



How ‘within-regime’ tensions can create windows of opportunity for new mobility services

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Received 21 November 2022, Revised 12 October 2023, Accepted 16 October 2023, Available online 19 October 2023, Version of Record 19 October 2023.



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<https://doi.org/10.1016/j.eist.2023.100784> 

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Highlights

- Multi-level governance theory allows us to explore tensions within the MLP regime.
- Within regime tensions can create windows of opportunity (WoOs) for niche technologies.
- Responsibility, coordination, capacity and incumbency affect the emergence of WoOs.
- Regulatory and institutional gaps provide opportunities for emerging technologies.
- Mobility services facilitated by digitalisation can in some cases utilize latent WoOs.

Abstract

Often described as a difficult sector to transition, mobility has been the focus of much research within sustainability transitions. In transition studies, a window of opportunity (WoO) for new technologies often results from exogenous developments. This study draws on the political science perspective of multilevel governance to conceptualise mechanisms that create WoOs. Examining the introduction of two emerging mobility technologies (e-scooters and mobility-as-a-service), we argue that within-regime tensions arising from existing multi-tiered institutions and policies may contain latent WoOs. Our findings suggest that how a new technology is positioned vis-à-vis established institutions affects its ability to reach market. Actors that position new technology against a different tier of government than those who are embedded with existing technologies face less opposition during introduction. Moreover, because digital technologies are less scale

dependant, such technologies may allow actors more freedom concerning how they position their service in relation to the established institutions.

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Key words

Multilevel perspective; Multilevel governance; Windows of opportunity; E-scooters; Mobility as a service; Technological transition

1. Introduction

Understanding how new technologies can be introduced is paramount to achieve a sustainability transition in mobility. Socio-technical transitions are often analysed using the multilevel perspective (MLP). A key analytical advantage of the MLP is its ability to show how socio-technical regimes can be unlocked through pressure on the regime from the development of alternative niche technologies and exogenous developments occurring at the 'landscape' level. A destabilisation of the regime can then create a window of opportunity (WoO) for advocates of niche technologies to influence policy processes in favour of their technology (Geels and Schot, 2007; Pakizer et al., 2023).

WoO is well established as a concept in the sustainability transitions literature, but it is typically linked to a destabilisation of existing regimes by external factors. WoOs occur as a combination of long-term developments and specific events. Historical studies often emphasise how conditions for WoOs are created as a result of long-term processes (Geels, 2002). Studies focusing on political processes recognise that these WoOs may exist for a limited amount of time (Normann, 2015) and be caused of specific events (Tongur and Engwall, 2017; Geels and Schot, 2007; Kanda and Kivimaa, 2020). Linked to the concept of WoO is that of the *evasive entrepreneur*, who can create a business by circumventing existing regulations (Elt and Henrekson, 2016) and *policy entrepreneurs* (Mintrom, 2019) who create new policy frameworks through active political action. By showing how the pre-existing configuration of institutions and actors may provide opportunities for market entrants, we focus on the former type of entrepreneur.

Heeding calls to take politics, power and institutions more seriously in transition research (Köhler et al., 2019; Avelino, 2017; Kern and Rogge, 2018; Runhaar et al., 2020; Hacker and Binz, 2021; Fuenfschilling, 2019) the present study proposes an integration of the MLP and the multilevel governance (MLG) frameworks. The latter is often used by political scientists to illuminate how vertical dispersion of authority affects governance capacity (Hooghe and Marks, 2021). In doing so, we show how governance structures in the established socio-technical regime entail latent WoOs. These can be exploited by entrepreneurs advocating new technologies. Our argument is illustrated by the introduction in Norway of e-scooters and mobility-as-a-service (Maas), two mobility technologies facilitated by digitalisation.

Mobility is a system where public policy and institutions play an important role. Moreover, public policy and institutions in the mobility sector is characterised by a division of authority across scale, from local to supranational. This institutional tiering follows a structure of multilevel governance, where the appropriate level of (de)centralisation of authority is determined by geographical preference variations, transboundary externalities, and economies of scale (Oates, 1999). While the pre-existing setup of policies, responsibilities, institutions and resources may be well suited to regulate established technologies, it may still not be fine-tuned to handle the challenges posed by emerging technologies (Docherty, 2020).

While e-scooters have proven highly successful since their introduction in 2019, commercial Maas has so far failed to reach the main markets in Norway. We argue that this pattern in part can be explained by the fact that the e-scooter companies entered the mobility market in a void without strong actors and institutions, and that the entrepreneurs successfully exploited ambiguous responsibilities that resulted in blame games and lack of coordination between tiers of government. In contrast, Maas attempted to enter a highly institutionalized market in which politically resourceful public transport authorities (PTAs) were standing their ground. This served as a barrier for commercial Maas reaching the stage where it could become a viable option for customers.

The remainder of the paper is structured as follows: [Section 2](#) discusses our theoretical background and demonstrates how MLG illuminates regulatory faultlines in the multi-regime mobility system, potentially uncovering latent WoOs. [Sections 3](#) and [4](#) presents how we collected our data on e-scooters and Maas in Norway, how authority is decentralized across tiers of Norway's system for transport governance, and how the two emerging technologies came to interact with that governance system. [Section 5](#) analyses four mechanisms through which latent WoOs embedded in the MLG structure may affect market penetration. Specifically, we propose that multi-tiered governance systems can create WoOs through blame games between levels of government and lack of policy coordination between levels of government. We also argue that regulatory capacity and the existence of powerful incumbents are important. Finally, [Section 6](#) discusses the wider implications of our findings, and suggests future research along the lines of our work.

2. Theoretical background

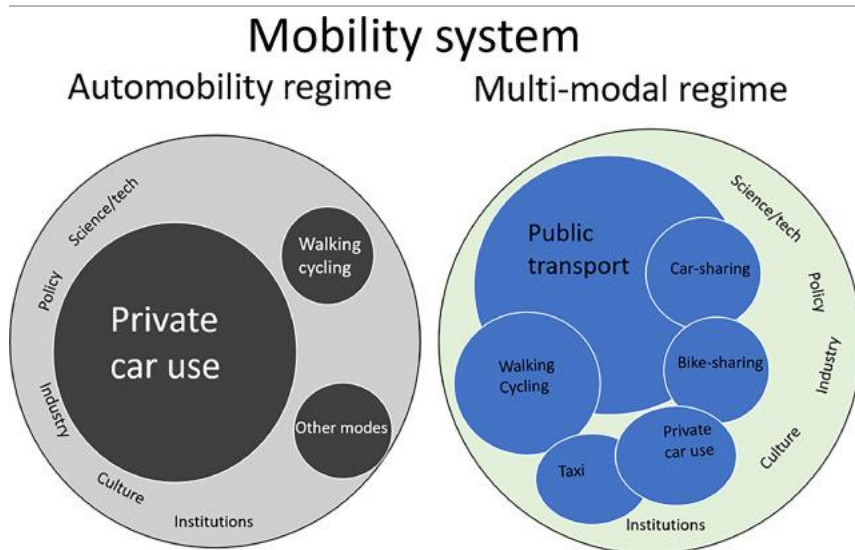
Research in sustainability transitions has justifiably focused on drivers and barriers to the introduction of new, more sustainable solutions into the existing socio-technical system. More recently, the discontinuation of unsustainable practises has come under scrutiny.

Transitions, both new and ongoing, are often analysed using the MLP framework (Zolfagharianetal., 2019; Kivimaaand Kern,2016). The MLP implies understanding transitions as the outcome of interplay between drivers and barriers at three different analytical levels. At the core is the socio-technical regime, which encompasses the dominant institutions, organisations, cultural and political context that surrounds the existing domain. Below the established regime are the niches where new technologies are conceptualised as developing in protected spaces. The landscape level above the regime includes the exogenous developments that occur across socio-technical regimes, including economic growth and cultural change. In the MLP transitions occur in non-linear processes when circumstances within and between the three different analytical levels align (Geels,2011). Transition studies in general and the MLP in particular has been criticised for falling short in the analysis of policy (Kernand Rogge,2018; Avelinoetal., 2016) and power relations (Avelino,2017). We argue that this shortcoming is of particular concern when analysing innovations in sectors such as mobility, where public policy and funding plays a dominant role in determining market outcomes. Furthermore, we argue that there is a need to recognise that the mobility system is heterogeneous, with authority distributed across scale. To investigate these issues we complement the MLP-rooted notion of institutional struggles between dominant logics and new templates (Geels,2020) with a MLG framework to investigate the particular institutions and policies involved.

2.1. Mobility as a multi-regime system

Transitions researchers often perceive mobility as a complex multi-regime system (Geels,2018; Moradiand Vagnoni,2018) that is hard to transition (Markardetal., 2012). When assessing the interplay between policies and institutions of the existing regime and new technologies, a point of departure is to recognise that there is indeed more than one mobility regime. Passenger mobility is often divided into two or more socio-technical regimes (Moradiand Vagnoni,2018; Geels,2018; Köhleretal., 2020). Scholars usually distinguish between *automobility*, which is centred on the private car as its core technology, and *multimodality*, as an alternative. In this paper we use automobility and multimodality as separate concurrent regimes in the urban mobility context. We do this as each of the two regimes include a set of institutions, policies, industry, technology, and cultures that is not shared across the regimes. Multimodality is more directly influenced by policies and institutions than automobility is, as many decisions such as price and availability are directly and actively decided politically. The regimes do, however, have in common the overarching trends at landscape level, such as increased environmental awareness and digitalisation.

In some studies multimodality is further divided into public transport (PT) and other even more mode-specific regimes (Geels,2018). These sub-regimes in multimodality are considerably more interdependent than the sub-regimes in the automobility regime (Fig. 1) and can even be characterised as niches in a broader mobility context. Irrespective of whether we conceptualise these entities as sub-regimes or niches, the important factor is the level of institutional and policy alignment between these and the extant levels of government.



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Fig. 1. Mobility as a two-regime system.

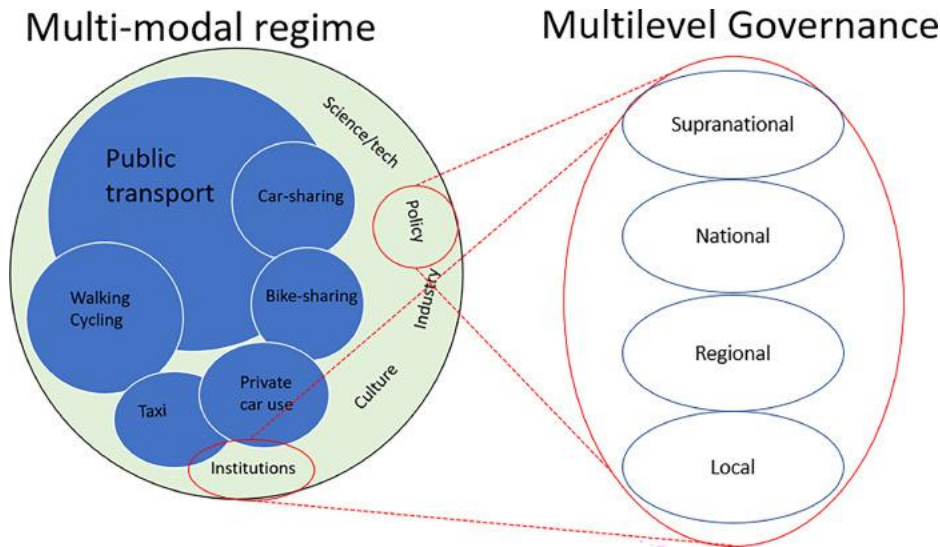
Fig. 1 illustrates passenger mobility as a two-regime system. Automobility is centred on the private car as the dominant mode of transport. In contrast, the multi-modal regime is built on multiple different modes that to some extent rely on common pillars (institutions, culture,

industry policy, and technology), and to some extent on specific actors and institutions for the mode in question. The figure also illustrates that PT, in terms of resources and traffic volumes, is the largest mode in the multi-modal regime.

2.2. Including multilevel governance (MLG) at the regime level in the MLP

In short, MLG can be understood as the dispersion of authority across scale (Hooghe and Marks 2021). Since entering the mainstream vocabulary of social scientists in the early 2000s (Hooghe and Marks, 2003), MLG has become a standard concept in a remarkably large number of literatures (Stephenson, 2013). The array of MLG interpretations could be indicative of the usefulness of the concept: MLG provide a general framework and starting point for understanding political processes across states, sectors, and political subfields. The (re)distribution of authority downwards (to the regional or municipal level) or upwards (to the supranational level, including the European Union (EU)) is often underpinned by a functional logic: That units at a given level of government may be too large or too small to handle a given problem.

The public sector plays an important role in the multi-modal regime (Fig. 2), both as authority and as a major source of resources. However, the public sector is not a single entity; rather it is a common term for a large set of actors, policies and institutions organised at different levels.



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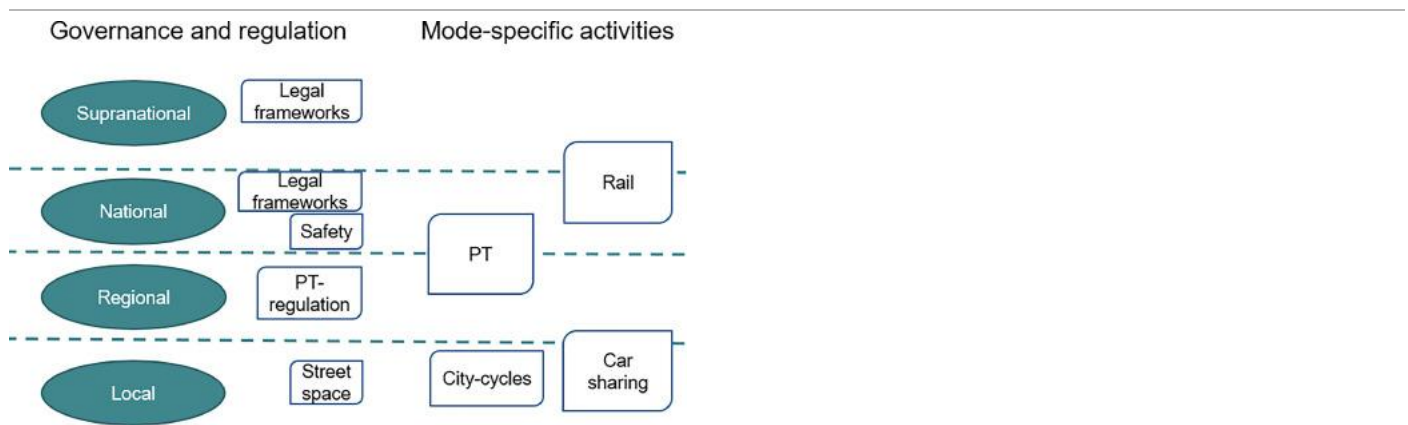
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Fig. 2. Elements of the multi-modal regime that is subject to the influence of multiple governance levels.

Fig. 2. illustrates how policies and institutions are distributed between governance levels, and how these levels relate to two of the key components at the socio-technical regime level in the MLP. Policy development and the institutions are distributed along the organisational levels of the MLG. As a result, policy development in the multimodal regime is affected by forces on all four governance levels. Each level's importance varies considerably across modes in the multi-modal regime. The national level represents the main level of governance, providing legal frameworks and main policy directions. While in this context less important than the national level, the supranational level influences relevant legal frameworks. In the case of PT most activity is located at the regional level, which is where funding and practical decisions are made. At the local level street space and location-specific decisions are taken, such as the location of parking facilities.

2.3. Using MLG as a tool to identify windows of opportunity in the regime

The different modes of transport in the multi-modal regime can be mapped by placing the main activities in relation to their governance level (Fig. 3).



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Fig. 3. A map of mode-specific activities of the actors and regulatory institutions.

Fig.3 illustrates how different levels of government in Norway have different responsibilities vis-à-vis the multimodal regime. By and large, the distribution of authority is consistent with the prescriptions of the decentralisation theorem (Oates 1999). Legal frameworks are mostly provided by the national and supranational level. That level also performs tasks related to operational regulation of modes such as rail, through the national rail authorities,¹ and the ministry of transport and communications. The regional level performs one particularly important task in the transport governance system: In accordance with the vocational transport act (Ministry of Transport and Communication, 2003/2019), regional authorities shall ensure that an appropriate level of PT is available in their geographical area. Competitive tenders, using gross contracts, are the most common measure used to provide such local transport (Aarhaug et al., 2018). A consequence of this way of organising PT is that ticketing and thereby income risk is allocated to the regional authorities. Because daily travels often take place within regions, the regional level seem to be appropriate for governing such activities, the decisions are made in the county council and implemented by the county administration and PTAs. A core task for local (municipal) authorities is to make decisions over and manage street space, which is critical for city-cycles and car-sharing. They do so within the boundaries defined by legal frameworks decided upon at the national or even supranational levels, but nonetheless enjoy considerable regulatory freedom and authority. Because preferences concerning the use of street space may vary from municipality to municipality, but cross-municipality spill overs and economies of scale are largely absent, it makes sense to decentralize decisions concerning street space, in accordance with the decentralisation theorem.

While this distribution of tasks, resources, and power may be adequate for one set of challenges, it may be ineffective when new ones arise. Features of existing governance system may affect the entrant technology's success, depending on what services it offers. That success may also depend on the challenger's ability to navigate and influence the institutional environment it faces. Well-suited illustrations include the introduction of actors such as Uber in ridesourcing (Pelzer et al., 2019; Cooper et al., 2023).

Previous studies suggest that WoOs for niche technologies mainly arise from landscape-level developments (Geels and Schot, 2007; Kanda and Kivimaa, 2020). In contrast, we argue that other sources of such windows are latent in Norway's multimodal regime. We conceptualise four mechanisms that arise from within-regime tensions in multi-layered systems.

First, existing MLG scholarship has established that the problem-solving capacity of such systems depends on the degree to which responsibilities are clearly defined. When responsibilities and distributions of tasks are blurred, regulatory responses may be suboptimal, or even fail to materialize (e.g., Hooghe and Marks, 2021; Matteucci, 2020). We therefore propose our first mechanism that any *ambiguous distribution of responsibilities* may lag adequate regulatory responses and hence be beneficial to entrant technologies. That is particularly true for challengers who have leeway and ability to navigate the institutional environment it faces.

Second, one governmental tier may adopt regulation that reduces the effect of rules created at another level. (Bache et al., 2015; Stephenson 2013). Hence, as our second mechanism, we propose that *lack of policy coordination* may create or reinforce WoOs for entrant technologies. This mechanism is previously suggested by Docherty (2020) as a challenge for MLG structures, in particular facing challenges in 'smart mobility'. It also has parallels to policy sequencing (Howlett, 2019) but focus on relations between levels of government and not temporality.

Third, the level of government facing the task of handling the emergent technology may *lack adequate bureaucratic resources*. Stemming from a MLG structure, regulatory capacity is linked to the needs of the present technologies. This adds to the Elerst and Henrekson (2016) argument that institutions are more important for the incumbents than for the new enterprises. Strong institutions exist at the tiers of government where they are needed, and much weaker institutions exist at different levels. We therefore contend that a WoO may arise when an existing technology is regulated by one tier of government and a new technology that offers similar services is regulated by another. In doing so the

new entrants have more freedom to provide their services, as exemplified by the taxi versus ridesourcing case in California, (Cooper et al., 2023), where taxis are licensed at city level but ridesourcing (TNCs) is licensed at state level.

Fourth, we propose that *presence (or absence) of strong, institutionalised actors in the targeted market* at the relevant scale may affect the new technology's success. This mechanism is related to the traditional MLP argument of strong incumbents and a stable regime presenting a barrier towards a transition in the absence of exogenous forces (Geels, 2011). However, we extend this by coupling it with the MLG recognition that the strong and institutionalised actors may only be present at the scales that apply to the existing technologies. In turn, this creates latent WoOs at other levels, even when the socio-technical regime seems to be without cracks.

3. Methods and data

This study is conducted as a plausibility probe (Eckstein, 1992) to test our theory that a MLG structure tailored for existing technologies entails voids that provide latent WoOs for new technologies. Based on our research question, we listed two main criteria for case selection. First, we wanted cases that were concurrent. Second, using the Geels (2005) typology, we sought technologies in the second (where the novelty is used in small market niches) or third (where the technology reaches a breakthrough). This timing is important because the technologies had to be salient and relevant (so that our interviewees had sufficient understanding of them), but still not part of the established socio-technical regime. Ideally, we would have chosen cases that only vary with respect to one explanatory variable, how the technology relates to the levels of governance. However, after examining the possible cases we have found no such cases exist: To select possible cases we drew on the work of the Norwegian Board of Technology, which created a list of 16 mobility technologies most likely to be relevant in the Norwegian context in the 2020s (Haarstad et al., 2020). Our study is designed as a comparative study of two technological cases, e-scooters and Maas, in the context of the Norwegian mobility market. These cases represent technologies that relate differently to the governance structure in the multimodal regime, but otherwise share many features, such as being niche technologies with significant backing and dependant on developments in ICT.

Further similarities between the two technologies include that they were introduced in the years shortly before 2020. This timing is important as we avoid recall bias in our data, and that the landscape level developments are similar. At the time of the study, neither technologies can be seen as having become parts of the established regime. Both technologies may also play important roles in sustainability transitions (Kivimaa and Rogge, 2022; Sareen et al., 2021), as potential components of the multi-modal regime. Both technologies are also at a similar stage of development, meaning that the digital components of the technologies are mostly developed, while the convergence towards a uniform business model and market consolidation is an ongoing process. The technologies differ in that e-scooters add new physical mobility facilitated by developments in digital technologies, while Maas mainly adds a new digital tier to existing mobility services, acting as a digital platform (Hensher, 2022).

To summarise, we argue that the technologies constitute distinct niches under the same socio-technical regime in the same geographical location, vary concerning their relation to institutions and policy levels. This context is well suited for testing our claim that within-regime tensions are important for understanding how WoOs emerge. However, as is true for most small-N, in-depth studies, our basis for generalization is limited. Future research can test our proposed mechanisms in other MLG structures, or by using different technologies as cases.

The study draws on nine expert interviews focusing on the e-scooter case conducted in the period March to June 2021 (Table 1) and on two series of expert interviews (11 interviews) conducted in 2019–2020 and September to December 2021 on future mobility in general and Maas in particular (appendix). The interviews were conducted as semi-structured expert interviews with key persons representing municipal and county governments, the Norwegian Public Roads Administration (NPR), Maas and e-scooter operators and municipal politicians. The interviews were recorded and transcribed, and direct quotes were translated to English by the authors. The authors have also participated at e-scooter seminars and events as experts, panellists, and discussants, and had follow up calls and emails to several of the interviewees. These interviews have been supplemented by studies of policy documents, including government strategy documents and inquiries, legal documents and bills, policy proposals and background document.

Table 1. Interviews and informant ID.

Infor-mant ID	Actor	Position	Theme	Duration	Date
1	Viken county	Special Advisor – urban mobility	Maas E-scooter	1 h 30min	03 March 21
2	Entur	Director – digital services	Maas	1 h 30min	04 April 21
3	Kyyti	Director	Maas	1h	05 April 21
4	Bergen (city)	Commissioner for Climate, Environment and City Development	E-scooter	50min	20 April 21
5	Various counties/ municipalities	Special advisor – former head of administration	Maas E-scooter	1h	22 April 21
6	Drammen (city)	Senior Advisor – cycling and micromobility	E-scooter	1h	7 May 21

Infor-mant ID	Actor	Position	Theme	Duration	Date
7	NPRA	Senior Advisor – juridical issues	E-scooter	50 min	11 May 21
8	NPRA	Senior engineer – micromobility	E-scooter	50 min	11 May 21
9	Oslo (city)	Strategic Advisor - mobility	E-scooter	1h	10 June 21

4. Empirical background

E-scooters and Maas both represent mobility innovations that are facilitated by digitalisation and are positioned as complements to the existing multi-modal mobility regime.

E-scooters are a combination of several pre-existing technologies; the kick-scooter, the electric motor, GPS/GIS, smartphone, a digital hailing system to name a few. In this way it is an innovation as new combination of existing technologies. Dockless e-scooter services were first introduced by Bird in California autumn 2017, and has since been rapidly introduced in new markets (Fearnley,2021). At the time of writing the technology is increasingly becoming part of the established multi-modal mobility regime in many cities both in the US (Riggsetal., 2021), Europe, Australia (Fieldand Jon,2021) and elsewhere, while remaining controversial, as illustrated by the recent ban decision in Paris (Bellan,2023). Depending on pre-existing legislation and popular opinion there are examples of both a push for more liberal and stricter policies. In the UK, where pilots were politically initiated and e-scooters are illegal, there is a call for liberalisation. In contrasts there are calls to tightened regulations where they initially were legal and their introduction was market driven (Fearnleyand Kristensen,2023).

Maas can be defined as “an integrative concept that bundles different transport modalities into joint, seamless service offerings, as means to provide tailored mobility solutions that cater for end-users’ travel needs.” A key characteristic is the facilitation of intermodal use of PT and other transport services (Smithetal., 2018a). Maas became a common term for describing the general idea of providing the end-user a single service to search, access and pay for a wide variety of transport options (Aapaoja,2017), in other words to put all mobility options into one app. Similar to the concept of a digital mobility platform (Hensher,2022). This feature has the promise of decoupling the decision to travel from the decision to choose mode. In other words, Maas constitutes a form of business model innovation (Sarasiniand Langeland,2021), making non-car options more attractive by avoiding the lock-in effects of private car ownership. Commercial Maas providers, such as Maas Global and Kyyti, emphasize existing PT offerings as a core component of their services. While the commercial success of Maas has yet to materialise, various pilots and tests at scale have been conducted in a number of locations, with mixed results (Pangbourneetal., 2020). At the time of writing new iterations of the concept are envisioned (Hensherand Hietanen,2023).

4.1. E-scooters in Norway

Since the first e-scooters were introduced in Norway by Voi and Tier in May 2019 (Fearnleyetal., 2020) the number of companies, e-scooters and trips increased rapidly. As of spring 2023, commercial e-scooters have been or are in operation in 36 municipalities. Moreover, more than 20 companies were represented (Ydersbondetal., 2023). Initially e-scooters operated legally and were unregulated. In Oslo, e-scooters reached a total number of trips comparable to that of the tram system, with about 25,000 e-scooters and eight e-scooter providers in an unregulated market (Aarhaugetal., 2023a). Other Norwegian cities has experienced similar growth rates, but at a lower scale and with fewer companies involved.

Until the Norwegian act on shared micromobility on public grounds, which came into force June 2021, there was much regulatory confusion. Following this act, municipalities were explicitly allowed to create local regulation of e-scooter operations in their area. This has created a large set of different regulations (Ydersbondetal., 2023) In Oslo the expansion lasted until a new local regulation came into place in September 2021 capping the number of e-scooters to 8000. That total was to be divided equally between the companies that were approved as service providers (Oslo municipality,2021). Bergen municipality introduced a voluntary regulation including a cap on the number of scooters, but not all operators chose to follow the regulation (Sareenetal., 2021). In Trondheim a tender was introduced by the municipality, limiting the number of actors. This policy was, however, successfully challenged in court by one of the operators that had not been awarded a contract. In smaller cities, such as Drammen, there has been less conflict, and as in the case of medium sized cities in Sweden, many regulatory issues have been solved by dialogue (Paulssonand Aarhaug,2021).

4.2. Maas in Norway

In contrast to countries such as Sweden and Finland (Ydersbondetal., 2020; Smithetal., 2019), Maas was first introduced in Norway in 2015 (Ruter,2015) as a policy objective by a PTA, not by a technological innovation. Although efforts have been made by international Maas actors, including MaaS Global and Kyyti, independent Maas services have not been commercially launched. Instead, different public transport authorities (PTAs) have developed PT centred apps with some Maas features, such as the inclusion of city bikes, and app transfers. The PTA-centred services have only recently been challenged in the market, after Vy and Bolt began offering bundled Maas-like mobility services.

Crucially, however, neither Vy nor Bolt include local PT in their services. At the national level, there have also been efforts to bring in Maas features into the rail ticketing platform Entur.

4.3. E-scooter and Maas activities and governance levels

Focusing on the Norwegian case, we have mapped out the regulatory structure and activities of Maas and e-scooter actors in [Table 2](#).

Table 2. Regulatory structure and actors, the case of Norway.

	Maas		E-scooter	
	Regulatory structure	Activities	Regulatory structure	Activities
Supra-national	Framework (EU)	Digital services Marketing and lobbying	No framework	Digital services Marketing and lobbying
National	Framework, delegate authority, Limited regulation	Marketing and lobbying	Limited (ad hoc) regulation, limiting local authorities	Marketing and lobbying
Regional	Strong actors, clear juridical practise, operations	Physical services	No regulation	
Local	Limited capacity		Limited capacity	Physical services

First, we consider the activities of Maas companies and the institutional environment in which they entered. Maas has a digital component; that is, the development and maintenance of the Maas platform and associated digital systems. Such activities are sparsely (and, if attempted, often rather ineffectively) regulated by national authorities. However, at the supranational level, the European Union (EU) may create relevant regulations in the form of revisions of the ITS-directive. While such digital components are not tied to given locations, other aspects of Maas are place specific: Maas entails offering physical transport services, including tickets to local PT, which in Europe are predominantly provided at regional level.

As local PT is strictly regulated and subsidised (as in Norway), Maas companies depend on explicit policy provisions that create a WoO for their business ([Hensher et al., 2021](#)). In particular, to include PT in their services, they rely on third-party ticketing. Still, Maas companies sometimes offer services in direct competition with strong, established actors, either utilising strong ties to the local PTAs, or using other modes, such as ridesourcing, for their physical services.

In their in-depth assessment of PT governance in Oslo and its neighbouring county Viken, [Olsen et al. \(2022\)](#) found that at regional level, the established institutions, in particular the PTAs, perceived Maas as a direct competitor. In the multi-modal system, the PTAs are indeed very strong actors, exemplified by Ruter, the PTA tasked with planning, procuring, and marketing PT in and around Oslo. It employs approximately 300 people and has annual sales amounting to more than EUR 0.8 billion. Owned by Oslo and Viken counties, Ruter and its executives have considerable political connections. Moreover, like many other PTAs in Norway, Ruter is tasked with providing analysis and expert advice on PT to its owners. That expert role constitutes a source of power, as it implies considerable information asymmetry vis-à-vis its owners. Together with other PTAs, Ruter have lobbied against regulations allowing third-party ticket sales, thereby increasing the barrier for third party Maas offerings ([Olsen et al., 2022](#)).

At the local level, there is little Maas-related activity. Maas companies have instead mainly used third-party services or as in the case of Vy's car sharing service, opted out of the municipal support scheme to use their preferred business model.

Second, we consider e-scooter companies and their relation to pre-existing institutions. At the supranational level we note a similarity between Maas and e-scooter companies: Both have considerable digital components. The development of a digital platform can take place independently of the location of the physical service. The same is true for storage and analysis of big data generated by Maas and e-scooter users. No national regulations target these activities. As shown in [Table 1](#), the digital components of both Maas and e-scooter companies take place at the supranational level.

In contrast to the experience of Maas companies, e-scooter companies entered in a void where little regulations existed at national and regional levels. Established actors were largely absent. In May 2019, the international companies could deploy their first e-scooters on Norwegian streets in full compliance with Norwegian legislation. This WoO was created by a series of regulatory changes implemented from 2014 ([Ydersbond et al., 2023](#)). Combined these implied that e-scooters should adhere to rules approximately as stringent as those bicycles are subjected to. For instance, e-scooters could use pavements, if they yield to pedestrians. When crafting the 2014 regulatory changes, politicians did not give e-scooters much thought – and certainly not the number of e-scooters that would eventually be deployed ([Ydersbond et al., 2023](#)). Rather, regulations were changed following an initiative by the Progress Party (a right-wing populist party having recently joined a coalition government) to remove “stupid prohibitions”, including regulations that had blocked the use of “Segways” in Norway ([Ministry of Transport](#)

and Communication,2013/2015). Evaluating 16 potential measures targeting e-scooters, Fearnley(2020) concluded that regulation of e-scooters was indeed a legal area in need of clarification.

5. Analysis and discussion

First, this section shows how Maas and e-scooter actors positioned their offerings vis-à-vis regulatory levels in Norway's transport governance system. Second, we identify four mechanisms that may create WoOs for entrant technologies, within this structure.

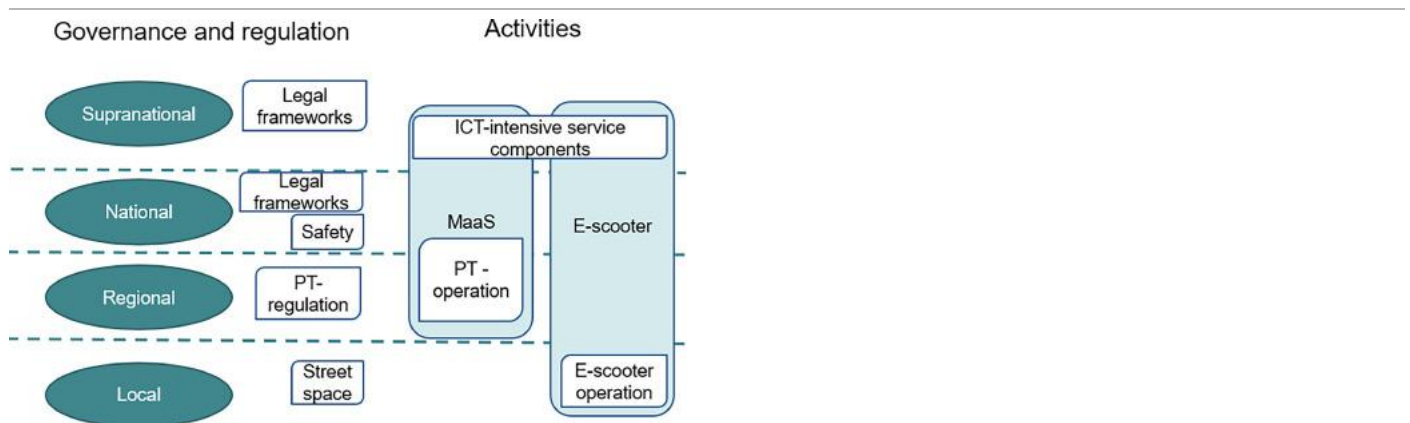
5.1. Maas and e-scooter interaction with pre-existing governance structures

Maas and e-scooters share one important feature: Their digitally intensive service components can be produced irrespective of localisation. Hence, both technologies can easily be introduced in new geographical areas. There is, however, one key difference between them. While most e-scooters companies include provision of the physical vehicles, the production of Maas services relies on partnering with operating companies at each location.

Although e-scooters are provided by national or multi-national companies, they constitute a local service whose externalities are mainly local. The digital component of the e-scooter services scales well, it can be offered across localities and has increasing returns to scale. However, the physical component can only be offered locally. Some economies of scale owing to densities exist locally (Fearnley,2020), but not comparable to the economics of scale in the digital components of the technology. Unlike bus services, which are usually provided through long-term contracts, e-scooters can be rapidly moved between locations within a city, between cities and countries in response to regulatory changes. For the most part e-scooters are owned by the operator, who can move the scooters to a new location if the market develops unfavourably or regulations change.

At the core of most Maas offerings is the connection with local PT: In most European urban areas, local PT has substantial modal shares. Such integration may be challenging, as PT receives subsidies, and is targeted by multiple regulatory measures. In the Norwegian case these regulations have removed the possibility of establishing an independent physical set of services, even if these services would be economically viable (Fearnleyand Aarhaug,2019). In addition, the PTAs can obstruct any unwanted bundling of PT tickets in accordance with national law (Ydersbondetal., 2020), making them a strong incumbent.

Placing Maas and e-scooters in the framework developed in Fig. 3, Fig.4 illustrates that the services span across most governance levels.



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Fig. 4. Maas and e-scooters positioned against governance and regulatory levels.

Fig.4 illustrates how the new mobility innovations align with different levels of a MLG system. Fig.4 builds on the case of Norway, which shares many similarities with other European countries when it comes to transport governance.

Maas include physical service offerings at regional level, targeting integration with the existing PT system. At the national level, Maas requires legal frameworks that creates a WoO for their business. Such a window was created by the Finnish transport act (2017/2019), which required suppliers of local PT to provide an open API facilitating ticket sales by third parties. Norwegian suppliers of local PT have not been subjected to such a requirement (Ydersbondetal., 2020).

For e-scooters, access to street space is paramount. That access is regulated at local (city or municipal) level. Because e-scooters are mostly used for local mobility (Aarhaugetal., 2023b), they seek to gain shares in the market currently dominated by PTAs. However, as PT is organised

at the regional level, this means that PT does not share regulatory institutions with e-scooters (nor taxis, city-bikes, and car sharing). The same origins and destinations can however be served by services relating to different levels of government. Both local and regional authorities govern based on framework regulation, set by the national or supranational level. These frameworks limit how and to what extent regional or local governments can intervene in the relevant markets. This points towards the four mechanisms through which a WoO may exist latently in MLG system.

In the next subsection we further theorise and substantiate those four mechanisms, which were all caused by the fact that the pre-existing governance apparatus was not rigged to handle the challenge presented by the new innovations. While such challenges are neither exclusive nor inherent to MLG systems, the causes of the WoOs were contained in the multi-level structure or the pre-existing governance system.

Table 3 provides an overview of these four mechanisms.

Table 3. Mechanisms creating WoOs for entrant technologies.

Mechanism	Observable effects	Example
1 Ambiguous responsibilities	Inter-tier blame game, regulatory deadlock and delayed (or even no-) response	State-municipality disagreement over formal municipality authority
2 Lack of inter-level policy coordination	One level creates one rule, another creates a conflicting regulation	State-level authorities turned down municipalities' request of an authorization to charge e-scooters for externalities
3 Inadequate bureaucratic resources/capacity	Too little competent staff at the municipal level, which 'by accident' got to handle e-scooters	Drammen (small town): Only one civil servant responsible for e-scooter regulation Bergen (larger city): a majority of the staff in the relevant department occupied with e-scooter regulation tasks
4 No strong actors in target market	No established institutions. Walk-over victory for market entrant	Maas entry was blocked by e.g. Ruter (Oslo region PTA). E-scooters faced neither such actors nor a designated regulatory body

5.2. Latent windows of opportunity in multilevel governance: four mechanisms

5.2.1. Ambiguous responsibilities

This situation was summed up by one of our informants, representing a state-owned company in the transport market: *"The Ministry [of Transport and Communications] contends that the municipalities do have the legal leeway to regulate e-scooters. The municipalities, however, awaits clarification from the ministry"* (interview, 2). Trine Skei Grande, a former Liberals leader and minister in the Conservatives-led coalition cabinet between 2018 and 2020, represents the national level governance perspective. She argued that the Oslo city government had plenty of time to ensure local clarifications for the use of e-scooters (Grande, 2020). Her views are sharply contrasting those of municipal politicians such as Thor-Haakon Bakke, the then Commissioner for Climate, Environment and City Development in Bergen,² who in interview 4 stated that *"the [national] government has caused an unclear legal area surrounding e-scooter regulation."* While frustrating the regulators, the legal ambiguities did not stop e-scooter companies from entering the Norwegian market. When conflicts occurred, some actors actively used the courts to support their case. Ryde, against whom Trondheim municipality took legal action in early 2020, did not discontinue their activities pending the court's decision. In subsequent rulings between April 2020 and December 2021, the three tiers of Norwegian courts found that companies are not obliged to acquire municipal approval before deploying e-scooters.

To summarise, municipal authorities eager to regulate e-scooters had (at best) a limited menu of viable measures available. Moreover, the legal ambiguities caused a blame game between politicians at the local and the national level: While municipalities argued that effective regulation of e-scooters required that the government put forward new legislation, representatives of the central government suggested that municipalities had considerable leeway to implement local regulations. This has clear parallels to the policies of blame avoidance pointed to by Bache et al. (2015).

5.2.2. Lack of policy coordination

In May 2021 the government proposed multiple regulatory changes to alleviate problems stemming from the use of e-scooters. However, these explicitly did not include the use of economic regulations which were favoured by the local governments. Operating fees could only cover costs associated with e-scooter regulation, not externalities.

I assume there is a rather low cost and high income per e-scooter. So in terms of business it is a goldmine, as long as there are no regulations and [the e-scooter companies] do not have to pay for street space as other actors have to. The street merchants at Fisketorget have to pay, everybody has to. But [e-scooter companies] do not, because they argue that they can use a gap in the regulations which allows them to not pay. (Interview, 4)

Seen from the city level, national regulation limits local governments' action space, without presenting clear regulatory alternatives for the cities.

At the national government level PT and road-use issues are delegated to the NPRA. The NPRA is very clear that they do not perceive the regulation of e-scooter actors as within their mandate.

We do not really care about the financial issues or economics. We do not care who owns it (...) who rents to whom, and who makes the money. When it comes to use of the vehicles on a public road, it is traffic safety, accessibility, and all that, that is the NPRAs issue and responsibility and area of authority. (Interview, 7).

In addition, there are EU-level directives that form frameworks that both state entities and local governments need to pay attention to. However, EU-level regulation of micromobility has so far not materialised and is only starting to emerge with relation to Maas. A key issue in Maas, but also relevant in the context of e-scooters, is the relation to data production, storage, and ownership. On the need for regulation of data access in order to create opportunities for the establishment of third-party Maas services (Maas platforms), and the possibility for real time regulation of e-scooters, one informant stated:

But if they are to regulate, they must actually get access to real-time data and those things, if we mean that there can be solutions here. As by having a central regulation and central data access point, I state again, not data ownership, but if you have a central data access platform, it will be possible for private actors to actually innovate on that data and create mobility solutions. (Interview, 2).

Together this lack of policy co-ordination points at a recurring critique of any MLG system in the face of systemic mobility changes, and climate change in particular (Bacheetal., 2015). However, while Bacheetal.(2015) argue that politicians deliberately create 'fuzzy governance' to distance themselves from potentially unpopular decisions, none of our informants suggested any such deliberate policy decisions in our cases. Rather, the lack of coordination in the e-scooter case seems to stem from long-standing issues in coordinating sector-specific policies and cross-cutting policies, and turf battles between different public entities. This finding is parallel to the governance challenges for accelerating sustainability transitions identified by Markardetal.(2020).

5.2.3. Inadequate bureaucratic resources and capacity

The degree to which the relevant government institutions are prepared for the arrival of a new mode is important. In the case of e-scooters the lack of legal clarification was perceived as more of an opportunity than an obstacle for the companies, consistent with the evasive entrepreneur concept (Elerand Henrekson,2016). Indeed, the courts' decisions ended up limiting local authorities' leeway to regulate the use of e-scooters. Moreover, the bureaucratic capacity at the local level – the level where e-scooters offer their physical service – was often insufficient. During our interview in April 2021, Bergen Commissioner Thor-Haakon Bakke indicated that handling the large-scale e-scooter deployment was a tough challenge, also in terms of bureaucratic resources.

At the moment, most of the manpower in the Agency for Urban Environment³ is busy handling the legal case against Ryde, a regulatory pilot project, and other long-term and day-to-day e-scooter matters. Simply put, we do not have enough people. When one problem is solved, two more arises. (Interview, 4)

Given that Bergen is Norway's second largest city, it likely has relatively large bureaucratic resources in terms of competent staff. Hence, Bakke's statement could suggest that the entry of e-scooter companies is even more challenging to smaller towns, where bureaucratic resources presumably are in even shorter supply. This suspicion seems to be corroborated by Gert Myhren, senior engineer in Drammen municipality. In the Norwegian context, Drammen can be considered as a medium-sized city, with a 2022 population in excess of 100,000. During our interview, Myhren gave an overview of the municipality's efforts to develop and enforce e-scooter regulations. He stressed that such activities are constrained by the number of relevant staff: *"The resources we can use to follow up on e-scooters and stay in touch with e-scooter companies are very limited."* (Interview, 6). When we asked about the number of employees involved in the e-scooter regulation efforts, he replied:

Well, it is basically just me. In e-scooter matters, my closest colleagues are the coordinator of bicycle policies and the officer responsible for rental of public space. I authored the documents specifying the municipality's conditions⁴ for e-scooter companies alone, I drafted relevant contracts, and prepared most if not all background documents for municipality politicians.(Interview, 6).

Myhren referred to a gentlemen's agreement between the municipality and the three e-scooter companies that operated e-scooters in Drammen at the time of our interview. He stated that the companies have been eager to appear "responsible", and that the agreement has been useful because it has established mutual understandings and codes of conduct. It seems, however, that the companies have not accepted terms that threaten their commercial interests:

"Due to the uncertainty regarding the municipality's authority to demand such an agreement, our terms were rather cautious. We included only conditions we expected that the companies would find reasonable." (Interview, 6).

Taken together, our interviews with key informants in Bergen and Drammen suggest that e-scooters have posed a considerable regulatory challenge testing the capacity limits of local bureaucracies. However, the amount of bureaucratic capacity needed seems to be strongly linked to the individual behaviour of the e-scooter companies that were present in the individual markets. In markets such as Drammen, where none

of the actors were actively challenging the authorities, very limited resources seem to have sufficed. However, the lack of resources limited the scope for policy since the city did not include challenging conditions. This is in parallel to observations in Sweden, where many cities initially regulated e-scooters through voluntary agreements (Paulsson and Aarhaug, 2021). However, when the market entrant chose a confrontational approach, even a city such as Bergen lacked the bureaucratic capacity to handle the situation properly.

Further there is the argument that the local authorities are generally too small and lack the capacity to develop regulation on data-intensive services. *"The more data intensive, to use that expression, the more appropriate it is to get a central regulation"* (interview, 2). This points to the need to create a central regulation for mobility services that has much of their value creation from data. The underlying conflict is between having a physical service that operates and is regulated at a local level, and digital value creation that is outside the purview of local authorities. The digital services point towards regulation at higher levels of government. In this way both e-scooters and Maas present business models that do not fit well with the established institutions in the multi-modal regime.

5.2.4. Absence of strong incumbents

At the time of their introduction to the Norwegian markets the e-scooters (shared dockless as well as private) represented an entirely novel service. Hence, they entered an established regime without a clear relation to a strong extant institution. There was no bureaucratic authority directly targeting their commercial activities (Fearnley, 2020). Only after lengthy deliberations were national regulations established, authorising municipal-level rules for e-scooters (Ministry of Transport and Communication, 2021). By that time, the service was well established.

This contrasts with commercial Maas companies in Norway, who sought to offer services in direct competition with strong incumbent actors; that is, the PTAs operating in an established regime where responsibilities and rules were long clarified. According to the strategy document of the PTA in the Oslo area (Ruter, 2020), there is an ongoing battle between local and multi-national actors over data from the local users, and it is of paramount importance for the local authorities to remain in control over this information. The line of argument suggests that there is a conflict between good multi-modal mobility and third party operated Maas, and that the public is best served by the PTA centred Maas model (Olsen et al., 2022). In an MLP-framework, the PTA, as the dominant actor in the multi-modal regime, seeks to block potential market entrants by providing a similar service. In other words, commercial market entrants were effectively opposed by Norwegian PTAs that provide their own inhouse alternatives.

Two further cases support the argument that a strong incumbent actor at the relevant level of a MLG system is an important factor. First, the bundled services offered by Vy and Bolt do not include local PT. Instead, they provide local services through entities that are not regulated at the regional level. Second, the strong incumbent as a barrier argument is supported by how the process of Maas development unfolded in Finland, where commercial Maas-companies were given a legal WoO that allowed the technology to develop (Ydersbond et al., 2020; Smith et al., 2018b; Kivimaa and Rogge, 2022). This was done by limiting the role of the PTAs to provide PT services and data, so that commercial Maas could operate at a different tier.

Furthermore, if a technology enters in an established environment characterised by clear responsibilities and regulations, strong competitors, and high bureaucratic capacity, the potential for evasive entrepreneurship and success decreases. This happened in the case of Maas in Norway, where the established actors have been able to address existing weaknesses in the current institutions and regulations, and by doing so have prevented new actors from entering the market with a different technology. Instead, the existing industry has developed alternative business models and frameworks utilising some elements of the new technology (such as integrated ticketing and travel planning). This contrasts the experience in Finland, where Kivimaa and Rogge (2022) argue that active policy experimentation, in the form strategic niche management, have supported Maas. It also illustrates that commercial Maas actors in Finland, by more actively engaging in and supported by supportive policies, were able to overcome the barriers presented by the extant regime. The corresponding actors were not able to do this in Norway. At first glance this appears to contrast our argument, both countries have similar MLG structures. However we believe that it does not, as the critical events, especially considering when and how the legislation was changed, was different (Ydersbond et al., 2020). Moving ticketing from regional to national level, as was (in part) the case in Finland, also helped bypass the potential barrier presented by the incumbent PTAs. This not only highlights the importance of the conflicting interests of different governance levels but also that of policy sequencing (Pakizer et al., 2023) in a transition process.

6. Conclusion

Established innovation theory, such as the MLP, suggests that windows of opportunity for new innovations to enter the mass markets are created when the relevant socio-technical regime is weakened by pressure from external landscape level events or internal problems. We argue that a WoO may also be latent in the pre-existing socio-technical regime's institutional and political structures. Specifically, we argue that how authority and resources are distributed across tiers of government may create regulatory voids or faultlines that in turn result in WoOs for emerging technologies. The distribution of authority and resources is particularly relevant in multi-level governance structures.

Building on findings in existing MLG studies (Bacheetal., 2015; Hoogheand Marks,2021; Matteucci,2020), we propose four mechanisms through which WoOs can be created in and by a multi-level governance system. First, ambiguous responsibilities may lag adequate regulatory responses and create blame games between levels of government (e.g., the municipal and the national level). Second, lack of policy coordination may further obstruct effective policies. Third, the level of government facing the task of handling the emergent technology may not have the adequate bureaucratic resources. Fourth, the presence (or absence) of strong, institutionalised actors in the targeted market may affect the new technology's success. Through these mechanisms we add to the conventional MLP understanding of the regime by suggesting that it may be strong and stable overall but weak in certain areas. This distinction seems particularly relevant for innovations facilitated by digitalisation that are introduced in regimes such as mobility where governance actors play a large and active role. The preceding mechanisms allow for a richer and more nuanced understanding of WoO that arise from existing regime structures rather than landscape forces.

Our study shows that extant service providers can be, and sometimes are, successfully challenged by moving activities between administrative levels of government. This has parallels to evasive innovation (Elerand Henrekson,2016). However, as highlighted by our mechanisms, this is not necessarily the result of active positioning, or institutional entrepreneurship (Pelzeretal., 2019) from the part of the innovating actors. It can also be a result of latent cracks in the established MLG structure and that digitalisation changing the relevant scales and locations.

Further, we argue that a WoO for new technologies may already exist as a result of extant regulations and policies that were developed to support and govern technologies that have been stable for an extended period. While the pre-existing setup of policies, responsibilities, institutions and resources may be well suited to regulate established technologies, it may still not be fine-tuned to handle the challenges posed by emerging technologies (Docherty,2020). Hence, key to understand why some new technologies fail and others succeed is to examine the institutional environment in which the technology enters.

Our two cases – the largely successful introduction of e-scooters and the equally unsuccessful attempt to offer commercial Maas services in Norway – provide illustrative evidence supporting our proposed mechanisms. International MaaS operators were not able to establish services in the Norwegian market when they attempted to position themselves between the PTA and the customer. In contrast to the Finnish case, where third-party ticket sales were made mandatory, no such enabling legislation was enacted in Norway. Moreover, Maas operators' efforts were obstructed by the incumbents, mainly the PTAs. However, multi-modal actors that did not offer services under the legal authority of the regional governments, instead basing their local service offering on taxis, car sharing and e-scooters have been successfully established (Bolt and Vy). These avoid head-to-head competition with the local PTA on their ticket sales, but they compete in the same geographical area, using modes that are outside the control of the regional governments. In line with our model, they have provided a service with a mobility offering for local trips to the customer, without coming into direct conflict with the strongest incumbent actors. Their services compete with local PT, but the newcomers operate under regulatory structure that the PTA has little influence over.

E-scooters can be seen as a niche development that has successfully entered the main markets, without directly conflicting with the established regime. Instead, they have utilised legal loopholes arising from the faultlines between local, regional, and national authorities. These latent WoOs in the regulatory structure have been utilised in combination with rapid expansion. This has resulted in e-scooters being able to establish legitimacy with large parts of the public through on-the-ground presence before being challenged by incumbents in the multi-modal regime.

Based on our two cases we extend this argument by suggesting that digitalisation-facilitated mobility technologies by being less place dependant than incumbent mobility technologies have the possibility to offer a similar service organised at alternative geographical scopes. This may correspond to different levels of government compared to the pre-existing services, and in extension faultlines or voids in the existent regime-level institutions and policies. In other words, ICT-based mobility innovations may exploit the WoO created by MLG by presenting their service at a different level of government compared to the closest alternatives in the physical mobility market, and similar to the concept of evasive entrepreneurship, as opposed to being dependant on supportive policies.

This is not to say that any innovations with a large ICT component can circumvent any regime. Rather it means that digitalisation-facilitated mobility innovations have more flexibility in exploiting market opportunities in heavily regulated sectors compared to innovations that are only able to offer services at the same governance level as the established actors.

Changing scales of operation may expose latent WoOs in extant policies and institutions at socio-technical regime level. In turn, this may ease the mass-market entry of new technologies. By decoupling the physical provision of services from the interaction with customers, digitalisation allows choosing the path of least resistance when entering a new and highly regulated market. Not only do the voids or faultlines in existing MLG structures present latent WoOs for new technologies: These may also actively be exploited by digital services that are not, to the same extent as extant mobility technologies, bound by established scales of operations.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Jorgen Aarhaug reports financial support was provided by Research Council of Norway. Andreas Kokkvoll Tveit reports financial support was provided

by Research Council of Norway. Jorgen Aarhaug reports a relationship with Research Council of Norway that includes: funding grants.

Acknowledgements

The authors are grateful for the comments from and discussions with Alexander Paulsson and Cyriac George, and helpful suggestions from two anonymous reviewers and editor Loís Carvalho.

Appendix

Table A

Table A. Interviews and informant ID (supplementary interviews).

Informant ID	Actor	Position	Theme	Date
10	Brakar	Director	Maas	Oct 21
11	Brakar	Directors	Maas	Oct 21
12	Start Up	Founder	Maas	Jan 20
13	Bolt	Director – regional	E-scooter	Oct 22 ¹
14	Kolumbus	Senior advisor	Maas	Feb 20
15	SINTEF	Research director	Maas	Feb 20
16	Acando	Advisor	Smart City	Feb 19
17	Oslo City	Advisor	Maas	Oct 20
18	Norwegian Board of Technology	Director	Maas	Jan 20
19	Start Up	Founder	Maas	Jan 20
20	ITS	Director	Maas	Jan 20

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Recommended articles

Data availability

Data will be made available on request.

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- 1 These authorities include the Norwegian Railway Authority, responsible for control and supervision, the Railway Directorate (coordination), Bane Nor (infrastructure), and various other companies and institutions. All operate at the national level.
- 2 Along with several other Norwegian cities, Bergen uses a parliamentary model in which the executive City Government requires the support from and is accountable to the city council. Members of the city government are entitled Commissioners or Vice Mayors.
- 3 The Agency for Urban Environment is an agency under the City Government's Department of Climate, Environment and Urban Development.
- 4 Drammen municipality entered a gentlemen's agreement specifying mutual obligations.

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