 2023 (5.4 million if the broader metropolitan region is considered) (FHH, 2023). Hamburg is considered an important hub in the European trade and transportation network, and the city's port has historically played an important role in shaping the city physically, economically, and culturally (Lieber, 2018). Planners and politicians alike also strive to live up to the city's image as a 'green', 'inclusive', and 'growing' city by the water (FHH, 2014). This relates both to maintaining and improving its physically green

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spaces and urban nature, and also to sustainability ambitions more broadly. The city has committed to achieving climate neutrality by 2045 as part of its climate protection plan (FHH, 2019a), and it was crowned the 2011 European Green Capital. Tensions between the often contradictory ambitions around economic growth and environmental protection have a long history in the city (Bauriedl and Wissen, 2002). Furthermore, Hamburg's status as both a city and a federal state (*Bundesland*) provides relative political autonomy for actors engaged on the municipal level to shape institutional arrangements and development direction. These factors – the strong tensions between the priorities of economic growth and sustainability and the relative independence of the city's decision-making bodies from the nation-state – make Hamburg a very suitable case for investigation into destabilization processes at the local level. If such processes occur and matter on this level (and do not, for example, just trickle down from higher governance levels), it can be expected that they can be observed through investigation into this case.

A case study is conducted as a research strategy to gain a full insight into one or several objects or processes confined in space and time (Verschuren and Doorewaard, 2010). As a first step in this case study, two 'helicopter' interviews (Hajer, 2006) were conducted with senior academics who have an overview of the historical development of the urban governance arrangements around urban mobility in Hamburg. Additionally, 24 semi-structured interviews (approximately 90 minutes in length) were conducted with individuals (15 male and 9 female). Interview partners include retired practitioners (4); current practitioners from a range of transportation and urban planning organizations (13); representatives of civil society organizations (3), and academics (4). The limits of the municipal administrative area were considered as a general spatial boundary. However, as the mobility system extends beyond the municipal borders, what is considered to constitute Hamburg's urban mobility system was left open to the interpretation of interview partners. In terms of temporal demarcation, the overall duration of a process of destabilization depends largely on 'when one counts' (Sovacool, 2016; Turnheim, 2023). Therefore, an inductive approach was taken to identify one particular turning point away from car-centric urban development – a perceived 'high point' of car-based automobility in this context – and then elicit development phases from that point until the present.

The approach utilizes an abductive methodology moving between observations in the data and the concept development in iterations (Charmaz, 2014). I draw upon four concepts, as articulated by Turnheim (2023), deemed help-

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ful for this investigation. First, I consider the dialectical relationship between (1) *weakening continuities* (the erosion of the ties that hold locked-in arrangements together) and (2) *intensifying discontinuities* (threats and challenges to the prevailing arrangements) (Turnheim, 2023: 49). In appreciation of this relationship and the multitude of forces at play when considering socio-technical change, I further draw on the notions of (3) *pressure fronts* (observable emergent tensions) and the corresponding (4) *strategic responses* of incumbent actors to these mounting pressure fronts (Turnheim, 2023). These were not operationalized through the development of indicators that would constitute evidence of their occurring. Rather, they were considered sensitizing concepts (Charmaz, 2014) to investigate destabilization processes openly and inductively over long periods. Beyond striving for a broad range of actor perspectives, the approach sought to triangulate different sources of data, particularly transport development plans and other municipal strategic documents (Patton, 2015: chap. 9). References are made to specific interviews[1] or documents when possible, suitable or necessary.

Destabilization of urban automobility in Hamburg

A clear turning point away from car-centric urban development in Hamburg can be seen in the public opposition that emerged in response to the planned expansion of the street network that was articulated in the city's General Transportation Plan (Generalverkehrsplan, GVP) of 1976 (FHH, 1976). Attempts to implement the plan in the following years, which would have meant deep cuts in densely settled urban areas to make way for large-scale motorways, were met with strong public opposition, sending a message to politicians and planners alike that such projects to meet growing rates of motorization had become an impossibility (RP1; RP3; RP4).

1 References have been anonymized according to the following codes: P = practitioner, RP = retired practitioner, CS = civil society (NGO), A = academic. The abbreviation is followed by a number producing a unique code for each interview partner.

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1976–2001: *Accommodating* metropolitan development through incremental changes

Population decline and the regional relevance of the port during the Cold War had been playing a central role in Hamburg's urban governance since the 1960s. The city was characterized by growing unemployment, with a turn towards stronger economic growth first emerging in the 1990s. Transportation planning was embedded in the Department for Economic Development (Wirtschaftsbehörde), as transport was understood as imperative for an effectively functioning port and economy more broadly. Due to public opposition to the 1976 plan, the mandate for the unfettered development of the city's street network was lost despite growing motorization rates and suburbanization, and planners were forced into a piecemeal approach to traffic planning (RP1; RP3). Some central projects from the 1976 plan became institutionalized through separate legislation or integrated into the city's land-use plan, leading to the incremental expansion of the road network and the extension of certain rail lines (RP3; RP4). The approach still aimed to maximize performance in terms of movement of goods and people, but planners were presented with obstacles when doing so. With the growing awareness of the problems associated with auto-centric urban design, the image of the car as a symbol of progress and freedom was in decline (P2; RP3). This emerging realization of the mistakes of the preceding decades manifested in wider public discourses as critical questions were being asked about the type of city inhabitants wanted to live in (P2; RP3). Localized initiatives and individuals began pushing for low-car and traffic-calming measures in their places of residence, work, and study (RP3; A2).

In the late 1980s, planners began experimenting with speed limits, specifically focusing on residential areas (P2; RP3). Through parking controls in the city's core, and the establishment of park-and-ride (P&R) facilities, there was a steady shift towards commuting by car to public transport. Maintaining Hamburg as a strong metropolitan area was ideologically a central building block of the social democratic project of the ruling Social Democratic Party (SPD) (A2). This helped justify the expansion of the road network (as well as the public transport system) to connect the inner city to the surrounding regions. Recognizing the challenges of negotiating the increasing tensions and conflicting goals in transportation development in a growing city, policy-makers opted to develop a Transport Development Plan (Verkehrsentwicklungsplan, VEP) during the 1990s, which proposed further instruments to encourage modal shift

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(FHH, 1999). The *Veloroute* (cycling network) concept was also developed in the '90s, with the first route completed in 1999. However, these early signals of the re-emergence of cycling were primarily because of activities outside of the formal planning arrangements. Within formal transport planning circles, cycling was largely neglected as a credible form of transportation during this period (CS3; A2; A4; P2; P5).

2001–2008: Hamburg first – *neglecting* the metropolitan project

After the city election in 2001, the centre-left SPD was forced into opposition for the first time since World War II. The conservative Christian Democratic Union (CDU) took over leadership, initially in coalitions and later governing alone from 2004 to 2008. Metropolitan development – connecting the city with its surrounding areas – was strongly associated with a social-democratic project embedded in a general framework of Fordist ideology: a car for every worker and the freedom to move around was a central promise to the working class in the decades prior (A1; A2). Signalling a shift towards more neoliberal logics, the new coalition was less interested in maintaining that project. This manifested in a relative indifference towards projects that would better connect the inner city and outer suburbs (whether by road or public transport) in favour of promoting growth in the urban core (A1; A2).

In terms of municipal organizational structure, transportation planning was separated from economic development to join construction in the Department for Construction and Transport (Behörde für Bau und Verkehr) and in 2004 joined the Department for Urban Development and Environment (BSU), which centralized key public authorities around urban development. The newly formed government disregarded the earlier transportation development plan and abandoned initiatives to promote cycling and reintroduce a light rail network. A selection of the planned motorway projects and extensions to the rail network (which were present in the initial plan) were continued, maintaining the overall development trajectory but forsaking early efforts to encourage modal shifts in transportation (P4; RP3). A new rail line (U4) was planned to link up the newly developing HafenCity largely because of pressure from developers of the new district (RP3). The period also saw growing pressures from other governance levels through European laws that set standards for local air and noise pollution.

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2008–2011: The just-do-it interlude – *mobilizing* unsuccessfully

In 2008, the conservative CDU entered a coalition with the environmentally progressive Green Party, which required agreement on a series of contentious projects, including a range of motorway developments. In exchange, the Greens successfully negotiated a range of key projects of their own, as well as control over the influential BSU. This included the establishment of the Cycling Forum (Fahrradforum), through which the city's first cycling plan and a city-wide bike-sharing system would be developed. The unconventional coalition was understood as a marriage of convenience despite some common ideological ground around the 'creative city' (Landry, 2008; A4). The powerful position held by a Green senator in the BSU led to a strategy less focused on long-term planning as much as it was on implementing initiatives to establish concrete results (A1). However, this approach encountered formidable challenges, with two of its central projects faltering in their advanced planning stages: a shared space concept and implementation of the planned light rail system. These were both physical interventions in urban space, and they encountered significant local opposition from residents and businesses in the targeted development areas.

2011–2020: *Diverting* towards economic growth through ITS

The election of 2011 marked an important ideological turning point as the SPD returned to power, winning an absolute majority. Coinciding with mounting pressure on the city to address air quality issues, driven largely by the threat of lawsuits for systematic non-compliance with European air quality standards, the newly elected government embraced the concept of intelligent transportation systems (ITS) and smart cities (A1; RP2; RP3). Not only did ITS carry lofty promises to improve traffic flow and mitigate the negative effects of transportation, but it also promised an avenue for economic development (A1). Hamburg was thus announced as 'open for business', as companies were invited to test smart mobility solutions in the city (A1). During this time, the meaning of transport planning was further broadened beyond the creation of infrastructure to include the management of real-time traffic flows and mobility management (A1). Notably, citing budget restrictions, the SPD abandoned the light rail project that was developed under their leadership during their previous term in power. This excluded it as a potential consideration in

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the transportation strategy, and the leadership instead opted to optimize the existing bus network.

These ideological shifts were manifested in the city's organizational structure. Transportation re-joined with economic development in the Department for Economic Development, Transport and Innovation (BWVI). The BWVI was consecutively led by two independent senators with close ties to the private sector, although much of the ongoing smart mobility activities were directly managed by the mayor's office (A1; RP4). Several letters of intent (LOIs) were signed between the city and companies. The mayor himself was involved in establishing the Platform for Urban Mobility (Plattform Urbane Mobilität), bringing together a range of German cities and representatives from the automotive industry, among others, to envision the future of urban mobility centred on ITS (P1). In 2014, a master plan for the city's e-mobility charging infrastructure was developed (P1). In 2015, the senate published a digital city strategy, followed by an ITS strategy the next year, including the establishment of an ITS project management office to organize activities around smart mobility in the city. Swift action was taken to modernize the city's outdated or non-existent traffic management systems, piggybacking on Hamburg's successful bid to host the 2021 ITS World Congress to justify investments in traffic management technology (RP2; P1) and the implementation of a range of urban testbeds to experiment with new mobility services and autonomous vehicles.

The Transport Development Plan (VEP) was reintroduced as an instrument for long-term planning and coordination. Additionally, a Mobility Advisory Board (Mobilitätsbeirat) was established within the framework of transportation development planning. This board was designed to integrate a broad group of stakeholders from politics, the administration, business, research, and selected civil society organizations to steer the development of the ongoing planning process (FHH, 2013).

After the election in 2015, the SPD could not maintain their majority alone and went into a coalition with the Greens. This coincided with the announcement of plans for a new heavy rail line (U5) and the role of cycling coordinator becoming formalized in the transportation department. The following year, the Alliance for Cycling (Bündnis für den Radverkehr) was endorsed by senate representatives, borough offices, councils, and the mayor to commit to developing Hamburg into a 'cycling-friendly city', striving to increase its modal share of cycling to 25%. Together with the public transport authority, an 'offer offensive' (*Angebotsoffensive*) was proposed as a means to create a 'real alternative to the car' through the improvement of public transport and on-demand shuttles,

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vehicle and ride sharing, and other mobility services (FHH, 2019b). In 2019, 200 experts and around 8,000 other visitors came together in the Bauforum workshop to contribute to the development of a master plan for the city's main arterial roads, reimagining them as *Magistralen* that would 'put people first' (RP4; A2; BSW and Meyhöfer, 2020).

2020–2024: Reimagining 'smart'– *mobilizing* and *transforming*

An election in 2020 followed significant environmental protests in the city throughout 2019. The Greens experienced a notable surge in election results, nearly doubling their voter share to 24%. The emergence of a new Greens-led organizational entity, the Department for Transport and Mobility Transition (Behörde für Verkehr und Mobilitätswende, BVM), once again separates transport from economic development, establishing it as an independent department with '*Wende*' ('transition' or 'turnaround') imprinted in its title. This signalled change, fostering a new culture within the mobility department characterized by an ever-growing new generation of planners whose education extended beyond conventional transportation planning to consider more integrated perspectives on urban development and sustainability (P4; A1).

There was an important shift in the framing of ITS. The new perspective decentres the car and integrates the improvement of public transport and cycling more explicitly (FHH, 2016; 2021). The *Hamburg-Takt* became a central coordinating vision: a goal to offer every city inhabitant a mobility connection within 5 minutes of their location to anywhere else in the city through enhancing the public transportation network and integrating on-demand services. A commitment to the further development of the city's shared autonomous vehicle project was formalized through the signing of a declaration of intent between the city and national governments, aiming to position Hamburg as a Metropolitan Model Region of Mobility. Through this agreement, a goal was set to have up to 10,000 autonomous vehicles on Hamburg's streets by 2030, serving as a modern on-demand transport service. Traffic calming in the inner city was also expanded and certain areas were made car-free. Though not uncontentious, decades of incentives to encourage modal shifts for inner-city commuting helped justify these measures (A2).

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Table 1: Overview of the phases.

Period	Phase	Party Control	Formal Institutional Arrangements	Mounting Pressure Fronts	Incumbent Responses
1976–2001	*Accommodating* Metropolitan Development through Incremental Changes	SPD (coalitions with FDP, STATT, Greens)	Transport embedded in Dept. for Economic Development (Wirtschaftsbehörde)	Public demand for better cycling infrastructure, safer streets, and enhanced liveability; decreasing importance of cars as a symbol of progress; growing congestion; limits on road expansion; environmental protection institutionalized	Parking management and park-and-ride; traffic calming in residential areas; incremental expansion of public transport and streets; light rail network planning; long-term planning through Transport Development Plan (VEP)
2001–2008	Hamburg First: *Neglecting* the Metropolitan Project	CDU (coalitions with Schill, FDP)	Transport joins Construction Dept. (Bau und Verkehr); later Urban Development and Environment (BSU)	Intensification of pressures, including lawsuits for forced bike-lane use and compliance with EU noise and air pollution standards	Abandonment of previous transport plans, maintaining selected projects; incremental public transport and street network expansion; rollback on metropolitan development; neglected street maintenance; discontinuation of light rail and cycling infrastructure upgrades

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2008–2011	The Just-Do-It Interlude: *Mobilizing* Unsuccessfully	CDU (Green coalition)	Green control of BSU	Opposition from local businesses and residents; citizen-led referendum against light rail; budget constraints	Incremental expansion of public transport and street networks; implementation of shared space and light rail projects; development of a cycling plan and establishment of a cycling forum
2011–2020	*Diverting* Towards Economic Growth through ITS	SPD (Green coalition from 2015)	Transport reassigned to Dept. for Economic Development, Transport, and Innovation (BWVI); new organizational units for ITS World Congress	Budget constraints; referendums for green space protection and improved cycling infrastructure; legal threats over air quality; district-level experiments with car-free or low-car initiatives; climate plan and large environmental demonstrations; reimagining *Magistralen*	Mobility management and ITS; experiments with mobility services (autonomous vehicles, ridesharing); 'Offer Offensive' in public transport; revival of long-term transport planning (VEP); formalization of objectives and advisory board; institutionalization of cycling promotion
2020–2024	Reimagining 'Smart': *Mobilizing* and *Transforming*	SPD (Green coalition)	Transport reassigned as an independent department: Transport and Mobility Transition (Verkehr und Mobilitätswende)	Space availability (e.g., parking vs. blue/green space); sector-specific climate goals; opposition to parking management	Reframing 'smart' with public transit and cycling prioritized; redistribution of space (car-free zones and temporary bike lanes); unsuccessful attempt to expand parking management and speed limits; pledge of up to 10,000 autonomous vehicles by 2030

Source: Author.

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The incoming Green senator and cycling coordinator prioritized the improvement of the cycling infrastructure, supported by the established Alliance for Cycling and substantial grassroots pressure through the *Radentscheid*, a citizen-initiated referendum demanding improvements to the city's cycling infrastructure. While previous attempts to implement the *Veloroute* concept faced frequent local opposition, the reduction in commuter traffic and the shift to remote work during the Covid-19 situation provided planners with an opportunity to implement and expand street space redistribution through 'pop-up' bike lanes. This became feasible in streets where such interventions would have encountered substantial opposition only a few years prior (P2; RP2; CS3). The significant physical transformation of the cycling infrastructure in a relatively short period was seen as somewhat radical by some (RP1; RP3). For others, it merely compensated for decades of neglect of cycling as a legitimate transport mode (P5; CS3).

Local dimensions of socio-technical destabilization

The introduced developments demonstrate that there have been significant changes to the governance arrangements around urban mobility in the city of Hamburg since a turning point in the late 1970s. Since that moment, the automobility regime has been exposed to mounting pressure fronts, with the array of problematized issues also widening over time. Initially, pressures were mainly about congestion, death and injury, and local air quality, while more recently, the scope of problems has widened to also include climate change, space scarcity, and broader questions of environmental health, quality, and justice. Throughout the observed period, five phases can be identified, reflecting changes in the incumbent response to the mounting pressures. Responses have ranged from incremental efforts to *accommodate* the mounting pressure fronts (1980–2001); to largely *ignoring* them (2001–2008); to *mobilizing* them unsuccessfully (2008–2011); to *diverting* them through reimagining the problems as new opportunities for economic growth (2011–2020); to *transforming* them into physical changes in the urban fabric (2020–2024). Each phase has its path dependencies. To name just a few examples, the implementation of car-free inner-city areas was supported by decades of incentives to discourage car travel into the city centre (A2). Rising maintenance costs to compensate for neglect of infrastructure in the 2001–2008 period contributed to budget restrictions which were a barrier for the implementation of the light rail and

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shared space projects in 2009–2011 (A1). The embracing of ITS and associated projects in the early 2010s created a pathway through which the promised 'mobility transition' a decade later brought with it the involvement of Germany's largest car company in the local governance arrangements (VW through its subsidiary MOIA). Nevertheless, there is also scope within incumbents' respective terms to shape the mobility arrangements and change direction.

The turning points are typically the product of changes in government or coalition partners. Based on these patterns, it might be tempting to assign too much responsibility for changes to the government in power. However, the case shows that important shifts (such as infrastructural and technological decay, civil society organization and mobilization, staff turnover, changes in other urban contexts, etc.) are constantly influencing the governance arrangements and play a role as well. Often, the change in government and the associated reshuffling of formal institutional arrangements reflect an opening of the metaphorical floodgates, bringing about a more rapid change of direction. Formal reshuffling can also have the opposite function of stifling or diverting emerging pressures for change into other political topics (e.g. economic growth). Nevertheless, shifts are indeed clearly marked by elections, emphasizing the importance of formalized local politics and formal institutional arrangements in processes of destabilization.

To exemplify the importance of locally embedded and dialectical dimensions of *weakening continuities* and *intensifying discontinuities* that play a central role in the emergence of pressure fronts, in the following section, I bring to the fore two concrete examples that can be drawn from the case. It is important to note that these are multi-scalar in that they have both endogenous and exogenous dimensions but that they are enacted and institutionalized (or mitigated and resisted) locally.

Weakening continuities through shifts in planning logics

Changes in the logics that underpin transport planning reflect important examples of weakening continuities. One example is the weakening in the supremacy of absolute traffic performance or 'efficiency' (*Verkehrsleistung*) and a shift towards a broadening of evaluation criteria. Traffic 'performance' has typically been understood primarily in terms of efficiency in a very narrow sense, leading transport planners to focus primarily on improving traffic flow, congestion, travel time, and overall system capacity (Banister 2008). This can lead to the counterproductive assumption that if a system is delivering

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maximum movement in terms of distance travelled per capita, this system is performing better than one in which there is less physical movement, even if the latter might deliver all necessary and desired trips in a safer and more environmentally friendly manner. The dogma of traffic performance and its underlying assumption that increased efficiency is inherently desirable appears to be shifting, partly through the lessons learned from other urban contexts:

> We had a brief conversation with a colleague from Vienna who is responsible for transport planning […] and she told us […] they don't actually look at the efficiency [*Leistungsfähigkeit*] of […] intersections when they are being rebuilt because even if it goes down, that's the goal. […] In order to encourage fewer people to drive, we no longer want to be so efficient.[2] (P4)

Transport planners have an important role in determining the future mobility arrangements of urban developments by anticipating dimensions such as future traffic volumes, modal split, and car ownership rates. In recent decades, there has been a shift from anticipating these factors to prescribing them, with the underlying objective of minimizing the role of the car in future arrangements. This has been supported by local legislative changes offering more flexibility on parking minimums that give planners the freedom to make these decisions, but also through planners' changing perceptions about what is plausible in terms of minimums on car ownership and use. This has partly been spurred on by car-sharing organizations, which have demonstrated that their services can offer the same mobility with significantly fewer vehicles through modelling exercises (P2; P3). These changes are evident in the layers of development behind a large urban development project, the Leap Across the Elbe. This development began with the building of the HafenCity district in the early 2000s with remarkably low ambition in terms of prescribed car ownership and use and has now become progressively more ambitious:

> I think that is what the car-sharing providers are saying: '100 to 105 vehicles per 1,000 inhabitants and we can organize everything for you.' And that would be 0.2 [parking spaces per residence], and that's Grasbrook. […]

2 Interviews were conducted in German; interviews and non-English quotations have been translated by the author.

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> In 2000, we had a parking space ratio in the HafenCity of 1 to 1.5 per residential unit, i.e. built in Kaiserkai. And now we're doing 0.4 in the eastern part. Yes, that's also a huge step. That wouldn't have been possible back then. (P2)

These are manifestations of a departure away from logics of 'predict and provide', a shift that has been common knowledge in mobilities research for some time (Banister, 2008). However, there appears to be a difference in how long it takes for such paradigm shifts to make their way into the day-to-day activities of practitioners and to what extent they do so. In Vienna, for example, according to the quote, planners aren't looking at efficiency at all, and they have an *explicit* goal of reducing efficiency. In Hamburg, efficiency is apparently still important, but not as central as it had been.

Intensifying discontinuities through a broadening opposition to the car

Pressures on the prevailing governance arrangements have largely been driven by an ongoing and consistently growing local opposition to auto-centric urban planning. Although not only targeting the transport sector, a growing environmental movement has been central to the problematization of the negative impacts of the car. Indications of the institutionalization of the movement in the local governance arrangements can be seen in the rise of the local branch of the Green Party and the professionalization of a range of local NGOs (CS1; CS3). Growing environmental awareness has also been institutionalized in the city bureaucracy. Management of environmental issues began formalization from 1978, becoming the Department for the Environment (Umweltbehörde) in 1985 and gaining further competencies (water, energy, and waste management) in 1987. The department developed strategies for environmental protection (e.g. noise pollution, local air pollution, climate change mitigation and adaptation, green space protection, etc.). An independent Department for Urban Development (Stadtentwicklungsbehörde) was formed in 1991, marking a moment of institutionalized weighing up of an ever-growing list of urban priorities and their consideration in spatial terms (RP3). While it is impossible to account for all the work of these institutions over the period investigated, the recent Master Plan for the city's main arterial corridors, reimagined in the plan as '*Magistralen*' (as a callback to the pre-car-centric terminology), is one example of how the work of these organizations directly challenges the prevailing automobility regime. These major thoroughfares facilitate most of the

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road transportation to and from the city centre from the urban peripheries. Through the process of motorization throughout the 20th century, their monofunctionality purely to facilitate traffic has made them normalized keystones of the city street network. However, urban planners have recently embarked on an initiative that builds on a large-scale visionary workshop (Bauforum) to transform precisely *this* space.

> If you look at what is being created as a vision […] you can see in this [Magistralen] Master Plan that all the authorities are involved and it's no longer just some crazy ideas from the Bauforum. Then you suddenly see that […] these major thoroughfares have been reduced from four lanes to two lanes with two lanes of greenery. […] I was totally surprised when I saw this the other day because it means that the transport department is somehow supporting this. (RP4)

> Actually, the idea of replanning the main roads, […] that was actually the first visible confrontation against the old orientation, which was to optimize commuter traffic as much as possible, and to relativize it this time. In other words, this trend, which started in the 1970s and '80s because of suburbanization, was undisputed until 2020. (A2)

These main corridors form the backbone of road-based transportation in the city. In the past, traffic-calming measures and space redistribution were always limited to residential areas. Because the logics of transportation planning were dominated by ensuring maximum 'efficiency', anything that would not enhance or maintain capacity was largely out of the question. But in this case, the effort to change the roads has come from outside formal transport planning, and this initiative seems to be supported from within transport planning, a scenario which appears not to have been plausible in the past.

Conclusion

This investigation underscores that there are fruitful insights to be gained by investigating processes of destabilization on the local level. There are myriad forces at play that contribute to the challenging and reproduction of automobility on multiple governance levels (Böhm et al., 2006; Canzler et al., 2018; Haas, 2020; Manderscheid and Cass, 2022; Hawxwell et al., 2024). However, considering the particularities of the urban in terms of obduracy (Hommels,

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2005), it is not surprising that investigations into destabilization at the urban scale can expose new faces of the regime and unique dynamics of its potential unmaking (Jayaweera et al., 2023). For example, an emerging pressure front around space scarcity and the zero-sum nature of space allocated to different forms of transportation and the many other functions that urban space performs suggests that this is a particularly urban phenomenon (Petzer et al., 2021). Despite this, one should be wary not to fall into the 'local trap' (Purcell, 2006), losing sight of broader forces that extend beyond the local. This investigation is somewhat blind to the extent to which changes could more credibly be assigned to other governance levels. While it is clear that pressure fronts will have both exogenous and endogenous dimensions, focusing exclusively on the local makes it difficult to identify the relative strengths of the endogenous or exogenous forces, respectively: It is difficult to know the extent to which changes are predominantly the product of the work of actors locally.

Beyond negotiating trade-offs in terms of scale, trade-offs between breadth and depth also need to be considered when investigating destabilization journeys. A broader goal of destabilization research is to move towards the identification of common underlying mechanisms behind such processes (Turnheim, 2023). Getting at such detail likely requires high-resolution perspectives. To account for the long-term shifts away from car-centric urban development, this study was only able to sketch the contours of a destabilization journey, providing a glimpse into its dynamics. Therefore, it likely misses the nuances of particular moments but helps identify starting points for such higher-resolution investigations. These shortcomings stress the need to also move between *temporal* scales, as well as the importance of collaboration and coordination between different cases and research approaches.

Despite the long-term scope applied in the investigation, it is still difficult to assess the relationship between *destabilization* and *decline* of the role of the car in the mobility system. As has been demonstrated, there have been shifts in the underlying logics and a rising formidable force to challenge car-based automobility. Also, the portion of trips by car in the modal split has been in decline since 2000 (FHH, 2023). However, there are some developments that suggest the cracks in the regime of automobility might not be as deep as they appear. Hamburg's senate still lobbies on the national level for, and itself invests heavily in, new motorway developments to expand road-based transportation, which is an obvious contradiction to a transformation agenda. Looking at car ownership also shows a regime more locked-in than ever, with the absolute number of privately owned vehicles in the city steadily increasing until 2022, when

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there were signs of levelling off (FHH, 2023). Looking at the space allocated to (road-based) transport infrastructure over time would likely tell a similar story. Another example is Hamburg's leading role in the emergence of autonomous mobility services and the associated for-profit models that have the potential to transform the mobility system into an even more problematic regime of automobility (Freudendal-Pedersen et al., 2019; Marletto, 2019). Future research could therefore investigate the forming of new ties between new and old elements that are reproducing and mutating urban mobility regimes in the making of urban mobility futures.

Identifying pressure fronts can be a helpful means of recognizing that emergent matters of concern (Latour, 2004) are the products of opposing forces coming into contact with each other rather than some objective problem. The car's impact on the city only becomes a problem when it is problematized (see also Jørgensen, 2012). The many environmental and social conflicts the car has created and continues to create only become contested under particular circumstances. Those challenging the prevailing arrangements play an important role in this process of problematization and are helped or hindered immensely by the prevailing institutional arrangements. Once a pressure front that is deemed to be of particular importance along a destabilization journey has been identified, a deeper investigation into processes of (de)legitimation and associated justification strategies could be a fruitful avenue for investigation. Furthermore, by focusing on *destabilization*, the approach is not blind to novelty or innovation. It brings to the fore precisely the innovation that can be directly assigned to the pressures that force meaningful change. This can help decipher 'what makes for a destabilising source of change' (Turnheim, 2023: 48). It can therefore be a well-justified means of identifying 'niches' that warrant 'strategic management' (see Schot and Geels, 2008). This underscores the Hoffman and Loeber claim that there is 'no clear-cut division between innovative practices on the one hand (often referred to in terms of a "niche") and the vested interests manifest in institutions, prevailing rules, and actors (alternatively referred to as "regime") on the other' (2016: 706). It further bolsters calls to, therefore, focus on the 'processes of translation' that shape interactions between 'niche' and 'regime' rather than seeing them as dichotomous entities (Raven, 2006; Smith, 2007).

The research provides important insights into questions of governance of, and intentionality behind, destabilization (Frank and Schanz, 2022; Turnheim, 2023). This Hamburg case shows that even though incumbents have not intentionally been curbing auto-centrism in any serious way, an ever-growing force

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of actors (in terms of power and numbers) has intentionally been working towards dethroning the car within the urban development paradigm of the city for decades. This highlights the important processes and 'work' that occur long before more formal decisions to 'phase out' or 'discontinue' (Koretsky et al., 2023) have been taken. It shows that forces of change might lie much deeper in the historical record than one might expect. Until 2011, there was no apparent intention articulated on the side of incumbents that the system should be fundamentally changed. After that point, the intentions appear to be mainly techno-utopian promises, and later, more explicit albeit moderate efforts to discourage car ownership and use. The concessions made prior could be understood as efforts to *disarm* rising pressure fronts to *maintain* the prevailing car-based arrangements. This is exemplified considering the change to the conservative government in 2001, which marks a shift towards a more neglectful stance regarding the emerging pressure fronts rather than making incremental concessions, as the previous incumbents had done. One could speculate that this neglect played an important role in the dramatic change in the direction that came after. Therefore, investigations into destabilization should consider the question of whose intentionality matters. The case also points to the importance of more relational and emergent understandings of governance (Briassoulis, 2019) when investigating destabilization rather than limiting the scope of governance to the 'cockpit' (Smith and Stirling, 2007; Stirling, 2019). Finally, connecting to the theme of this volume, this contribution highlights that urban future-making does not take place in a vacuum. Not only do conflicts emerge between rival imaginaries about the future of urban areas, but also in the *un*making of that which has been inherited from the past.

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