


RESEARCH ARTICLE

# Time, timing, and conflicting temporalities in experimental urban mobility governance

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**Abstract** • In this article, I explore the role of experiments in urban mobility governance. I ask to what extent they are responses to the challenges of coexisting timeframes and temporalities and what challenges the latter pose for experiments. My analysis is based on field visits and interviews with urban administrations and public transport providers in Copenhagen, Lisbon, and Madrid. My results show that urban administrations use experimentation as a form of reflexive, transformative governance. Public transport providers use experiments to navigate tensions between rapid regulatory changes and technological innovation and their long-lived infrastructure. Both actor groups stressed the importance of disruptions as natural experiments. Urban administrations used disruptions for experimentation to fast-track approved but difficult-to-implement projects. The temporary nature of experiments can pose a risk: It makes them vulnerable to political attacks. To mitigate backlash, good timing is critical.

*Zeitfaktor, Timing und unterschiedliche Temporalitäten in städtischen Mobilitätsexperimenten*

**Zusammenfassung** • In diesem Artikel untersuche ich die Rolle von Experimenten in der städtischen Mobilitätsplanung. Dabei stelle ich die Frage, inwiefern sie Antworten auf die Herausforderungen der Koexistenz unterschiedlicher Zeithorizonte und Temporalitäten sind und welche Herausforderungen Letztere für Experimente darstellen. Meine Analyse basiert auf Besuchen vor Ort und Interviews mit Stadtverwaltungen und öffentlichen Verkehrsbetrieben in Kopenhagen, Lissabon und Madrid. Die Ergebnisse zeigen, dass städtische Verwaltungen Experimente als eine Form der reflexiven Transformationssteuerung nutzen. ÖPNV-Anbieter nutzen Experimente, um im Spannungsfeld zwischen schnellen regulatorischen Veränderungen und technologischer Innovation so-

wie ihrer langlebigen Infrastruktur zu navigieren. Beide Akteursgruppen betonten die Bedeutung von Disruptionen als natürliche Experimente. Stadtverwaltungen nutzen Disruptionen für Experimente, um bereits genehmigte, aber schwer umsetzbare Projekte zu beschleunigen. Die temporäre Natur von Experimenten kann dabei ein Risiko darstellen: Sie macht sie anfällig für politische Angriffe. Um Gegenreaktionen zu minimieren, ist gutes Timing entscheidend.

**Keywords** • transport, urban governance, sustainability, experimentation, transition

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## Introduction

Experimental approaches have pervaded practices of governing urban mobility (Hodson et al. 2018; Meinherz et al. 2023; Verlinghieri et al. 2023; Wentland and Jung 2021). Requalifications of streets and public spaces are first tested in the form of street experiments (Verlinghieri et al. 2023). Policies such as free or fare-reduced public transport are rolled out through pilots (Bissel 2023), as are technological innovations such as self-driving cars (Servou et al. 2022). Such experiments have in common that they are temporary and adaptable and favour learning-by-doing by testing interventions on the ground (Hodson et al. 2018; Kivimaa and Rogge 2022; Verlinghieri et al. 2023).

This turn in urban (mobility) governance to “various forms of experimentation via pilots, fast demos, trials, and fast tracking” (McGuirk et al. 2021, p. 4) has been described as “a new – messier and provisional – mode through which governing is taking place” (Torrens and von Wirth 2021, p. 4) that fosters reflexive action and contrasts traditional governing practices based on rigid long-term plans and strict implementation pathways (Torrens and von Wirth 2021; Voß et al. 2009). Experimental governance practices can be linked to objectives such as navigating uncertainty, probing public reception, overcoming policy

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stalemates, demonstrating a commitment to long-term policy goals through short-term action, or fast-tracking planning processes (Matschoss and Repo 2018; Scheer et al. 2025; Torrens and von Wirth 2021; Verlinghieri et al. 2023).

The proliferation of experimental practices in urban climate and mobility governance has been explained, in part, as a response to the complex temporalities of decarbonization efforts and as a strategy for long-term governance in the face of high uncertainty and time sensitivity (Bornemann and Strassheim 2019; Scheer et al. 2025; Torrens and von Wirth 2021; Voß et al. 2009). Mobility is contingent on long-lived infrastructure that takes decades to plan and build. At the same time, decarbonization objectives for mobility require adjustments to existing plans and infrastructure, and technological innovation presents new opportunities and challenges (Marsden and Docherty 2013). The implementation of widely supported long-term decarbonization strategies for urban mobility is often hampered by conflicts concerning specific interventions on the ground (Marsden and Docherty 2013; Meinherz et al. 2023). Meanwhile, as a “present-oriented and evidence-based trial-and-error mode of action, experiments [...] facilitate collective action towards sustainability, which would otherwise be blocked by a forward-looking calculation” (Bornemann and Strassheim 2019, p. 1007). Experiments allow governing bodies to “navigate and make sense of the present whilst also giving concrete form to particular visions of the future” (Torrens and von Wirth 2021, p. 2), to deal with long time horizons all while maintaining adaptiveness in light of new political, societal and technological developments (Kivimaa and Rogge 2022; Matschoss and Repo 2018; Scheer et al. 2025).

However, with their short timeframes, experimental governance practices introduce their own, potentially asynchronous, temporalities into long-term planning and governance processes (Mukhtar-Landgren 2021; Wentland and Jung 2021). Furthermore, whereas experiments can be a way for governing bodies to navigate tensions between short- and long-term planning objectives, they can also be a tool to leverage time as a governance tool. Notions of urgency can be instrumentalized to push through measures that may otherwise face opposition, by deferring discussions regarding the goal and method of the intervention until

challenges of navigating complex temporalities, and in what ways issues regarding time, temporality and timing can be challenges for them. I broadly define experimental governance practices as temporary and adaptable interventions that serve as pilots, tests, public demonstrations, means to fast-track policies or to foster public dialogue (Kivimaa and Rogge 2022; McGuirk et al. 2021; Mukhtar-Landgren 2021). I focus on the practices of urban administrations and public transport providers. Both are actors who provide mobility services and plan and implement long-term mobility transformations. They act on democratically legitimized mandates that bind them to pursuing publicly accepted visions for the future of mobility (Eneqvist et al. 2022; Kronsell and Mukhtar-Landgren 2018).

## Case studies, data and research method

The empirical material was gathered as part of a larger research project on the role of experimentation and crises in mobility transformations in European metropolitan regions<sup>1</sup>. For this article, I analyze the cases of Copenhagen, Lisbon, and Madrid, and thus of three cities that are dealing with different mobility challenges and that stand at different points in their transformation towards low-carbon urban mobilities. Choosing a heterogeneous sample is aligned with the exploratory nature of my study and promises to show different possible roles and temporal implications of experimental urban mobility governance.

Copenhagen, one of Europe’s cycling capitals, has been confronted with increasing levels of car ownership and a decreasing modal share of cycling, while the modal share of public transport stagnates below 20 % (Københavns Kommune 2021). Madrid has a well-developed public transport network. Public transport, driving and walking each account for approximately 1/3 of the modal split. However, Madrid struggles with high levels of air pollution (EC 2019). In Lisbon, driving accounts for 45 % of the modal split, followed by walking (30 %) and public transport (22 %). Lisbon is still rebuilding its public transport capacity after the Troika dismantled it after the 2008 financial crisis (EU 2020).

## *Experimental practices were an essential part of interviewees’ toolbox.*

after the urgency is resolved (Bornemann and Strassheim 2019; Hodson et al. 2018; McGuirk et al. 2021; Meinherz and Fritz 2024; Patterson et al. 2021). More research is needed on how experimental governance practices refer to time, to foster interventions “that are sensitive to their temporal implications and can consciously make use of them” (Bornemann and Strassheim 2019, p. 1002).

In response to this call, I explore the role that experimental governance practices play in the governance and planning of urban mobility, and ask in what ways they are answers to the

I conducted a mixed-methods study based on non-participant observation and interviews. The observation consisted in field visits of the operation centers of public transport providers and of infrastructure-based experiments (i.e. road space reallocations, traffic regulation systems, mobility hubs). I documented the field visits through photographs and notes. I analyzed the

<sup>1</sup> The TrEx (Transformative Mobility Experiments) project was one of 14 research projects conducted during the first phase (2021 – 2024) of MCube – the Munich Cluster for the Future of Mobility in Metropolitan Areas.

Copenhagen	Actor	N people participating in the interview
Public transport	Bus operator (strategy & planning)	1
	Bus operator (operations management)	1
Urban administration	Regional administration (regional planning department)	1
	Communal administration (environmental department)	1
	Communal administration (economic department)	1
Lisbon	Actor	N people participating in the interview
Public transport	Bus operator (strategy & planning)	1
	Regional public transport consortium (strategy & planning)	2
Urban administration	Communal administration (mobility department)	3
	Policy advisor to the communal parliament (mobility expert)	1
Madrid	Actor	N people participating in the interview
Public transport	Public transport operator (strategy & planning)	1
Urban administration	Communal administration (mobility department)	1

Table 1 Interview sample. Source: *author's own compilation*

material by identifying frictions and harmony in the coexistence of long- and short-lived infrastructure, in public transport operators' innovation efforts and operations, and in infrastructural experiments' embeddedness in the overall socio-infrastructural context.

In each city, I interviewed the representatives of public transport providers and communal and regional administrations in charge of strategy development and long-term planning (Table 1). I asked interviewees about the role of temporary, transitory and adaptive interventions in their practices, and discussed insights from the field visits with them. Because interviewees' knowledge is unique to their position in the respective organization, the interviews cannot be anonymized. Therefore, I present the findings in a summarized way that cannot be traced back to individual interviews. Interviews were transcribed verbatim. In a first round of coding, I identified all references to transitory and temporary measures, pilots, practices of testing, learning-by-doing and adaptive implementation, and explicit mentions of (natural) experiments or living labs. In a second round of coding, I identified which roles time, temporality and timing played in these practices. With this approach based on open concepts, which was inspired by grounded theory (Charmaz 2006), I strived to reveal interviewees' own conception of what experimental intervention is and the role it plays in their governance and planning practices, as well as their own interpretations of the roles that time, timing and temporality play in their experimental practices.

## Results and discussion

All interviewees insisted that experimental practices were an essential part of their toolbox. As I show in this section, most referred to pilots and trials. Some also qualified disruptions as experiments that informed their practices. Some mentioned experimental interventions in response to disruptions.

### Tests, trials and tricky timing

Representatives of urban administrations stated that they implemented most new policies or regulations through pilots. Their motivation for doing so was learning-by-doing, to finetune policies and their implementation. For instance, Lisbon conducted pilots for a program to accompany children on the bus and bike ride to school in a few schools, adapted the program based on those pilots, and then rolled it out city-wide. Lisbon and its bus operator also conducted pilots for measures to make public transport more attractive. Copenhagen implemented a city-wide speed limit reduction one road segment after the other, to learn how to adapt signalization, raise awareness of the change, and avoid backlash. This use of pilots and tests can be interpreted as reflexive governance that relies on probing and learning and is characteristic of long-term governance (Scheer et al. 2025; Voß et al. 2009).

Representatives of public transport providers insisted that their operations were inherently experimental. For them, experimentation meant operating long-lived infrastructure while adapting to constantly changing mobility patterns and new technological requirements. Their understanding of their operations as inherently experimental underscores the pertinence of analyzing transport planning through the lens of adaptability, rather than stability (Marsden and Docherty 2013), and stresses the importance of experimentation as a governance tool to navigate co-existing timeframes, i.e. the long-time horizon of transport infrastructure and shorter-lived regulatory requirements. For instance, in response to EU regulations, bus operators had started phasing out diesel buses, replacing them with natural-gas powered buses for which they received subsidies. In 2020, the European directive on clean powertrain technologies changed. Gas-powered buses no longer qualified. Instead, subsidies were awarded for electric buses. Madrid's public transport provider had already phased out diesel and its fleet was one fourth electric. However, its newest maintenance center had been designed for gas-powered buses. The provider began testing whether its gas-powered

fleet could operate with biomethane from waste incineration, to avoid having to replace the maintenance center. Lisbon's bus provider did not yet have any experience with electric buses. They started with a small batch of electric buses to learn how to operate them and contracted external maintenance to avoid having to additionally train its staff for maintaining a new vehicle type. When the second batch arrived, the operation of this new vehicle type was smooth, and they could build up their own maintenance capacity.

Next to experimenting in reaction to regulatory changes, public transport providers also conducted experiments by their own initiative. Madrid's and Lisbon's bus operators were experimenting with hydrogen-powered buses. Madrid's public transport provider had already conducted first experiments with hydrogen in 2002, but found that the technology was not yet reliable. They now gave it another try with an initial batch of ten buses and were planning to purchase another twenty once the first ones could operate, to have a sufficient number of buses in operation to gather robust data on their functioning. These examples highlight that not only municipal authorities (Eneqvist et al. 2022; Kronsell and Mukhtar-Landgren 2018), but also public transport providers are powerful spearheads in experimenting with emerging technologies. Public transport providers embraced the possibility of failure (i.e. Madrid's initial test with hydrogen), thereby defying the often-observed bias in experimentation for successful implementation (Torrens and von Wirth 2021).

can have major policy implications and jeopardize projects in the long run.

Still, interviewees insisted that people ultimately supported most interventions. In Lisbon, when the new mayor wanted to remove the contested cycle, people again protested to defend the cycle lane, demonstrating that the issue was not the cycle lane but the implementation process. Madrid's public transport provider managed to appease users by offering them free minutes in compensation for the nuisances of the shift in the shared bicycle system. Nonetheless, those experiences demonstrate the importance of timing in experimental intervention, and notably of accounting for coexisting temporalities, i.e. those of legislative cycles and elections (Meinherz and Fritz 2024; Wentland and Jung 2021).

### Disruptions as living labs and opportunities for transformative experiments

When talking about experimentation, representatives of urban administrations and public transport providers also mentioned recent disruptions, namely the Covid-19 pandemic and related lockdowns, and the rise in energy prices following Russia's war against Ukraine.

On the one hand, interviewees described these disruptions as natural experiments or, to quote representatives of Lisbon's and Madrid's administrations on Covid-19, as a "living lab" which allowed the population to experience the city with less traffic and

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Representatives of urban administrations and public transport providers stressed that adaptive governance and iterative implementation could trigger backlash. For instance, Madrid's public transport provider faced many complaints when it introduced a new bicycle model for its shared bicycle service, because for a short while, the two bicycle types coexisted but could each only be returned to their respective stations. Lisbon's administration suspected that people's fierce opposition to an initially badly designed pop-up cycle lane on a major avenue, that was hastily implemented during the Covid-19 lockdowns, contributed to the governing party losing elections that took place a few weeks later, even though in the meantime, the cycle lane had been improved. In Copenhagen, plans for a road congestion tax that were discussed in 2012 based on premature and invasive technology created major backlash. The ruling party abandoned the plan and shut down the debate on road pricing for years to come. Only recently, with improved GPS technology making more targeted and cheaper road pricing systems possible, the discussion has again become possible. These experiences illustrate that badly timed experimental interventions, especially when requiring substantial initial adaptations,

better air. Thereby, the lockdowns may have contributed to the collective building of visions for the future commonly associated with experimentation (Kivimaa and Rogge 2022; Scheer et al. 2025; Torrens and von Wirth 2021). Public transport providers of all three cities described how the rise in energy prices demonstrated the resilience of electric fleets to disruptions in global energy provision systems. The disruption was a stress test that allowed public transport providers to learn about the resilience of their operations.

On the other hand, representatives of urban administrations described disruptions as windows of opportunity to implement transformative changes through experimental intervention. For them, disruptions were opportunities because people's routines were already disrupted, because governments were less wary of backlashes, and because budgetary constraints were lifted. Representatives of Madrid's and Copenhagen's administrations explained that the ability to act fast through experimental approaches was key in seizing emergency funds. Madrid was able to fast-track many of its mobility projects by financing them through the Covid-19 related European recovery funds. Copenhagen, which usually had to sequence its projects so as not to

exceed its cap on spending, was able to implement many road space reallocation projects in parallel when the spending cap was lifted for the duration of the post-pandemic recovery phase. These findings reflect the observation that crises and emergencies, as temporary states of exception, introduce a permissiveness into governance processes that favors transformative action (McGuirk et al. 2021; Patterson et al. 2021). By mobilizing discourses of urgency to leverage disruptions for transformative action, administrations were “pulling sustainability-oriented decisions into the here and now” by making an “instrumental use of the present” (Bornemann and Strassheim 2019, p. 1007).

Existing scholarship stresses that urban experimentation in conjunction with discourses of urgency may present democratic deficits (McGuirk et al. 2021; Patterson et al. 2021). Urban administrations indeed used experiments during disruptions “to overcome policy stalemates and institutional resistance to change” (Matschoss and Repo 2018, p. 615). However, akin to findings from other cases (McGuirk et al. 2021; Meinherz and Fritz 2024; Meinherz and Wentland 2024), administrations leveraged the disruption of Covid-19 to fast-track planned and approved projects. Lisbon conducted street experiments that reallocated road space in favor of cycling and public transport, that corresponded to approved projects that had been postponed because it was unclear how to implement them and because politicians feared backlash. Madrid’s administration moved forward on the pedestrianization of the city center and extended the network of bus lanes through street experiments. Urban administrations’ strategic use of time can, thus, be interpreted as contributing to effective governance in a context where transformative action is democratically legitimized but challenging to implement (Hodson et al. 2018; Kronsell and Mukhtar-Landgren 2018).

However, representatives of Lisbon’s administration regretted that, due to their ephemeral nature, experimental interventions faced a higher risk of having to be removed again than built infrastructure. Next to the aforementioned cycle lane, these issues also concerned cases where opposition from neighborhood councils forced the administration to reverse transformations of surface parking into parklets and playgrounds. Wentland and Jung (2021) found that in Barcelona, to address this vulnerability of ephemeral interventions, after it lost elections, the exiting government reinforced transitory pedestrianization measures with concrete blocks to prevent the new government from removing them.

## Conclusion

I explored the role that experimental governance practices play in the governance and planning of urban mobility, asking in what ways they are answers to the challenges of complex temporalities, and in what ways issues relating to time, temporality and timing can be challenges for them. My findings are informed by field visits and interviews with urban administrations and public transport providers in Copenhagen, Lisbon and Madrid.

First, I found that urban administrations implemented most transformation-oriented policies through pilots and tests, which resonates with the proliferation of reflexive action and experimental learning in sustainability-related long-term governance. Public transport providers considered their operations as inherently experimental. They conducted rigorous pilots and tests with new technology to learn how to operate it, to smoothen transitions between different technologies, and to test the maturity of emerging technologies. Their experimental practices were answers to the challenge of operating long-lived infrastructure while remaining adaptive in the face of constant change, and thus to the challenges of navigating coexisting timeframes.

Second, I observed that timing was critical for successful experimentation. The adaptive implementation and improvements characteristic of experimentation could create backlashes that could jeopardize long-term transformations if, for instance, experiments were badly timed regarding electoral cycles. A better understanding is needed of how different kinds of disruptions – crises, but also elections – interact with experiments and shape their outcomes. In addition, due to their ephemeral and temporary nature, experiments can be removed just as easily as they can be implemented. This makes them vulnerable to backlashes and political attacks. More research is needed on how political tensions surrounding experiments can be fruitfully addressed to create spaces for deliberating and enacting long-term transformations.

Third, urban administrations and public transport providers valued disruptions such as the Covid-19 pandemic and the rise in energy prices as natural experiments; the first, because disruptions were opportunities to collectively build visions of what a car-reduced city could look like; the second, because disruptions served as stress tests for the mobility system. Urban administrations also strategically conducted experiments during disruptions to leverage them for transformative action. Such instrumental uses of time in experimental interventions, i.e. by mobilizing notions of urgency, may present democratic deficits; however, I found that urban administrations leveraged disruptions to push through approved projects of which the implementation was challenging. Their strategic use of time allowed them to fulfil their democratically approved mission and contributed to effective governance.

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