Study

"Mobility transition and governance in EU Municipalities"

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SUMMARY

In the context of climate change and the goals set by the IPCC to reach carbon neutrality by 2050, the future framework conditions of urban development constitute a major challenge for EU cities and beyond (UCLG, 2019; EEA 2020). This vision is firmly embedded in global policy debates about the climate crisis and in meeting the requirements of livability and social justice.

This is particularly the case of transport, which is considered one of the biggest challenges ahead to decarbonising national economies (as per the 0% emission car objectives by 2050), due to this sector's critical role in values and lifestyles, national and transnational industrial policies, and as a negative externality of urban sprawl. Transport still accounts for a 25% (and growing) share of Europe's GHG emissions, an estimated 23% of which are accountable to urban areas alone (EEA 2022). Compounding this, emissions have not seen the same pace of reduction as in other sectors, remaining 28% higher in 2017 compared to 1990. In spite of continued efforts to cut down on CO2 emissions and shift away from car use, transport still relies on individual motorization, henceforth causing harmful emissions and significant environmental deterioration across the EU (EEA, 2020, 13, 159). Results have rarely matched the stated ambitions, and major gaps have been observed at the time of implementing these policies and plans (Halpern, 2018).

In view of the challenges lying ahead, public authorities recognize the need to accelerate and intensify the shift (Abdullah, 2021). It is becoming increasingly clear that without a step-change in how we approach managing urban transportation's role in carbon reduction and climate change mitigation, the EU will be set to miss its 2050 net-zero targets to cut transportation GHG emissions by 90%. A number of European cities have set out to adapt to this rapidly changing environment by developing a holistic and integrated approach to sustainable transitions in the mobility field. They have also at times engaged in resolute and innovative approaches to accelerate some of the desired objectives. This reflects in the fourth generation of urban mobility plans currently under development, with the explicit goal to achieve carbon-neutrality and adapt modal split goals accordingly. While cities share a number of similar goals – enhance livability, ensure social justice, reduce carbon emissions etc. – significant differences can be observed across cities in regards to the strategies, methods, measures and processes planned or being implemented. Moreover, some cities lack the resources and competencies to develop and implement their sustainable urban mobility policy agenda.

In the context of the acatech project "Integrierte Stadtentwicklung und Mobilitäsplanung", this report "Mobility transition and governance in EU Municipalities" examines what sustainable transition strategies are being developed by regions and municipalities in Europe and what results they achieve. Drawing on four cases considered as pioneers in promoting innovative forms of integrated transport and urban planning to achieve transformative change, it feeds into the work done at project level about what design and planning approaches can be transferred to other regions and municipalities, and into the provision of guidelines for interdisciplinary urban and mobility planning in the German federal context.

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INTRODUCTION

Mobility transitions constitute a major challenge for public authorities across levels of government in the EU. Global debates about the climate crisis have highlighted the need to take urgent action in order to meet the requirements of livability and social justice. The latest report issued by the IPCC in 2021 and preparatory discussions prior to the COP 26 to be held in Scotland in 2021 serve as a powerful reminder of the need to speed up transition processes and of current actions to be brought to fruition by a more thorough implementation of set climate related goals. This is particularly the case in urban areas[1], where the population is expected to grow from 74% to around 80% in 2050 and with cities being responsible for 72% of all GHG emissions in the EU (EEA, 2020). Transport and mobility account for about 1/3rd of these emissions, 96% of EU citizens living in urban areas are exposed to levels of air quality considered harmful to health by the WHO[2], and high traffic volumes in cities account for 38% of road fatalities in the EU.

SHIFTING URBAN DEVELOPMENT GOALS AND FRAMEWORK CONDITIONS FOR MOBILITY PLANNING

Cities are committed to contribute up to 60% of the EU's CO2 emissions reduction goal by 2050 (EC, 2020)[3]. This is not a new development. Increased awareness of how human activities impact the environment have led to a number of initiatives at the urban scale to contribute to global efforts to address the negative externalities resulting from car-centric urban development and density, and create more prosperous and liveable cities (Maassen, Galvin, 2019).

Among the various policy issues addressed through urban sustainability transition agendas, mobility has been the focus of much attention (Banister, 2005; 2015). Local and regional authorities actively sought to engage in strategic mobility plans, encouraging a shift towards more sustainable transport[4]. Over time, city authorities have developed sustainable modes of transportation, adopted ever more stringent standards pertaining to carbon emissions related to transportation[5], promoted alternative land-use patterns, and encouraged the development of new road space functions (Hickman, Banister 2014). Cities have also lobbied their governments, the EU and international organizations, in order to support their actions and to enhance existing regulatory frameworks (Bulkeley, Castan Broto, 2013). EU policies, programmes and tools, particularly Sustainable Urban Mobility Plans (SUMPs), have been crucial to driving this development across member states and the industry[6]. Taking stock from three to four decades of initiatives aimed at transitioning towards sustainable urban transport, the effectiveness of cities' preferred policy options has been positively assessed while at the same time highlighting the need to speed up and scale up to include wider metropolitan areas (Winkler et al., 2023).

The cities that already have a long experience with sustainable mobility planning[7] now go beyond transportation objectives in order to integrate a wider range of urban policy objectives, such as health and well-being, as part of a more holistic approach to urban transport and mobility (Anciaes, Jones, 2020)[8]. The fourth generation of urban mobility plans, currently under development, holds the explicit

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[1] Urban areas as cities plus towns and suburbs (Dijkstra et al., 2016).
[2] World Health Organization
[3] Following climate negotiations at the global and the EU level: the UN's "Urban SGD", the EU's urban agenda and the 100 cities carbon neutral mission, etc.
[4] See the work done as part of the CREATE project (Halpern et al., 2018).
[5] As per EURO VII standards being currently implemented.
[6] See the work done as part of the MORE project (Halpern et al., 2020).
[7] See the work done as part of the CIVITAS SUMP PLUS Project (Halpern et al., 2023)
[8] This approach is explicit in slogans such as "More urban life for all" (City of Copenhagen, 2013), Streets for all (Transport for Greater Manchester, 2017) or the "15 minutes city" (City of Paris, 2020).

goal to achieve carbon-neutrality and adapt modal split goals accordingly. New tools and methods, such as Greenhouse Gas (GhG) inventories, are being introduced across levels of government (Moran et al., 2018), including local authorities, in order to assess the contribution of key services such as energy provision, transportation modes and other carbon intensive sectors to the acceleration of climate change but also as a way of undertake concrete initiatives as to curtail – and possibly revert-current climatic trends[9]. This contributes to the development of common frameworks aimed at improving the conditions of livability and overall sustainability (UCLG, 2019).

A SIGNIFICANT CHALLENGE FOR THE GOVERNANCE OF MOBILITY IN CITIES

Beyond these considerations, more fundamental, structural societal change is challenging the overall organization of mobility and ushering a major overhaul as in the case of elderly populations, but also precarious groups of society actively engaged into the gig economy (Ravenelle 2019).

Mobility in cities must take under consideration the increasing intertwining of transportation and dependence, adapting rolling material and infrastructure to the specific needs of an ever-ageing population. Public shared bike schemes and their use in cities, have come under strain in certain cities - like Paris - because of platform delivery companies operating under the principles of precarious work. This has led workers to rely on available existing shared mobility infrastructure and have exposed these city services to unintended uses and many interrogations for the future. The covariance of mobility choices and available transportation modes had ultimately led residents in core and peripheral areas shifting either by constraint or by their preferences, and embracing or resisting mobility orientations, brought by municipal governments or platform companies.

Decarbonization objectives have led, in this sense, to the adoption of national and city climate plans that have curtailed the presence of individual car mobility in cities, shifting their use to hybrid or electric cars, but also removing them as the preferred means of transportation out of city streets. The creation of bike lanes, first in the form of tactical urbanism responses, and then as long-lasting transformations of cities, have slowly but surely displaced cars. This has both led to the more resolute adoption of biking as a preferred mobility for short distances, but also fueled a resentment in peripheral metropolitan areas. Here, long distances and poor dedicated infrastructure have led to important sections of the population resisting de facto less than de jure the adoption of cleaner, friendlier transportation modes. Elsewhere, the choice of cleaner modes and friendlier streets are becoming the norm, but this choice is fraught with unresolved questions about the allocation of road space between transport modes and uses.

This poses significant challenges for the organization of mobility in the public space[10], in the form of an operational multi-modality, and has become a tug of war between city authorities, operators, private car users and new mobility actors such as platforms. Another important challenge as to expedite individual journeys and to reduce the amount of time spent in public transportation has been to effectively implement intermodality by resorting to novel data aggregation instruments and to engaging into data sharing strategies with private operators[11]. More fundamentally, the role of public space has slowly but surely superseded all these other considerations as the most important challenge at hand for city and municipal authorities (Halpern, McArthur, 2022).

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[9] A +3-6° scenario.
[10] See findings from the MORE project (Jones et al., 2022).
[11] The case of UBER in Paris has become in this sense a template of things to come for cities that wish to mediate the operations of mobility platforms within their operational perimeter as shown by Uber Movement for New Mobility and tailor-made accords with secondary cities as in the case of Nice.

The ambition of this contribution to the acatech study "Integrierte Stadtentwicklung und Mobilitätsplanung" report is to shed light into the prominent sector of transportation policies and the way it is being integrated into broader urban development objectives. Planning for enhanced integration is understood as the various ways through which transport and mobility goals are increasingly embedded into the urban political agenda and context-specific transition pathways[12].

In this report, we focus on the choices made by cities and regions to enhance integrated urban and mobility planning. City mobility plans and the transitions they foretell have the capacity to reveal much about the material possibilities of transportation policies when they collide with limitations within cities (territorial, social, political). Drawing on the public policy analysis and urban studies literature, this proposal focuses on the policy strategies and the regulatory decisions carried out by urban authorities in a multi-level governance context. It pays a particular attention to making sense of currently existing pressures for or against these city objectives, ultimately contributing to defining the scope for mobility transitions in cities. Applying a comparative perspective allows examining the way in which this process unfolds in different institutional contexts.

This contribution to the acatech study seeks:

1. To assess existing gaps between ambitious mobility policy objectives and the way they are made material through specific policies, measures and partnerships aimed at enhancing integration between mobility; and

2. To account for the disruptive impact resulting from the setup of new services (e.g., ride & share services), technologies (e.g., electric mobility) and stakeholders (e.g., global platforms, consolidated transport industries) and the extent to which mobility plans are able to overcome increasing complexity;

3. To examine evolving governance arrangements and capacity building at the local level in relation to carrying through mobility transitions and adjusting initial goals by policy learning;

4. To carry out this research in a research framework comparing four European cities, to account for main differences and similarities in mobility transitions within their respective regional context and contribute to current debates in cities and regions wishing to speed up implementation by the provision of guidelines.

The report introduces the analytical framework and the four cities and regions. It then presents cross-city analysis highlighting key lessons for other public authorities wishing to speed up transformation processes and what lessons could be drawn for developments taking place in regions and municipalities in the German federal context[13].

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[12] See the work achieved in the EU-funded projects (Horizon 2020 programme) CREATE (Grant agreement ID: 636573), MORE (Grant agreement ID: 769276) and the SUMP-PLUS (Grant agreement ID: 814881) projects.
[13] City-specific narratives of mobility transitions have been introduced in the full version of the report (June 2023).

A COMPARATIVE GOVERNANCE AND PUBLIC POLICY PERSPECTIVE: RESEARCH DESIGN

Within the scope of this work, sustainable mobility transition is understood as a specific type of transition aimed at successfully transforming mobility to achieve the requirements of livability and social justice in the context of climate change, both today and in the future.

Taking stock from previous comparative research done on sustainable mobility transitions in European cities[14], this report acknowledges the need to better understand what city authorities across Europe make of desired future city visions and how such long-term visions translate into concrete integrated urban development and mobility planning measures. In order to do so, the report looks into the general frameworks and guidelines setting the template for these transformations, interrogating the consistency of the instrumentation in relation to the expected outcomes, as well as the results achieved over time. Moreover, it explores how the concrete governance of these processes has led to the alteration of these initially set goals, feeding back in elements of change -whereas incremental or abrupt.

Three major assumptions have guided our work.

First, city visions in regard to sustainable mobility futures have changed over time, highlighting similar trends but also context specific dynamics (see Figure 1). Indeed, mobility transitions never take place in a vacuum. Depending on pre-existing mobility governance arrangements and policy changes, some transition processes are bound to include the whole set of vertical and horizontal interactions entailed in a multi-level governance setting, whereas others may only involve local actors. often draw context-specific policy combinations. Also, transition processes are expected to shape governance arrangements by legitimizing some actors while excluding others.

Second, particular importance is brought to the analysis of measures intended to breach the gap between metro and city core areas, and the resulting coordination of metropolitan entities in charge of regulating transportation across the border. Metropolization dynamics constitute another key challenge for those cities committed to even out access levels to all their territories, and to phase out sharp differences that are very much present today. In a number of cities and regions in Europe, the redistribution of funding for vital connecting transportation infrastructures is underway, albeit, it has been subordinated to instrumental logic at times, in the way of grand projects that are not always in phase with the constituencies demands for faster and better transportation. In the case of Paris or Barcelona, key strategic economic development choices seem to have taken over these considerations (the 2024 Olympics, the WMC, mass tourism, etc.) and embraced contested formats of directive transportation planning. In Antwerp and Malmö, the presence of the port area and the proximity of Copenhagen contribute to similar dynamics.

Last but not least, the process of mobility governance and change is explored by looking into the transformation of currently existing mobility plans, and their integration within larger climate action plans. This step is crucial as to being able to single out the more fundamental initiatives for decarbonization, and sorting the more incremental, and novel ones that result from ulterior adjustments. A particular attention is paid to *innovation in action*, that is the introduction of responses to some of the challenges mentioned here above, that have constrained city governments to get out of their comfort zone and engage in unprecedented steps such as.

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[14] See above, CREATE, MORE and SUMP-PLUS projects. See Glossary for more details.

The study examines developments taking place in four cities and regions in which specific attention was given to the measures aimed at achieving enhanced integration between urban development and mobility planning.

The aim is not to compare cities, but rather, to draw on a diverse set of cities, from a governance and a public policy perspective, to understand how they address the challenges of sustainable urban mobility planning and delivery. In doing so, the report :

1) highlights the specific role of institutional, organisational, political and regulatory factors,
2) examines the range of policy resources cities can draw upon and mobilise,
3) identifies potential barriers
4) provides insights on how cities have sought to overcome them by introducing integrated urban mobility and planning tools.

Their distinctive feature[15], in the context of this study, is summarized below :

- Antwerp (BE), embracing the smart city model.

The distinctive feature of the Antwerp case is the attention given to integrated planning and to making it operational through organizational reform and interdisciplinary policy expertise. This approach is now being extended at the regional level, through the creation of the Vervoerregio in 2019, in order to speed up mobility transitions.

- Barcelona (SP), reviving the superblock legacy.

The superblock concept addresses present and future challenges in terms of density, metropolization, and the digital economy, and through enhanced regional coordination. This framework strategy seeks to anticipate climate risks to ensure the health and well-being of its residents. The distinctive feature of the plan is the strategic role given to citizens through participatory policy making including the co-construction of policy measures and scrutiny.

- Malmö (SE), the green city concept.

Malmö is well-known as a pioneer case of green city planning, with a strong focus on energy and housing. The distinctive feature lies in the attention given to different age groups as well as to social mixity and justice constitutes a distinctive feature of this case. It reflects the recent efforts made in Swedish cities towards inclusive mobility, understood in relationship to gender and youth.

- Paris (FR), the 15 minutes city model.

The 15 minutes city concept provides a new impetus to further enhance integrated urban and mobility planning. The distinctive feature of the Paris case is the leading role played by city authorities and high levels of competition with other public authorities at a regional level and the State. Regional cooperation has focused, over the recent years, on enhanced public transportation and developing new services and modes to further reduce incoming car traffic.

The focus on these cities provides a better understanding of the process, resonance, strategies and successes. This helps highlight similarities and differences in terms of their capacities to effectively induce and achieve transformative changes over time.

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[15] "What is it a case of", as per Ragin and Becker (1992) in their classic work on comparative research.

Sustainable mobility transitions are examined in the four cities and regions by developing an analysis of framework conditions, key concepts and strategies, implementation processes, including policy resources and partnerships, and what results have been achieved so far. Particular attention is given to integrated urban development and mobility planning measures introduced at municipal and regional level.

The following information was collected in order to support the production of the dataset for each case study:

- Main law/regulations, climate and mobility plans, urban development strategies, annual reports and assessment studies, statistical data etc.
- Key experts were contacted in each city – Most have asked to remain anonymous.

For each city, the following dimensions of integrated development and mobility planning were examined: 1) evolving relationships between administrative authorities, politicians, regional organizations, business associations and civil society organizations, 2) key mechanisms and policy tools to support intermunicipal / regional cooperation and an integrated approach to urban and mobility planning, 3) what strategic choices were made.

A detailed case study is provided in the annex section. Only the main findings from each case are introduced in this section, highlighting what lessons could be drawn for developments taking place in regions and municipalities in the German federal context.

For each case, the analysis includes:

− An overview of mobility governance arrangements in the core city area and at the regional level,

− A stakeholders mapping, at city level (administration, politicians, business and civil society organizations) and across levels of government (cities, regions/federal states, national government, EU)

− A narrative of mobility transitions, with key milestones, drivers and outputs.

ANTWERP (BE): EMBRACING THE SMART CITY MODEL

Antwerp has a long experience with sustainable mobility planning. It stands out as a pioneer city for experimenting with digital-led solutions to deliver on net zero carbon objectives in transport and mobility. The digital city model was formalized in 2017 under the "Smartways to Antwerp'' initiative[16]. Not only was it singled out by the N-VA-led political majority as a prime location for experimenting with this approach to sustainable mobility transitions, but also as part of the mitigation package adopted that same year to put an end to a two-decades long conflict about the Great connection (Oosterweel link), a major road infrastructure planned under the leadership of regional authorities. "Smartways to Antwerp" seeks to support the principle of freedom of choice between modes, while at the same time addressing issues of air quality, congestion and freight transport throughout the city core area, including the port. In order to do so, efforts are being made to draw on digitization as an opportunity to engage a wide range of stakeholders, including a MaaS with a clear focus on maritime and freight transport, and develop new mobility services through public-private partnerships. The city prioritises accessibility - for passenger and freight - and liveability - in clearly designated residential and shopping areas**.**

The distinctive feature of the Antwerp case is the attention given to public-private mobility solutions, integrated planning and through organisational reforms. This approach is now being extended at the regional level, through the creation of the Vervoerregio in 2019, which supports the scaling up of the mobility planning priorities set at the core city level at the regional level.

BARCELONA (SP): SOCIAL INCLUSION IN A FRAGMENTED METROPOLITAN AREA

In the context of climate change, the latest efforts in Barcelona have sought to reconcile urban growth together with the famous planner Cerda's legacy. This has been done as part of the Barcelona Climate Plan (approved 2018) through the superblock concept to address present and future challenges in terms of density, metropolization, and the digital economy, and through enhanced regional coordination across the territories of the metropolis. This framework strategy seeks to anticipate climate risks to ensure the health and well-being of its residents as it looks to reconcile still disjointed urban territories into what has become a formidable urban continuum with dissimilar mobility fortunes. This Plan focuses on four key objectives: mitigation, adaptation, climate justice and ensuring a strong participatory base. The distinctive feature of the plan is the strategic role given to citizens

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[16] https://www.slimnaarantwerpen.be/en/home

through participatory policy making including the co-construction of policy measures and scrutiny. Participatory policy making constitutes a landmark of the city's approach to mobility transition and GHG emissions reduction across sectors (e.g. transport).

This development strategy for Barcelona has been actively consolidated within the partnership for the International Mobility Congress (IMC21) spearheaded by a wide set of metropolitan actors, such as the Generalitat de Catalunya - Ajuntament de Sitges - AMTU- Autoritat del Transport Metropolità (ATM) de l'àrea de Barcelona - Diputació de Barcelona- Ajuntament de Barcelona- Federació de Municipis de Catalunya (FMC) - Associació de Municipis de Catalunya (ACM)- Transports Metropolitans de Barcelona (TMB) - Ferrocarrils de la Generalitat de Catalunya (FGC) - Àrea Metropolitana de Barcelona (AMB), and key industrial actors such as Seat:Code[17]. It culminated in 2020 with the development of the Low Emission Zone (ZBE) which restricts the circulation of the most polluting vehicles and seeks to reduce environmental pollution and to improve air quality and public health. It equally pursues a more efficient and just integration of urban territories through infrastructure development and technology.

In Barcelona, enhanced integration between urban development and mobility planning has been fostered through an integrated transportation system, the super-block template which promotes both a liveability and sustainability template accruing to the benefit of soft mobility modes, and the negotiation of digital mobility platforms regulation at the city level.

MALMÖ (SE): THE GREEN CITY CONCEPT

Malmö is well-known as a pioneer case of green city planning, with a strong focus on energy and housing. Over the past decade, and in view of population growth, commuter traffic and a booming real estate market, a new urban development strategy is being developed in close combination with enhanced efforts to achieve mobility transitions. The development of the Western harbor area in particular, offers an opportunity to reconcile higher levels of urban density while at the same time addressing ensuring sufficient green space for kids, socially mixed neighbourhoods and reduced street space for cars. In this context the Western Harbour area development strategy (adopted in 2020) pushes for revising pre-existing policies and standards across sectors and at city level. The attention given to different age groups as well as to social mixity and justice constitutes a distinctive feature of this case. It reflects the recent efforts made in Swedish cities towards inclusive mobility, understood in relationship to gender and youth. Similarly, efforts are being made to engage in enhanced coordination at the regional level and across the Oresund channel.

Collaborative and participatory policy making constitutes a landmark of the city's approach to manage urban transitions over time and to ensure the alignment of policy priorities across departments.

PARIS (FR) AND THE 15 MINUTES CITY MODEL: INTEGRATION OF FRACTURED METROPOLITAN TERRITORIES AND THE PROMOTION OF APPEASED MOBILITY AND LIFESTYLES

Since 2015, Paris has committed to become an exemplary city in the fight against climate change, aiming at carbon neutrality by 2050[18]. Drawing on the work achieved since 2001, the 15 minutes city concept provides a new impetus to further enhance integrated urban and mobility planning. The Paris city climate plan (adopted 2020) provides a general framework to achieve these goals across sectors, incl. transport, and in partnerships with a wide range of public and private stakeholders regionwide.

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[17] SEAT CODE operates its mobility software, Giravolta, in six countries Spain, Germany, Ireland, Finland, Sweden and Greece. This software solution allows vehicle fleets to be operated and managed 100% digitally and offers connected mobility.
[18] Zero net emissions as per the Plan Climat de Paris, 2nd Edition, Ville de Paris, 2020.

The largest share of efforts was made in transportation, with a total reduction of 39% in carbon emissions since 2004[19]. This was achieved through a variety of traffic restriction measures, major public transport investments and place-making initiatives to support the road-space reallocation. In the future, a zero carbon vehicle emission strategy by 2030 is being proposed[20], with enhanced cross-sector initiatives between transport, energy and housing in particular. In order to meet these objectives, the city also seeks to measure greenhouse gas (GHG) emissions more exhaustively, including emissions of Parisian industries and a more thorough accounting of everyday activities by the national Ecological Transition Agency (Ademe).

The distinctive feature of the Paris case, as far as governance arrangements are concerned, is the leading role played by city authorities and high levels of competition with other public authorities at a regional level and the State. Regional cooperation has focused, over the recent years, on enhanced public transportation and developing new services and soft modes to further reduce incoming car traffic.

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[19] As per C40 official data and municipal reports from the City of Paris. Ville de Paris (2016), Plan Climat Energie 2016, annexé au BP2017, p.3. Available here : https://cdn.paris.fr/paris/2019/07/24/648705b46f78ee0d3536fd94d4f9690b.pdf
[20] With phasing out of diesel engine vehicles in 2024 and the end of internal combustion engine vehicles for the City of Paris' vehicle fleet in 2030. Only Crit'Air 0 labelled vehicles will be able to circulate in the Greater Paris metropolis. Agence Parisienne du Climat, 2020.

Findings from across the four cities and regions are presented in this section. They confirm that sustainable mobility planning should be understood as a priority which is embedded in a multidimensional conditions' framework. In this context and taking into account the need to articulate a 20–30-year vision and an implementation strategy timeline, working across levels of government and across sectors, while accelerating implementation in the shorter term, this poses significant challenges for governance.

A PRIORITY EMBEDDED IN A MULTIDIMENSIONAL CONDITIONS FRAMEWORK

Cities face a number of governance challenges that put increased pressure for a changed approach to transport and mobility planning.

First, transport demand and consumer choices have evolved significantly in recent years and contribute to corporate strategies that are challenging previous arrangements pertaining to city transportation and logistics. Short-circuits for food and consumption goods, combined with locavore choices have narrowed the radius of mobility for the purposes of shopping. This is redefining logistics in the city and bears significant consequences to the coordination of these different services that resort to significant fleets of vehicles for general and last-mile distribution.

From major platforms like Amazon that are redefining warehousing facilities and allocated routes, to new delivery actors, that have thrived since the beginning of the COVID 19 pandemic, these expressive changes are transforming how goods circulate in the city and are posing by the same token major challenges to city governments[21]. These include the redefinition of distribution routes, from spikes and hubs models to decentralized distribution operators, leading to a -potentially random- use of any way of passage for delivery purposes, leading to traffic congestion, multiplying delivery shifts, etc. This can potentially lead to increasing congestion times and CO_2 emissions in the long run. Moreover, the imposition of a vehicle standard that may counter initiatives aimed at clean sustainable transportation. This trend has been particularly prevalent in Paris and Barcelona, where delivery companies' associates (Deliveroo, Just Eat) resort for the most part to motorcycles instead of cleaner modes of transportation like bikes.

Second, cities have also been confronted to significant challenges brought by industry innovations and the relentless ascent of data intensive platforms, that have taken to redefine every aspect of mobility (Naml et al. 2018, Cohen, Kiezmann 2014, Kellerman 2019; Artigas, Castellano, 2020). From the way pedestrians walk and which related pathways are suited for their journey, to the way in which free-flow bikes are allocated across the urban space, and how public transportation systems have sought to optimize their everyday operations, data analytics have permeated and at times debunked existing systems by the consolidation of an ecosystem of novel and at times extremely challenging actors. The operations of transport service-oriented/related platforms[22] have consistently disrupted traditional city planning instruments, that operate within much longer frameworks, and are bound to revision every few years. The rapid implantation of these services has in this sense led to a significant push for public response, as observed with the "Smartways to Antwerp" initiative, whether in the form of regulatory decisions or by omission, leading to an interesting, albeit not fully accounted redefinition of prerogatives and competences between public and private and within government levels.

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[21] See APUR, Drive-throughs, dark kitchens, dark stores: New ways of distributing food in Paris, Paris, 2021
[22] For individual mobilities in the case of Uber, or food delivery for Deliveroo or Glovo.

Last but not least, social transformations have had a twofold impact for and on mobility uses. On the one hand, splintered metropolitan development combined with sprawling dynamics have led to an increasingly differentiated access to convenient mobility, further segregating citizens residing in remote areas and curtailing employment opportunities, and overall social progress. This situation has been further exacerbated by the cascading impacts of the Covid-19 pandemic years, which have exposed the increasingly differentiated risk factor for populations depending on one mode of public transport living in peripheries and those populations having convenient access to multiple modes living in the core areas[23]. Pandemic challenges however have brought forward a concern on leveling conditions for safe traveling in the city, ushering the discussion to the very least, of novel contingency plans and dedicated planning instruments for the purpose of reverting some of these trends. From immediate response strategies, such as the decision to move to contactless systems as has been the case for Transports Metropolitans de Barcelona (TMB) to automated lines accelerated adoption (Paris, Madrid), concern pertaining to risk management has led to several other related decisions and is shaping the future of inter and multi-modality.

CITY VISIONS CHANGE OVER TIME: WHAT IS THE ROLE OF INTEGRATED PLANNING IN THIS PROCESS?

EU cities have significantly increased their policy resources and political capacities to support sustainable urban mobility developments since the 1980s. A number of cities were able to significantly change their governance capacities by reorganising existing resources, developing new ones or by reaching out to potential allies. This includes enhanced efforts to achieve integrated urban development and mobility planning objectives at municipal and regional level. The CREATE, the MORE and the SUMP-PLUS projects have provided foundational insights on this phenomenon, whilst demonstrating the need for comparative research.

Drawing on the typology of the four policy stages approach developed by Jones (2018), city visions changed over time, reflected in policy developments shifting away from the car-oriented city (stage 1) to promote the sustainable city (stage 2), the city of places (stage 3) and an enhanced integration (stage 4) (Figure 1). While a number of similarities were observed across cities, such policy developments led to context-specific combinations of policy measures. In all cities under study, these policy developments contributed to transformative change, providing some understanding of mode shift. Yet it also accounts for the emergence of context-specific combinations of policy measures, thus generating some path dependency that has, in some cases, prevented the development of innovations in governance and policy making.

FIGURE 1: THE FOUR CREATE POLICY STAGES.
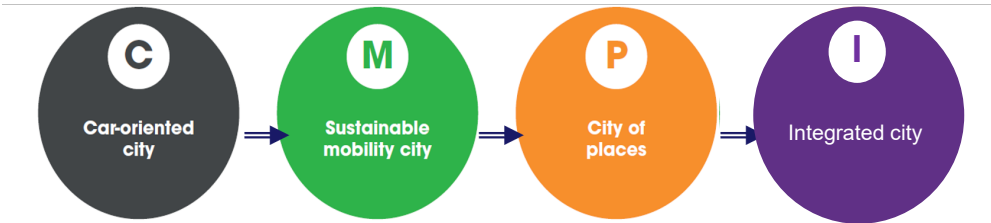
Source: Adapted from the CREATE approach (Jones 2018)

Furthermore, findings suggested that such processes are subject to different policy capacities. Policy capacities not only refer to a city government's "basket of policy resources" (Hood 1983; Howlett 2015)[24], but also to the ability to mobilise them across government levels or beyond the public sector, either through the selection of courses of action, and/or by bringing together competing interests to

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[23] As per the preparation proceedings in preparation of the 2021 International Mobility Congress (IMC21)
[24] Four policy resources are considered here (Hood, 1983) : information & knowledge, authority, financing and organisational.

reach a common goal through analytical and political means. In other words, enhanced policy resources and the capacity to mobilise them played a determining role in enabling cities to successfully pursue policy developments shifting away from car centric planning.

Over time, city governments expanded their capacities to act and function - through prioritisation, solution formulation, operationalisation, and self-assessment - in a cumulative manner (see Figure 2).

FIGURE 2: CAPACITY BUILDING INDEX FOR THE FIVE CREATE CITIES.
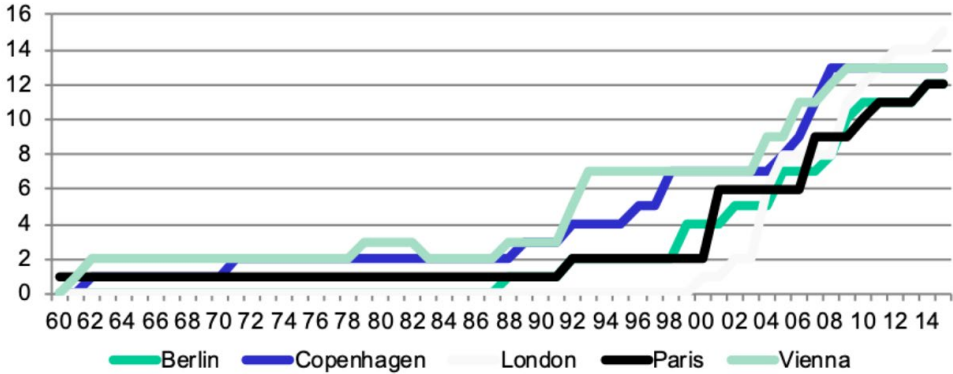
©Halpern & Persico, CREATE project (Halpern et al., 2018)

CITY GOVERNMENTS' STRATEGIES TO ENHANCE THEIR ORDER-MAKING POWERS

City governments of different sizes and shapes can successfully enhance their levels of institutional autonomy, as highlighted in findings from the MORE and the SUMP-PLUS projects[25]. This is important in the context of European multi-level governance, in which city governments wishing to develop an ambitious sustainable mobility agenda have to work in a crowded regulatory space.

As part of the MORE project, five strategies through which city authorities "made it work" were identified (Table 1).

TABLE 1: FINDINGS OF MAJOR FACTORS ACCOUNTING FOR ROAD SPACE TRANSFORMATION.

Leadership and policy narratives	Champions: Policy entrepreneurs, integrated transport agency, newly formed department.
Administrative structures and capacity building	Accumulate policy resources, competing for national & EU funds, partnerships with the private sector.
Design Standards and Indicators	Using national guidance materials on urban street design. Context specific design, no "one design fits all solution".
Dialogue with citizens and stakeholder groups	Formalized space for dialogue between a variety of stakeholders (public, technical experts, elected officials)-
Standard setting and international networking	Engagement with international working groups on standards and norms for cyber security, artificial intelligence, digitization of streets, surveillance technologies.

Source: Halpern et al. (2022), in MORE project guidelines.

This holds significant lessons for cities and regions wishing to deliver on integrated urban development and mobility planning objectives at municipal and regional level.

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[25] Main references from the MORE project are provided in the References section.

First, integrated urban development and mobility planning requires cities and regions to draw on additional powers and resources, as well as to develop specific strategies to enhance their capacities by drawing on political alliances, issue networks or business partnerships.

Second, city governments may seek to achieve enhanced urban development and mobility planning by holistically reallocating road space through capacity building. City governments may try to transform their governance structures (Peters and Pierre, 2018), that is the institutional and the organisational framework in which sustainable mobility goals are set in terms of rules, procedures, and division of responsibilities. They do so to overcome the fragmentation of responsibilities and resources across both levels of government and modes. Also, city authorities may actively seek for change in national/regional and EU legislation, by forging new political alliances, developing partnerships with stakeholders within and beyond the public sector, and challenging other levels of government through litigation.

Third, city governments may also rely on micro-level experimentations and tactical urbanism to demonstrate the added value of their proposed scheme and overcome resistances. This strategy became particularly visible during the COVID-19 pandemic, resulting in hundreds of bike lanes or "Corona lanes" being developed across EU cities and beyond. Holding to both was considered critical to avoid piecemeal approaches that were dependent on levels of opposition to proposed schemes and micromanaging implementation and enforcement. However, not all cities are well placed to experiment with city-wide or micro-level governance and policy innovations, typically due to the lack of authority or insufficient capacity.

Fourth, a city government's capacity at governing long-term transition planning does not only depend on *de jure* powers but ALSO on *de facto* capabilities, that is the ability to add to or overcome the lack of such powers and resources by reaching out - vertically - to other levels of government and - horizontally - to the private sector, civil society and the wider public. These de facto levels of autonomy were, in some cases, formally acknowledged through devolution and/or regionalisation reforms.

BARRIERS TO ACHIEVE INTEGRATED URBAN DEVELOPMENT AND MOBILITY PLANNING

City governments also face a number of barriers (see Figure 3) that may prevent or slow their capacity to plan and deliver its sustainable mobility transition agenda. Drawing on the findings from the SUMP-PLUS project, several deficiencies were identified, which were also visible in the four cities under consideration in this acatech study[26]:

FIGURE 3: BARRIERS IN GOVERNANCE AND POLICY CAPACITIES THAT PREVENT OR SLOW A CITY'S SUSTAINABLE MOBILITY TRANSITION.

| **I**nstitutional competition **O**rganisational fragmentation Random political support | **F**ragmentation of funding | **L**imited Expertise & Knowledge **I**nadequate policy tools & procedures **L**ack of human resources | **L**imited stakeholders' engagement: *NGOs, citizens, commercial groups, transport companies* |

Source: Halpern et al. (2023), SUMP-PLUS D3.3 report.

First, the involvement of multiple levels of governance, often resulting in institutional competition, may limit the ability of city authorities to develop and deliver an ambitious sustainable transition

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[26] Similar findings were presented for the work achieved on German cities and regions, as discussed during the acatech workshop in Berlin (October 2022) and subsequent meetings with the partners involved.

agenda. More precisely, regional location matters less than national/regional policy frameworks and size. Both factors play a critical role in enabling city authorities to develop a sustainable mobility agenda and to accumulate policy resources. When powers and responsibilities at a local level are shared with regional and national authorities, these higher authorities do not necessarily share with local governments the resources (whether it be funding, staff, or expertise) that they require to function. As a consequence, city governments often compete against, rather than cooperate with, different levels of authority in the decision making process. Such levels of institutional competition create negative lock-ins and limit the range of available resources. This is expected to be particularly exacerbated in federal contexts, as observed in the case of Antwerp and Barcelona in this study.

Second, findings from the four cases under study here confirm those from the literature review (above). Sustainability initiatives to shift away from fossil fuelled mobility are commonly hindered by limited issue ownership and leadership at city level. Sustainable mobility transitions constitute a classic case of transversal issue, which cuts across a large number of organisations and political portfolios. Such deficiencies are commonly attributed to political actors, all the more so in a context in which cross-partisan alliances were required to form a political majority, that is the case of Antwerp and Paris, and to a lesser extent, Malmö. When present, political divide in the city case studies developed in the annex has thus contributed for key initiatives to be replicated at times, potentially leading to a dislocation of planning templates across metropolitan territories and a disjointed mobility development[27]. Attempts at reconciling these different views into the new institutional reality of the metropolis has been complex and tributary of the ability to coordinate and reconcile these differentiated mobility needs.

This has been for instance the case for the Metropolitan Area of Barcelona and its thirty-five municipalities. As a territorial continuum, they represent a complex and dynamic construct where coordination and complementarity concerns 2% of the Catalan territory, but close to half of the population of Catalonia. The very local interpretation of space for social cohesion, coexistence, and proximity of transportation services, not to mention the levels of solidarity with neighbouring territories even, hinges on the ability to produce a common project for a sustainable environment. Here the task of coordinating the actions of the metropolitan city councils has provided significant advantages that have materialised in joint and quality public services, particularly linked to mobility and sustainability. The problem still lies in the means mobilised for this common endeavour, and the extent of the financial transfers that metropolitan territories are willing to agree to, in order to promote an affordable and accessible transport system. In this sense, the surcharges brought by the metropolitan authorities in order to decrease the price of the furthest located metro territories mobility has been contested and reveals relevant fault lines.

Yet findings also highlight the organisational dimension of leadership as posing significant challenges for transversal policy issues. Delivering on long-term policy ambitions should be accompanied by a sense of collective responsibility, to ensure active continued support beyond election terms. In the absence of any formal or informal organisational resources, transition pathways risk being subordinated to ad-hoc coordination mechanisms, the whims of specific individuals and a changing political agenda. This prevents or slows the ability to align long-term policy preferences and short/medium-term implementation strategies. Since sustainable transitions necessitate a long-term planning and delivery capacity, consequent policies and initiatives must be firmly established in robust governance structures and processes to avoid stagnation.

Third, where policy resources are directed from the regional or national levels, city governments lack the needed resources to address sustainable transition challenges. In the past limited funding was available for sustainable urban mobility initiatives. European cities of various sizes have sought to

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[27] This has been the case in Paris with the Ville de Paris pursuing a 15 minute city template of urban development, matched by the 20-minute city model sponsored by the Ile-de-France region, as a consequence of complex political relationships between opposing political forces in these two entities.

overcome these barriers by drawing on analytical and political skills to overcome the fragmentation of funding, and leverage additional resources at European / national / regional level, or from the private sector. This is less true in the context of increased attention to carbon, which is viewed increasingly as a national/international priority, but often with limited attention to small and medium sized towns which often remain off the radar of policy frameworks and programmes. More generally, for cities enjoying low degrees of institutional autonomy, there is a risk of a disconnect between the priorities set at the national/regional level, which tend to overly support electric vehicle purchases and smart solutions, and those set at the local level that emphasise more the enhancement of livability through providing integrated sustainable mobility alternatives and place-making initiatives. The definition of the very terms of general interest for regional transit cutting through metropolitan territories -Rodalies in Catalunya for instance- has proven to be an equal controversial endeavour in these transitions.

In addition to the limited funding available for mobility initiatives and investments, findings also highlight other policy resources lacking at city level, such as place-based data, expertise and policy analytics to understand and make sense of the problem at stake[28]. Further limited in-house human resources, in terms of skills to address the challenges of transformative change have been identified, and more fundamentally, limited person-months in a context of the hiring freeze that was widely introduced following the 2008 financial crisis. These deficiencies in policy resources often account for the lack of policy tools enabling strategic priorities to be translated into concrete actions. For example, many cities developed a SUMP with external support (e.g., consultancy work or national/regional authorities) while being unable to implement it due to limited policy resources and ownership.

Fourth, policy makers - or, in this case, "transition managers" - often encounter difficulties when engaging and communicating with specific stakeholders and citizens at large. Long-term planning and enforcement depend on the ability to foster consensus and integrate a large variety of interests, while acknowledging that new venues, that is places of interaction between stakeholders[29], need to be set up in order to overcome locational conflicts and social resistances. A lack of engagement often creates points of conflict and discontent, potentially leading to resistances and protests. Spaces dedicated explicitly to engagement between policy makers and citizens, whether during decision-making processes or at the implementation stage, can help avoid such conflicts (Cristea, Zagan, 2020). However, in many places, consultation spaces dedicated to sustainable mobility transitions are missing entirely, while in others they do exist, but not necessarily in a legitimate and accountable format.

MAIN STRATEGIES TO ADVANCE INTEGRATED URBAN & MOBILITY PLANNING

Among the many challenges raised by embracing sustainable mobility transitions, cities need to articulate a 20–30-year vision and a strategic policy timeline, working across levels of government, while accelerating implementation in the shorter term. Cross-city findings suggest that different strategies are being developed by city governments to achieve integrated urban and mobility planning. Each strategy will be addressed successively, drawing on examples from across the four cities and regions.

REVISABLE SUSTAINABLE URBAN MOBILITY GOALS

A first strategy lies in the ability to revise existing long-term goals - often having been adopted in the 2015-2018 period - to align with new challenges, such as carbon zero objective, constraints resulting from changes in the political outlook, the COVID-19 pandemic or the war in Ukraine. Malmö, Antwerp and Barcelona provide good examples.

In the case of Antwerp, enhanced integration was achieved by aligning mobility and urban planning goals in the context of the Climate Plan. In 2017, the City of Antwerp set itself the target to emit 40%

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[28] This is the case for travel related to tourism and urban logistics.
[29] See Glossary.

less CO_2 by 2030 and become climate neutral by 2050. The Climate Plan was adopted in 2020. It delineates the concrete ways to achieve this goal for the 2019-2024 legislature, in terms of issue-specific targets (such as a budget, an action plan, and a dedicated governance structure which include a climate director, Manon Janssen, who is an external consultant). Acting as a principle guiding document, the Climate Plan provides an unprecedented push towards decarbonising all policy areas, including transport and mobility. In addition to aligning existing and reorganising pre-existing policies, the Climate Plan seeks to achieve transformative change through a series of climate adaptation initiatives. This includes the Green Streets pilot project, launched in 2017, which aims at aligning streetspace with 'blueing' and 'greening' objectives by testing new technologies, developing guidelines for planning and delivery across different street types, and reaching out to the large variety of concerned stakeholders (district authorities, utilities companies, maintenance department, residents, etc.).

As for Paris, the local urban plan (PLU) also named "bioclimatic PLU" currently being developed, has strong ambitions in terms of sufficiency, reduction of carbon emissions and adaptation to climate change. This planning document has been in operation for more than twenty years carries the ambition to implement the city of tomorrow: greener, closer to the expectations of the inhabitants, more respectful of climate related considerations. The new urban plan for Paris has two goals: to adapt the capital city to global warming and to make it carbon neutral by 2050. As it is modernised and extended on an intermunicipal scale, the tools of regulatory urban planning have carried an increasingly broad ambition, aimed at translating locally a vision of the "city of tomorrow" and increasingly including mobility related objectives. However, the development of a PLU is a long exercise and very constrained legally, where ecological awareness, changes in lifestyles and just mobility transitions, not to mention possible pandemics and innovations operate at a faster pace. There is therefore often a significant gap between the political order, the expectations of civil society expressed in particular during the prior consultation phases and what the PLU can really accomplish. There has been an increasingly greater account of the metropolitan context in the findings, forecasting and housing distribution policy, and even more so in terms of travel where the agglomeration is the right scale to understand mobility, in general. The doubling of the length of the metro network in the very near future is likely to accentuate the outer migration of the population and change in mobility practices. The mobility component of the city's PADD - Projet D'aménagement et de Développement Durables or Sustainable Planning and Development Project - thus cannot be designed anymore without reference to the development of neighbouring communities.

Shift away from a mode-based approach towards integrated approaches

As part of a concern over implementation gaps, city governments seek to address transport in a more integrated way[30], often combined with enforcement strategies (see below). The more cities intensify their efforts to shift away from a movement based approach to mobility planning, the more they use these approaches in combination with one another.

The case of Antwerp is illustrative of this approach, fostered through the search to overcome the 2010-2017 campaign against the Great Connection link. A different approach to implementing sustainable mobility goals was introduced. Consisting of a choice-driven approach, it seeks to accelerate mode shift and achieve enhanced integration between sustainable mobility solutions. Due to its limited ability to draw on public transport investments, Antwerp massively invested in soft measures to significantly reduce car trips. The Smart Ways to Antwerp platform draws on smart technologies, micro-shared mobility and behavioural approaches to achieve significant reductions in car trips. Resulting from a close collaboration between the Mobility department and the Communications team, the city administration oversees the development of the city's MaaS (Mobility as a Service) by reaching

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[30] Another approach would be to draw on the Avoid-Shift-Improve framework (Wright, 2022).

out to cities' networks in Europe and the private sector for data-sharing, knowledge building and leveraging funding opportunities. It takes the form of a multimodal route planner aimed at encouraging the shift away from personally owned modes of transport to on-demand and shared mobility solutions. It also led to developing sustained relationships with some 110 firms to support the development of transport and non-transport solutions to support the modal shift for passenger transport and goods.

For Paris, the shift from regulatory decisions aimed at establishing the first cycle lanes, or the removal of parking space, establishment of a motorcycle dedicated paying parking spots, have progressively shifted towards participatory experiments, such as the referendum carried during the month of April by the city of Paris that ultimately led to the banning of free floating e-scooters. The decision further along the way to adopt a "street code" to solve the problems of cohabitation between all the users of the Parisian streets by June 2023, has been the most recent shift towards enhanced consultation of Paris residents aimed at combining several modes in a reasoned space out of strict technocratic criteria. Driven by a public consultation that began in February this initiative has sought to overcome the current predicament of the streets of Paris that have become increasingly difficult to practise for all users: pedestrians, cyclists, scooters, taxis, delivery vehicles, as well as buses from the public transit system. Carried after recurrent resident consultations devoted to the "good life" in Paris, this consultation has brought together residents, experts, public and private partners and transcended piecemeal modal discussions. David Belliard, the assistant for the Transformation of public space, wants to "protect the most vulnerable", and encourage pedestrianism as a relevant if not central mode of transportation under this new template. The mayor of Paris, Anne Hidalgo has therefore confirmed her strategy for the current 2023, which will result in the creation of 45 kilometres of additional cycle paths until the end of the year and will "multiply the pedestrian zones" in still undisclosed locations of the capital city. At the metropolitan level, the Grand Paris aspires to build 215 kilometres of cyclable lanes by 2030 through the Plan Vélo.

MONITORING, ENFORCEMENT AND SANCTION

Another approach to overcoming implementation gaps has been to invest in enforcement strategies, including monitoring tools and sanction mechanisms. Findings suggest that cities that already have more than 15 to 20 years of history with sustainable urban mobility planning score high on policy diversity, meaning that they were able to introduce a wide range of initiatives from across different policy types, including highly transformative measures such as a coherent and integrated sustainable mobility system (stage 2) and place-based initiatives to systematically reallocate road-space (stage 3). Furthermore they successfully draw on competitive bids and EU funding to support pilot projects and innovative micro-level experiments. Yet at the same time, these city governments also draw on strong organisational capacities to draw beyond micro-level experiments to transform public policies and scale up city-wide. This relies increasingly on analytical and managerial skills that make them less dependent on changes in political outlook and individual figures. They also developed a set of strategic and operational tools throughout the policy process to ensure enforcement, secure alliances through business partnerships and ensure the spatial distribution of resources. Instead of solely focusing on micro-managing the needs of potential opponents and influential stakeholders, engagement strategies also reach out to the silent majority of citizens to mobilise extended support for sustainable urban mobility measures.

In Antwerp, this approach was developed as part of the low emission zone, to reduce car access to the city centre and manage parking. Following the COVID-19 pandemic and the rapid surge in cycling (cargo bikes, bikes and e-bikes), a licence model for shared mobility was introduced early 2022 to limit the number of providers and permits per category, while at the same time improving quality and ensuring

public space access for pedestrians. Acknowledging this initiative's proven success in achieving mode shift targets, discussions have been underway to expand it in two directions: work related trips, including to and from the port area, and regional level trips.

In Paris, the implementation through the Mobility Orientation Law (known as the "LOM law"), published in December 2019, of the principle of Low Emission Zones (ZFE) imposes traffic restrictions in agglomerations of more than 150,000 inhabitants before the end of 2024. These restrictions are based on the Crit'Air classification of vehicles. Vehicles must therefore request the allocation of a Crit-Air sticker which must be affixed behind the windshield. Depending on the category to which they belong, vehicles may or may not, permanently or temporarily, access restricted urban areas. Failure to comply with a traffic ban in a ZFE is sanctioned by fines and the immobilisation of the concerned vehicles. The effectiveness of ZFEs is therefore conditional on the ability to control in real time the Crit'Air category of each vehicle entering the zone under control. If on the one hand the City of Paris resorts to manual control, carried out by police officers who can position themselves statically and filter vehicles temporarily on a given axis Paris can resort today to Automatic control systems which involve data aggregation. This method involves the use of license plate reading (LPR) to check the status of the vehicle in the Crit'Air database.

SCALE UP TOWARDS THE METROPOLITAN / THE URBAN FUNCTIONAL AREA

Intermunicipal cooperation, at metropolitan level or in the urban functional area, offers a timely opportunity for city governments to foster enhanced integration between urban and mobility planning to support sustainable transitions. Additionally, such forms of cooperation may result in additional funding opportunities and enhanced capacity to shape the priorities of regional / national authorities and transport companies. Such scaling-up raises a number of governance challenges, the first being the authority to do so, as suggested by findings from the MORE and the SUMP-PLUS project. Indeed only in some national contexts across Europe has there been devolution and regionalisation reforms to encourage or impose the setting of legitimate forms of cooperation, ranging from transport associations to joint authorities. Different forms of intermunicipal cooperation may, however, be drawn upon (OECD, 2015), including 1) soft or informal cooperation drawing on horizontal interactions between municipalities, 2) intergovernmental cooperation, either driven from the top through legislative change, or bottom up through strong political will, 3) supra-municipal cooperation leading to the creation of a joint authority, for the purpose of addressing integrated planning at the most relevant and effective scale.

In this study, one such example is provided by the Antwerp Transport Region (Vervoerregio), which was set up by the Flemish government in 2019 to strengthen inter-municipal cooperation between thirty-two municipalities located around Antwerp. As a policy-advisory organ, the Vervoerregio aims to elevate the voice of regional stakeholders and expertise in integrated transport planning, to achieve a structurally high use of sustainable mobility resources by 2030, namely an average mode split of 50/50 (car/sustainable modes) across the whole region (as opposed to 20/80 in Antwerp). The creation of this new policy-making venue did provide an opportunity for the City of Antwerp to address the specific challenges that are faced by many 'experienced' cities in Europe, when seeking to expand their sustainable mobility agenda to the metropolitan area to reduce traffic flows and improve air quality, while at the same time, avoiding giving the impression of imposing their approach in terms of policy measures.

Although providing a legitimate venue for exploring joint mobility initiatives, two political and institutional challenges had to be overcome in order for the Vervoerregio to deliver on its ambitious goals: one consisting of the core city 'imposing' its model on its neighbours, the other resulting from

misalignment with priorities set at regional level, notably for public transport developments and infrastructure development (hard measures) more generally. To this end, the Vervoerregio relies on the expert advice from Liantis (Liveable Antwerp through Innovation and Cooperation[31]), which was appointed by the Flemish government to support the development of the Great Connection link and reduce car dependency in the metropolitan area. The second challenge, resulting from a highly fragmented institutional setting, remains largely unresolved. While final decisions concerning the core public transport network remain with the Flemish government, other policy areas remain under the authority of municipalities (parking) and this has led to tensions. To this end, joint initiatives have mainly focused on soft and incentives-based measures, such as cycling (routes and e-bikes) and micro-shared mobility.

In the case of Barcelona and Paris, the way in which metropolitan entities are able to deal with at times conflicting interests and/or identities has been streamlined by resorting to a complementary, but not necessarily politically institutionalised, coordinated presence of governance and participatory practices. But at times too, a more voluntarist collaboration, or even a strong institutional construct, was necessary as a locus for gathering the necessary resources to address issues that transcend the strict city limits (Grand Paris Express for ex in Paris, the creation of the ATM and the AMB for Barcelona). The correlation between agglomeration needs and strategic operational capacity of the city, has not necessarily led to a uniform mobility experience, with several important gaps to be filled in the coming decades. Nor has it been easy to accomplish, as proven by the ongoing reorganisation of the metropolitan territory under the banner of Grand Paris or the consolidation of the AMB. The metropolitan area of Barcelona, which has incremented its capacities in different policy areas since 2010, started to articulate a metropolitan regulatory governance on key issues such as transport, the environment among others, after being able to secure cross-municipal support and phasing out conflicts over the allocation of financial contributions across municipalities. Because of the important processes of agglomeration and the concentration of resources and social dynamics arising from these new processes (Storper, 2014) Paris and Barcelona and their metropolitan areas have had -and still have- the capacity to raise new issues or long-established policy problems under a more tangible scope, resorting to social and political arrangements which cannot be seen at other levels. While increasing metropolitan relevance bears an intrinsically, though not entirely, bottom-up dynamic to it,the attainment of a metropolitan dimension for mobility has been the result of long processes of negotiation between municipal actors, concessions, that have not evolved in disconnect over the last decades, but that have rather been facilitated by transnational city networks -ICLEI, CoM, etc revealing increasing mobility interdependence needs across the metro territories.

Thus as seen for the Autoritat del Transport Metropolità (ATM) in Barcelona for instance, its creation was the consequence of a voluntary inter-administrative consortium initiative that to which all administrations holding public transport services eventually joined since its creation at the end of the 1990s[32]. A voluntary inter-administrative consortium of sorts - with a participation of 51% from the Generalitat de Catalunya and 49% from the Barcelona City Council, the AMB (formerly EMT) and the AMTU - was the instrument that allowed to optimise the negotiations on financing that, separately, these administrations carried out with the Spanish Federal State or AGE (through the Ministry of Development). While this simplified the financing replenishments, rendering metropolitan transportation a viable operation, it nonetheless ended up assigned other functions, which have been expanding over the years. The purpose of the ATM has been to articulate the cooperation between the public administrations responsible for the collective public transport services and infrastructures

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[31] Known as BAM until 2019.

[32] Which joined individually or through entities that group and represent them, that belong to the area formed by the counties of Alt Penedès, Anoia, Bages, Baix Llobregat, Barcelonès, Berguedà, Garraf, Maresme, Moianès, Osona, Vallès Occidental and Vallès Oriental

of the Barcelona area that are part of it, as well as the collaboration with the administrations that, as now the State Administration, they are committed to it from a financial point of view or they are holders of their own or non-transferred services. In this effort of metropolitan streamlining principles of transparency, consistency of decision-making in terms of goals and means, and finally openness to public scrutiny, have been key drivers of the success of this effort. This new metropolitan transport body has thus been entrusted with the thorny definition of tariffs and the development of an integrated tariff policy (which began in 2001) with substantial re-distributional consequences across the metro territory. It has also been assigned the planning of infrastructures and public transport services, which materialises in the realisation of the Master Plan of Infrastructures (PDI) every ten years, opening new venues for public transportation and contestation.

Navigating thus between unified transportation authority formats and stabilised and fair forms of cooperation across the metro territories, inter-city interactions remain intense, and metropolitan entities are thus engaged in formidable, and at times insidious, trade-offs in the way of securing transport integration across its territory. These patterns are often driven by furious market dynamics that have an unprecedented capability to disrupt, accelerate economic development and appeal of certain territories over others, in an increasingly volatile environment, further contaminated by pandemics and segregation dynamics.

THE ROLE OF EXPERIMENTATION, SANDBOXES AND TECHNOLOGY AGGREGATION

We observe in the different case studies explored in this report, novel participatory mechanisms have increasingly been exposed, willingly or disruptively, to new technologies, and platforms that have been instrumental in presenting alternative transportation modes, not entirely related to former ones in operation. These dynamics challenge multi-level governance in the context of European cities, as policy communities of urban planning and sustainability transitions at a wider European level have had a hard time accommodating these innovation thrusts and guiding them into a coherent narrative of how these technologies are to contribute to sustainability transitions in transportation. We see through our case studies that the rôle of technology and innovation ultimately lies at the city level, bound by very specific contextual dynamics where structural variables contribute to accelerating, tuning down, downplaying or pacing the introduction of these. This has thus limited the appeal of isomorphic policy responses, in relation to specific policy domains such as climate-change-related transitions (Steffen et al., 2019). What stems out of the trajectories of adaptation of the different cities to sustainability is an increasing recourse to experimentation in the sense of innovations but also from a very pragmatic trial and error approach, developing safe « sandboxes » (15 minute city, superblock, smart districts alike, but also LEAs for that matter). These sandboxes are experimental spaces to explore potential responses, that may or may not be scaled up to the city and metropolitan level, and that can ultimately be downplayed. Irrespective they have become an important urban planning instrument for cities looking for pragmatic responses, but also, that are looking to be trend setters in the race for more sustainable city models[33].

This evolution, which combines relatively novel interaction mechanisms between municipal authorities and transnational corporate entities, can be interpreted as the result of the limitations of traditional policy instruments – such as direct regulatory interventions, subsidies, and taxes – that have had a limited capacity to provide the necessary incentives for innovation, new technologies, and knowledge-related responses at the local level[34]. It is therefore not surprising to observe that the cities

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[33] From an extension of these notions towards pragmatic governance as per energy controversies, see Zittoun and Chailleux (2021). We define a trend-setting strategy as the ability – alleged or real – of city governments to position their policy experimentations as benchmarks within a specific policy sector and/or domain.

[34] In the sense that cities are often delegated to implement national or regional strategies with traditional governance instruments for low-carbon development and transformation (James, 2015)

of Antwerp, Barcelona and Paris have participated intensively in the development of experimental trans-governmental initiatives in which action networks (Heijden, 2016) and distinct collaborative knowledge facilitate mechanisms aimed at reducing urban resources and carbon intensities. Over recent decades these experimentations have accelerated, also to be circulated across these metropolitan entities, propitiating the participation to action networks linking these entities across borders (ICLEI, CoM, UCLG). There is a concomitant factor as well, as cities have had to react to the « landing » of innovating multinational digital platforms such as Google, Uber, Freenow, Dott, Bolt- which has ushered responses that prior were not necessarily under consideration, regarding the occupation of public space -for instance, are e-scooters part of the 15 minute city, or do they rather hinder the accomplishment of this planning template ?

On another note, the digital capabilities deployed by these new digital actors have led cities like Paris and Barcelona to explore new venues for innovation on their traditional mobility strategies, that could either substitute -the case of Barcelona's reinforcement of the IMET -Metropolitan Taxi Institute and digitalization of taxi fleets– or partially endorse the innovations brought by these entities (exploring last-mile partnerships as was tested in Berlin and Munich[35] or negotiating access to real-time dataflows provided by ride-hailing companies like Paris. This interplay has consolidated as well the imperative of public transit modernization as the best way to withstand the unknitting of public steered mobility as a consequence of the rapid introduction of these mobility platform's ride-hailing and free-floating operations. In this sense, irrespective of the concrete contribution to the emergence of a unified, distinct policy response further amplified by networks where these cities have influence and nodality (Kern & Alber, 2010) the cities explored in this report have contributed to powerful legitimising responses, based on local decisions in order to advance a pre-established model for just and sustainable transitions, that can also withstand recurrent cycles of disruption brought by transnational digital mobility platforms[36].

This position of relative strength has given Paris and Barcelona a greater latitude and self-reinforcing mechanisms to engage in experimental, collaborative approaches, as they seek novel ways in which to consolidate the tacit knowledge of non-state actors that can be included in the instrumentation design, thus opening up possibilities of improving effectiveness (Sabel & Zeitlin, 2011) and compliance (Borzel, 2012). Paris and Barcelona have placed experimentation at the centre of public action at the city level, both internally and externally, which has opened up interesting avenues for setting up limits of city action of larger national decisions on the one hand, and interesting scaling possibilities on the other. This experimental governance format has led cities increasingly to embrace direct forms of regulatory governance, often setting up rules for national regulatory frameworks that have failed to address relevant sectoral issues that either converge, reveal themselves, or erupt at the city level. These regulatory formats have stemmed from the maturation of participatory channels and are partly related to a form of increasing localised expertise on the city dimension of sectoral policies. More interestingly, because of the proximity of these two major European cities, several key decisions pertaining to new digital platform services have been disseminated between them, revealing an incredible potential for regulatory transfers between cities engaged in urban mobility sustainability transitions. (Artigas and Castellano 2020, 2022). The experimentation with locally generated instruments for specific city-related issues has become the other important arm of this governance transformation as mentioned before.

The scaling possibilities to metropolitan and regional dimensions of these experimentation and innovation drives is another formidable policy tool for change. These dynamics, no doubt, have

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[35] https://www.uber.com/en-DE/blog/uber-last-mile-phase-two/
[36] As shown by the latest attempt by Uber in 2022 to return to Barcelona in spite of the resolute prohibition of City Hall and a decision by the EU's court of justice. https://www.elpuntavui.cat/societat/article/2161412-uber-anuncia-el-seu-retorn-a-barcelona-com-a-servei-vtc.html

constituted an important transformation in recent years, where the increasing use of market- and corporate-based approaches and incentives—such as benchmarking, information sharing, and communication strategies – has narrowed the gap between national and local policy responses. The fact that technology- and environment-related issues have raised the stakes and the nature of challenges increasingly dealt with at the local level, has led in time to highly localised and embedded governance instruments which depend on complex networks of local actors involved in each city's governance (Evans, 2011). While these trends are encouraging, and there is much joint learning about this type of governance -specifically with academia of late- it is important to highlight that small, but relevant, differences in city contexts have the potential to challenge the transferability of these approaches.

This could ultimately be the case for both Paris and Barcelona. The dynamism of city interests, the nature of support coalitions and policy networks and, last but not least, the very nature of the political system, determine the scaling up or re-appropriation of relevant issues at the city level and the limits of knowledge-based instruments. For example, city leadership in global environmental governance, and in particular the ambitions of both Paris and Barcelona to become global leaders in low-carbon urban development, eventually may not be sufficient to force these transformations that rely on a support base and on coordination imperatives with other government levels.

NEW CARBON EMISSIONS REDUCTION SCHEMES AND OTHER RELATED NON TRANSPORTATION GOALS (ENGAGE A WIDER RANGE OF STAKEHOLDERS AND TRANSFORM POLICY)

The adoption of Low Emission Areas has been a resolute step forward in the way of transitions towards low carbon mobility in the case studies approached here. Acclaimed as one of the key measures presenting concrete incentives for substitution of the motorised fleets of individual cars in cities, but also for the limitation of the presence of polluting modes at a spatial level, LEAs have set a definitive perimeter for lesser emissions, building on a spatial limitation for pollutant mobility flows. The decision to adopt this urban planning instrument has contributed to a process of experimentation (see Supra) and sandboxing, in the way of further expanding this device towards the entirety of the city territory. While this aspiration still remains very much a utopian endeavour in many respects -opposition of certain metropolitan territories, social contestation of less affluent residents unable to update their individual vehicles to less emitting alternatives, etc- the adoption of LEAs remains one of the most significant moves towards sustainability. It is also so as it has been paired in all of the cases that were explored in this report with other urban planning instruments pertaining to either liveability of districts, appeasement of road space or air quality. These different dimensions have enriched but also somehow complexified the narrative behind the objectives pursued with such interventions.

Another important element of LEAs has been the contestation that has erupted in regards to the objectives pursued by their installation and the empirical assessment of emissions and congestion that can potentially result from these. These stated policy goals, explicit and implicit in the design of these areas, have still to undergo the test of time to fully account for a transformation in the "modus motus" of city and metropolitan residents combined. The questions that remain open relate in this respect to the capacity that LEAs will have to encourage a modal substitution of private combustion engine mobility towards cleaner vehicles or public transit, which is dependent on the existence of another set of variables and related infrastructure[37]. On the other hand, the success of LEAs is equally tributary of adverse dynamics not developing as a response by less favoured groups, that would renounce to their mobility and desert central LEA based perimeters thus indirectly favouring urban segregation and dual

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[37] In this sense, the availability of parking space, park and ride spaces and adequate mass rapid transit emerge as fundamentals in the way of accomplishing this process of modal substitution; these objectives need moreover to be attained concomitantly too.

city developments. Last not least, the outsourcing of emissions or potential carbon leakage is an issue that cities are taking seriously as such externalities can potentially offset efforts towards low carbon mobility in city central districts.

For all the cases studied here the pace a common development has come to play: the pace of adoption of more stringent regulations, as per the kind of vehicles in the recent years, has had to be combined with specific concerns of implementation as to ensure compliance with the traffic restrictions but also implementation strategies resorting to constraining -albeit not too authoritative- control mechanisms. This to ensure that Low Emission Areas lead to the intended results in terms of pacified mobilities and emission target objectives. The strategy pursued by the Swedish Transport Agency, in charge of proposing how compliance with regulations on environmental zones could be ensured is telling in this sense. By identifying and proposing measures that bypassed possible administrative obstacles and by harmonising LEAs with the array of environmental legislation already existing in Sweden this pathway showcased a pragmatic take on implementation of these measures. Moreover, another learning of the Malmö case pertains to the enforcing of Low Emission Areas, resorting to already existent parking monitoring carried out by the municipalities, with an implicit incentive for fine collection as a potential stream of revenue in the way of enforcing these mobility and emissions related objectives. While the Swedish case is a small common denominator of the template adopted by other cities in this study it also shows the main difficulties in the way of enforcement: resources for monitoring, the need to create an adequate body of incentives in combination with no-go areas, and finally an assessment of the outcomes of such measures.

The adoption of superblocks in Barcelona has been further consolidated by an important influx of European funds that implicitly link their development and the reinforcement of Low Emission Zones. Mainstreaming emission reduction objectives and funding to urban planning processes by the Ministry of Transport, the Mobility and Urban Agenda showcases a combined sectoral modernization strategy - by ensuring the acquisition of electric buses and the construction of road infrastructure such as bike lanes, with explicit urban and sustainability goals. This has accelerated the adoption and expansion of Low Emission Areas in Barcelona (ZBE) illustrating an interesting strategy for the deployment of these decarbonization devices. In the case of Barcelona, another important learning stems from the combination of planning objectives pertaining to quality of living and quality of the air that while centered on sustainability, habitability and health are eminently based on the principle of traffic regulation where a transition towards a cleaner and more reasoned modal offer is central. Low emission zones thus are a vital cog of the super-block model, ushering other future developments in the form of extended bicycle network, the extension of the tram system, or the creation of new parks (for example, Glòries) and green networks among others, to enact the changes to which aspire the Urban Mobility Plan for the 2018-2024 period.

CONCLUSION

In order for cities to deliver on their sustainable and net zero carbon mobility agenda, local governance and policy capacities need to expand while flexibly adapting to a shifting context driven by environmental, economic, and technological triggers. Key governance gaps need to be bridged to transform governance from a potentially constraining factor to an enabling one.

European cities face a number of governance challenges that put increased pressure for a changed approach to transport and mobility planning. Those that are most experienced with sustainable mobility transitions have significantly increased their institutional autonomy by accumulating policy resources and political capacities to support sustainable urban mobility developments since the 1980s. This was achieved, whatever the size, by reorganising existing resources, developing new ones or by reaching out to potential allies. This finding is important in the context of European multi-level governance and more specifically in the German federal context, in which city governments wishing to develop an ambitious sustainable mobility agenda have to work in a crowded regulatory space.

Drawing on the initiatives introduced across four cities and regions in Europe, this contribution to the acatech study examines different policy responses and coordination efforts raised by local and municipal administrations, in relationship with business and civil society associations. In doing so, it contributes to the overall project by highlighting how governance may support enhanced integration between urban development and mobility planning at the urban or the metropolitan level.

First, cross-city findings suggest that different strategies are being developed by city governments to achieve integrated urban and mobility planning. Among the many challenges raised by embracing sustainable mobility transitions, cities need to articulate a 20–30-year vision and a strategic policy timeline, working across levels of government, while accelerating implementation in the shorter term.

Second, findings from across the four cities and regions first suggest the need to adopt revisable strategies, to include new policy goals and challenges, such as the carbon zero objective or the COVID-19 pandemic. Third, as part of their attempts to overcome implementation gaps, city governments have sought to strengthen enforcement capacities, acknowledging it represents an important pillar of local transition strategies. The introduction of low emissions zones, for example, pertains to this trend, together with monitoring tools and sanction mechanisms. In addition, cities seek to shift away from a movement-based approach to mobility planning towards an integrated transport approach, extended to solutions outside the transport sector. In this regard, they draw on urban development, smart technologies or the marketplace.

Third, cross-city findings confirm that the experimentation with locally generated instruments for specific city-related issues constitutes an important arm to advance the shift to sustainable mobility transitions. Short-term initiatives can help facilitate buy-in from politicians. It also enables local authorities to reach out to other sectors and private actors to experiment with transformative policies. We also observe in the different case studies explored in this report, novel participatory mechanisms have increasingly been exposed, willingly or disruptively, to new technologies, and platforms that have been instrumental in presenting alternative transportation modes, not entirely related to former ones in operation. Yet beyond small scale experiments, scaling possibilities to metropolitan and regional dimensions of these experimentation and innovation drives constitutes another, more formidable policy tool for change. In this regard, establishing intermunicipal cooperation, at metropolitan level or in the urban functional area, offers a timely opportunity for city governments to foster enhanced integration between urban and mobility planning to support sustainable transitions. Additionally, such forms of cooperation may result in additional funding opportunities and enhanced capacity to shape the priorities of regional / national authorities and transport companies.

An important idea lies in the necessity to streamline the different planning instruments at work across different levels into an actionable but also compatible set of orientations that combine broad sustainability planning directives with mobility objectives. This process is contingent on the capacity to aggregate cooperation across the political divide, but also participatory schemes that do not necessarily always relate to one another. This also needs to take into account the specificity of times of uncertainty, over specific issues that conspire against the seamless integration of metropolitan territories and entities, such as 'folding back' mobility patterns in case of pandemics. The experience of mobility in this sense needs to acknowledge the diversity of city, metro and regional scale in the promotion of transportation modes that may not be as well suited for compact sections of the city - related to 15 minute city models for instance- with others that operate in splintered, disjointed territories, where mass rapid transit based solutions would make more sense.

MAIN RECOMMENDATIONS FOR CITIES AND REGIONS WISHING TO SPEED UP IMPLEMENTATION

The work done on governance as part of this acatech study holds useful lessons for the German federal context and beyond. To begin with, cities should play a proactive role rather than a reactive one. They may develop the following activities to enhance integration between urban development and mobility planning:

1. *Take local initiatives, either soft or hard ones, to actively increase the integration between urban development and mobility planning.* Examples include place-making initiates, 25/75 mode split or developing master planned eco-districts.
2. *Make administrative reforms to work transversally* with relevant departments within the city administration and relevant other stakeholders to adopt and implement new policy measures.
3. *Adopt a context specific mix of sustainable urban mobility policies.* Successful strategies rarely rely on a one-size-fits-all approach. Drawing on revisable policy mixes enables, on the one hand, adapting to new challenges (whether economic, social, ecological, technological etc.) and on the other hand, targeting a variety of groups.
4. *Implementation matters!* Link strategic priorities with a set of operational tools to avoid the pitfalls of micromanagement and ensure some level of continuity over time. By investing in a multi-pronged, multi-level effort, cities will increase their ability to implement and evaluate sustainable mobility plans at city level.
5. *Regulate to innovate*, whether to reduce the number of parking supplies, to apply congestion charging and reduce access.
6. *Maximise the opportunities and minimise the risks*. This can be achieved by looking for co-benefits with adjacent authorities and/or at the regional level, or by exploring solutions outside the transport and the mobility sector.
7. *Engage with a variety of stakeholders.* Sustainable transition mobility policies are bound to meet with resistances and spark conflicts. Venues for interaction and mechanisms for support across levels are key elements to ensuring net-zero pathways in urban transitions are maintained.

Moreover, national and regional authorities should support the cities' efforts, including smaller and medium-sized cities which have too often been neglected in previous sustainable mobility strategic frameworks. More specifically, local authorities would benefit from:

1. *A right to experiment* with a variety of policy initiatives such as road pricing, ultra-low emission zones, diesel bans etc.
2. *Developing enhanced capacities*, through the devolution of administrative and political authority, dedicated funding, policy tools and the creation of legitimate and accountable consultation and participatory venues.
3. The introduction of place-based and holistic policy and budgetary frameworks, to provide an alternative to a transport mode approach.

To conclude, having examined the various ways in which governance solutions may unlock sustainable mobility transitions, this report shows the real and very positive impacts that support from multiple levels of governance can have on efforts made at city level.

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