

URBAN LAB - SYNTHESSES 2024



# MOBILITY AS A LEVER FOR THE ECOLOGICAL TRANSITION

MASTER GETEC

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**SciencesPo**  
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## **PREFACE**

**Rafael Alatrisme-Gamba** - Partner from Transdev Strategy Department

“At Transdev, we are mindful of the fact that Public Transit Agencies face major challenges to secure funding while implementing network improvements for their communities. Due to local public financing instability and reform in Europe and abroad, inflation, supply chain disruptions and urban environmental challenges, Transit Agencies find themselves in a situation where building sound pluriannual investment plans, necessary for infrastructure development and network electrification, becomes almost impossible. Hence, we have requested GETIC Master students from the Sciences Po’s Urban School to deep dive into these issues and identify exit paths to unlock the current situation. In particular, multi-layered & green financing emerge as major tools to foster network development, provided that these become encompassing and accessible for local governments on the long run.”

**Loic Delhuyenne** - Tutor

“Mobility is now a key lever in the ecological transition. As the tutor of this academic project, I am particularly proud to present the in-depth research carried out by students in the GETIC Masters programme at École Urbaine de SciencePo. Their commitment to these crucial issues, in the service of a major player such as Transdev, illustrates the importance of collaboration between academia and business in tackling today's challenges.

The students have developed a systemic vision of transport, both in Europe and internationally, highlighting the financial support mechanisms that are essential to its development. Their analysis is fully in line with the European Green Deal, which aims to support regions in their development and ecological transformation.

Finally, this work highlights the importance of collective action in achieving ecological objectives. Cooperation between the various players - governments, businesses, citizens and academic institutions - is crucial to building a sustainable future.

I would like to thank the students for their valuable contribution and their dedication to this essential cause.”

## OUR PARTNER

**Transdev Group** is a French public transport operator that provides a range of services from technical and planning support, to operations in **19 countries and all continents** of the globe. Their main transport operations are buses and light rail, but they also operate cable cars and ships.

They engaged with the **ecological transition at the local scale** and ambitiously implemented a green strategy in 2019, “**Moving Green**”, to reach the Paris Agreement targets; The group committed to reduce by **30% the emissions of their fleet by 2030** and is pushing for a green mobility transition through an **increase in 50% of their alternative transport modes**: new gen vehicles, electrification, biogas and biofuels.

Transdev makes the link with **all levels of transport planning** (providers, financial institutions, transport authorities and clients), which give them the keys to foster a green transport transition.



Transdev in the world | Transdev

## METHODOLOGY

Our research methods are articulated around three pillars. First we conducted an academic and scientific literature review in order to understand how mobility was accounted for as a transition lever by the international actors and get a sense of the main challenges for the different stakeholders. Starting from the keyword “mobility”, we explored scientific reports on climate change and environmental challenges, academic literature on sustainable urban planning and green finance. We went across several disciplines: economics, political sciences, sociology and finance.

Second, we attended the European Connecting Days conference (Apr. 2nd-5th), which we will detail in the field study section.

Finally, we conducted fifteen one hour interviews with different professionals from the sector. We started with Transdev professionals issued from the Strategic and Finance departments. We then met with public transport experts: the DG from European DG Move commission, UITP representatives and academics. Finally, we discussed with operators representatives from Morocco, Budapest, Madrid and Italy which allowed us to build our case studies.

## FIELD STUDIED



Our sole field study was the Connecting Europe Days in Brussels, Europe's flagship mobility event, held from the 2nd to the 5th of April. The event consists of a variety of conferences, discussions and debates about the general topic of mobility in the European Union and its neighbouring countries. Brussels was not a case study, but some of the conferences were nonetheless highly informative and useful. Not all of them though: a large part of the conference was related to mobility topics outside the field of public transport (for example intercity mobility and freight transport). But even when the discussions were focused strictly on public transportation, the scope remained very much European, revolving around what the EU (particularly the commission) could and couldn't do. Guests were mostly ministers, politicians such as local mayors or transportation ministers, representatives of financial institutions (chiefly development banks), industry representatives, and of course a slew of European Commission officials.

We discovered at that event two key concepts of EU regulation regarding mobility: TEN-T regulation, and SUMP. TEN-T regulation is the commission's framework to fund, green and integrate continent-wide transportation networks, organised in corridors. SUMP, or sustainable urban mobility plans, are directly related to urban public transportation networks, and basically have the same objectives as TEN-T, albeit at the local urban level. Most conferences seemed to tackle one or more of three topics: carbon emissions, integration, and digitalisation. Integration particularly seemed to be of the utmost importance for a lot of the speakers, who pointed out that it would bring about better economic flows and would facilitate the choice of transport for users. This usually led to broader discussions on modal shift, which were linked with digitalisation. Overall, we concluded at the end of the event that the EU's two pillars for modal shift were integration and digitalisation. Finally, the overall discussion on emissions reduction seemed to chase the EU directives for clean cars and buses, and the carbon neutrality objectives. It often seemed to be mentioned as a means to the end of achieving the set objectives, instead of a good in and of itself.



## ISSUES

Meeting the Paris Agreement's goal of limiting global warming to 1.5°C above pre-industrial levels requires rapid decarbonization across all sectors, including transportation. Transport sector currently accounts for 15% of the total GHG emissions, 23% of the global energy-related CO<sub>2</sub> emissions (IEA, 2020). Transportation sector averages 1.8% of annual growth. Additionally, in 40% of the countries, transport represents the most energy consuming sector. Freight and passenger road transport accounted for 70% of the transport sector emissions in 2019, remaining the largest source of emissions. Cities play an ambivalent role as significant contributors to emissions and frontline bearers of the consequences of climate change. On the one hand, the urgency of climate action in cities is underscored by the increasing impacts of climate change, with 70% of cities globally already affected and more expected to face drastic changes by 2050. On the other hand, cities contribute significantly to global emissions, resource consumption, and waste production, with rapid urbanization exacerbating these trends. Urban mobility is responsible for 40% of the transport-related emissions and 8% of the global CO<sub>2</sub> emissions. It is consequently urgent to integrate the transportation sector into broader climate actions.

Transdev aims to foster the green transition from the transport sector but faces a major issue: local authorities are difficult to convince for investing in more costly green transportation systems. Therefore we were proposed to develop a support tool for local governments.



We started by identifying the different challenges faced by the local authorities:

**1 - Governance.** Public transport governance is complex and involves a long list of different stakeholders. Additionally, from a political perspective, the transport sector both pertains to mitigation policies - reducing GHG emissions is key for avoiding any further negative effects of rising temperatures - and adaptation, as new transport systems will be resilient and help face the consequences of climate change. However, challenges remain, particularly regarding cross-boundary operations and service integration.

**2 - Urban planning.** Addressing future challenges is an arduous task for local governments. Even though current emission reduction commitments are insufficient to meet the targets, some EU countries – like France – have already set ambitious targets for increasing the share of public transports and public investments. Additionally, successful modal shifts have already been observed in countries like Sweden and Norway through increased funding and improved services (ITF, 2023). Yet, urban planning is too often considered separately from transportation networks, leading to an increased risk of “lock-in” (i.e. European city’s infrastructures are already built and adapting them to new challenges increases the costs). This underlines the importance of integrating transport systems to urban planning, to avoid inefficient investments and improve services.

**3 - Finance.** Moving to a greener transportation system is extremely costly for local authorities as it requires additional investments for new technologies and infrastructure. In the European Union, meeting climate objectives from 2021 to 2030 is expected to necessitate an annual investment increase of €130 billion for vehicles and alternative fuel infrastructure, surpassing the previous decade. Additionally, approximately €100 billion per year will be needed for additional investment in green transport infrastructure.

We observed that different transport strategies are being implemented to answer the climate crisis but overall, they face important challenges linked to broader urban issues. Local authorities imperatively need to foster inclusive, safe, resilient, and sustainable cities; especially by accelerating the provision of adapted infrastructure and services while reducing emissions. Overall, achieving sustainable urban mobility requires increased coordination, integrated planning and investment in public transport infrastructure, operating subsidies, and the development of efficient, multi-modal transport systems.

Even though the European Commission defined a roadmap for transitioning and achieving goals, there is no consensus on whether public transportation should be a primary concern. Climate policies encompass many domains where transport is overlooked. There is no consensus on what should be considered as a “green” mobility. While some argue that fossil fuelled public transportation is already greener than private cars, others consider it is not sufficient and should be completely decarbonised. There is no consensus either regarding the decarbonisation paths: e-mobility or alternative fossil fuels, different options are put forwards by the industrials. With that in mind:

*How to make greener transportation accessible to cities ?*

# MAIN RESULTS

## I. URBAN TRANSITION POLICIES

### GOVERNANCE

The environmental crisis impacts all societal domains, making current governance frameworks inadequate for managing the transition. There is a pressing need to rethink politics at all scales to create sustainable and resilient environments, particularly in the realm of public transportation.

**1 – The progressive consideration for transport as a key solution at the international level.** Initially secondary in COP debates, transport gained prominence post-Paris Agreement (2015), which set ambitious climate targets. By 2023, COP28 underscored transportation's critical intersection with multiple policy sectors, prompting nations to include transport measures in their Nationally Determined Contributions (NDCs). Despite this, transport resilience to climate risks remains underemphasized.

**2 – The push for electrification from the European level.** The EU has been proactive in pushing for sustainable urban mobility through policies like the Sustainable Urban Mobility Plans (SUMP) and the Green Deal, aiming for net-zero emissions by 2050. A central measure includes ceasing gas vehicle production by 2035, focusing on electrification. However, this strategy, while environmentally focused, appears to prioritize industrial protection over social and environmental justice. The revised TEN-T regulation (2024) mandates significant emission cuts and requires urban nodes to adopt SUMPs by 2027, directly addressing local governments for the first time.

**3 – Navigating the multiple layers of decision making from a local perspective.** Local governance faces two main challenges: responsibility within a multilayered framework and capacity to implement effective solutions. In Italy, for instance, unregulated urban sprawl has led to high private mobility reliance due to poor public services. Spain's post-dictatorship exemplifies how decentralization created fragmented local governments with varying objectives, complicating coordinated efforts. Effective local governance can stimulate economic growth, reduce congestion, and enhance city attractiveness through well-planned public transit systems.

### PLANNING

**1 - Public transport planning faces the decrease in land availability.** Most of the still growing cities face the issue of “sprawling” inducing an over consumption of land by large cities. One must note that the extension of mass transit networks is often confronted with the lack of available land: apart from road infrastructure, public authorities generally do not have the land needed to develop subway, tramway, or LRT schemes.

**2 - The mobility patterns are influenced by the existing urban structure.** The way infrastructures and settlements evolved over time largely impacts the current share of transport emissions. Emissions are a function of distance and public transport is easier to plan in dense areas.

## FINANCE

Climate finance has seen significant growth in recent years, with the Climate Policy Initiative's 2023 report indicating that annual climate-related financial flows nearly doubled between the pre- and post-COVID eras. Despite this growth, the current level of investment (approx. \$1.3 trillion) is still far below the required €8 trillion annually by 2021/2022, escalating to approximately \$11 trillion by 2030, to meet the 1.5°C targets set by the 2015 Paris Agreement.

**1 - Economic Viability of Climate Finance.** Investing sufficiently in climate finance is estimated to be five times less costly than not taking action under a +1.5°C-by-2050 scenario. As of 2022, about 90% of global climate investments are focused on mitigation rather than adaptation. This focus is driven by the immediate need to reduce emissions and the economic viability of mitigation efforts. Over half of mitigation investments are managed by the private sector, while public actors fund 97% of adaptation efforts, which are currently less profitable.

### **2 - Challenges in Public Transport Investment.** Fiscal Constraints and Market Capacities

The limited investment in public transportation is partly by its low profitability and the inability of public actors to fund initial investments. Local and regional authorities often spend more than they collect in taxes, relying heavily on external financial support.

Local authorities' abilities to finance infrastructure projects vary greatly depending on national legal and political contexts. This disparity affects the development of local public transportation networks, with federal countries generally having more extensive networks compared to centralized countries with fewer financial capacities devolved to subnational bodies.

The Cities Climate Finance Leadership Alliance notes that only 4% of public development bank funds are earmarked for local government projects, worsening the unaffordability of new public transportation schemes for local authorities.

### **3 - Public transport funding and finance**

CAPEX			OPEX
<b>European funding</b> (project-based): insufficient and discontinuous	<b>support</b> and		<b>Users funding:</b> decreasing, most often due to political interference (fare setting policies, electoral cycles); should allow financial sustainability and concessional fares.
<b>European Banks:</b> mostly accessible through national government, low interest rates			<b>Taxpayers and government funding:</b>
<b>Private investment:</b> classical tools are not enough (loans, equity) and new alternatives are criticised (Land Value Capture causes equality issues and Carbon credits market is limited)			- beneficiary-pay taxes: key but criticised for targeting people that are not using public transport - polluters-pay taxes: non-neglectable source of funding, criticized for threatening social justice.



## II. DECARBONISING MOBILITY

### *AVOID*

The first lever of action to reduce transport emissions is to reduce unnecessary motorized trips. Indeed, the limitation of mobility, whether it is absolute or just car-related, indirectly pushes for the development of public transport, among other forms of mobility. The covid crisis showed that reducing activity through imposed constraints has long term consequences. The promotion of alternative services coupled with effective urban planning are necessary tools to achieve efficient transportation networks.

**1 - New mobility patterns and rebound effect.** A rebound effect was observed on emissions trends after the pandemic: the constrained mobility reduction did not influence positive long term behavior changes, and even encouraged a part of the population to relocate further and rely on the electric private vehicles boom for their needs.

**2 - The importance of integrated urban planning and alternative services.** The biggest challenge for public transport planners is to link the city to the low density living area and address the territorial inequalities of access to efficient mobility services. In that case, the MEAPS economic model helped a better understanding of the challenges at stake: emissions are a function of distance and local authorities should privilege integrated urban policies to develop public transport and population density taking into account the distance to jobs. Finally, urban planning policies must consider equally land use and transport planning as the case of La Rochelle illustrated.

### *SHIFT*

The second lever of action to reduce transport emissions is to put more people into public transportation systems and out of cars. What good is a bus if nobody rides it? Other than emissions reduction, this so-called modal shift also has other advantages. It reduces air pollution, is cheaper for both supply (governments and operators) and demand (users) than EVs, reduces infrastructure costs in the long run for municipalities related to road maintenance and private parking, it reduces socio-economic inequalities, and is cheaper for emissions reductions than the complete redesigning of cities. Economically, it can also have the advantage of decoupling emissions from growth, and finally, modal shift triggers changes in urban planning, with for example transit-oriented development, which pushes for denser housing near public transport infrastructure, triggering a virtuous circle of modal shift and density.

There are two ways to push for modal shift: convenience and inconvenience for users:

**1 - Inconvenience, or the stick.** Inconvenience is every way in which a municipality can make car use less convenient. To give out a few examples, LEZs, parking restrictions or lower speed limits all serve to annoy car-users, and might convince them in certain circumstances to switch to public transportation or soft mobility.

**2 - Convenience, or the carrot.** Convenience is the other side of the coin, aiming at making public transportation more attractive. BRTs, multimodal nodes, fare integration, digitalisation, safety and a good public image all attempt to convince users that public transportation is their best option.

Finally, some policies aim to do both at the same time, for example dedicated bus lanes, which both makes driving a car harder, and driving a bus easier.

### *IMPROVE*

To decrease the environmental impact of transportation, improving the efficiency of existing vehicles and technologies is essential alongside promoting more sustainable mobility habits. The transport sector heavily relies on internal combustion engines (ICEs) and petroleum-based fuels. Approximately 95% of transport energy comes from petroleum-derived liquid fuels, and about 60% of all oil production is used to make transport fuels. Although alternatives like biofuels, CNG, and LPG exist, they only cover about 5% of transport energy, with electricity and hydrogen having negligible shares. Projections suggest that by 2040, combustion engines will still supply around 90% of transport energy.

**1 - Electrification**, particularly through lithium-ion batteries, offers significant potential but comes with challenges. Battery electric vehicles (BEVs) are costly due to their large batteries and power electronics, and their environmental benefits depend on the electricity source. In regions with coal-based electricity, BEVs can have higher life cycle CO<sub>2</sub> emissions than ICE vehicles. Hybrid vehicles (HEVs, PHEVs) offer interim solutions, but widespread BEV adoption demands substantial investments in power generation, infrastructure, and grid management.

**2 - Hydrogen fuel cell vehicles (FCVs)** present another promising technology due to their efficiency and longer range. However, the high cost of vehicles and the development of hydrogen infrastructure are significant barriers. Hydrogen production is energy-intensive, and if the production process is not CO<sub>2</sub>-free, the overall emissions can exceed those of conventional vehicles. Significant investments, estimated in the hundreds of billions of dollars, are required for hydrogen supply infrastructure, including pipelines and refuelling stations.

Overall, a combination of technological advancements in vehicle efficiency, electrification, and hydrogen technology, supported by substantial investments in infrastructure and a shift to renewable energy sources, is crucial for reducing the environmental impact of the transport sector.

### III. TRANSITION IN PRACTICE

#### BUDAPEST (Hungary)

**1 - Budapest is one of the European cities with the highest share of public transport modal split (50%) for historical reasons.** Nevertheless, public transport authorities now suffer from decades of low public investment and lack of autonomy. The city recently enacted the will to cut emissions by 40% by 2030 through a drastic reduction of car modal split.

**2 - A costly transition.** Budapest largely benefited from the Cohesion Policy fund in the past. It allowed major infrastructure investments such as the refurbishment of the Metro line 3 with the past-period budget. Nevertheless, the European fundings is either project-based or allocated by the national government, which does not represent a reliable nor continuous source of funding. Therefore, the municipality has chosen not to prioritize the further development of tram and trolleybus and not electrification because too costly to implement.

**3 - Financial impact of political disputes.** One of the main obstacles to renewing the fleet and developing infrastructures remains the lack of public funding due to political disputes. Budapest Municipality has been run by the opposition party since 2019, since then, the national government adopted a restrictive financial strategy. Additionally, Hungary has a centralized governance - and tax - system, decreasing the financial autonomy of the municipalities.

#### RABAT (Morocco)

**1 - Favourable economic circumstances.** Thanks to its rapid economic development and favourable socio-political context, Morocco has recently launched a large number of infrastructure projects aimed at modernizing the country's major cities. Rabat, Morocco's Royal City, benefits from particular governmental and monarchical attention - as reflected by its transportation network. Fifteen years ago, the conurbation had just a handful of buses; nowadays, the city has a two-line tramway network and what's probably the most advanced public road transport network in the Maghreb, with more than 400 buses covering all neighbourhoods of the city.

**2 - Political window of opportunity to develop the network.** Looking ahead, Rabat's transportation infrastructure is set for further expansion, driven by Morocco's infrastructure investments and the upcoming 2030 World Cup, which the city will co-host. Planned projects include extending the tramway network, increasing the bus fleet, and enhancing smart city initiatives to improve traffic management. The high-speed Al Boraq rail network, connecting Rabat to Tangier, Casablanca, and eventually Marrakech, is also in development, aimed at boosting connectivity and supporting the city's growing population, which is increasing at nearly 2% annually.

**3 - Financial concerns and climate risks.** Rabat is already heavily indebted, raising concerns about the long-term sustainability of these projects given the city's budget deficits. Additionally, climate change poses a significant risk, with very increasing chances of natural disasters such as droughts, earthquakes, and floods. The Moroccan government's current infrastructure investments often overlook climate adaptation, highlighting the vulnerability of Rabat's transportation system to such events. Without proactive measures, the existence of this transport system is likely to be jeopardized by future exceptional climatic events.

## ABRUZZO (Italy)

**1 - Abruzzo faces chronic issues such as depopulation, demographic shifts, reduced public spending, and economic stagnation.** The local public transportation (TPL) sector is similarly affected. During the 1990s and 2000s, Italy's public transport sector underwent significant changes leading to a transition from direct public management to corporatization and privatization. However, this process was hampered by Italy's pre-existing fragmented system, with continuous renewals of concessions and inadequate service planning. The three main regional operators created in this context were ARPA, GTM and Sangritana.

**2 - Lack of political will to meet environmental targets.** The corporatization of former public companies in Abruzzo did not result in a change in management philosophy, with economic sustainability largely overlooked. By 2014, the main company faced a financial collapse due to a lack of business management criteria. Generous funding allowed Sangritana and GTM to maintain balance, but ARPA faced difficulties with regional extra-urban services, leading to significant annual losses. Reduced funding from the Ministry of Transport and the regional government resulted in limited contributions and an aging of the fleet. The solution involved merging the three main companies, ARPA, GTM, and Sangritana. ARPA's capital was reconstructed by acquiring 100% of GTM and Sangritana shares, forming a new company within a year. This merger resulted in the genesis of TUA, with immediate financial benefits, including a €10 million cost reduction in the first year and the elimination of non-subsidized kilometers, restoring financial stability and improving efficiency.

**3 - Promoting future decarbonization.** Public ownership of TPL is justified when it accomplishes public interest benefits through value creation mechanisms. For TUA, Abruzzo's main public transport company, the ideal scenario would involve covering 100% of TPL, maximizing economies of scale, and organizing a regional TPL not strictly driven by economic conditions. This includes experimenting with fleet maintenance and innovative technologies to reduce environmental impacts. The overarching goal is to promote decarbonization, enhance the social utility and status of public transport, and leverage funds for innovative projects like free TPL. TUA aims to change perceptions, demonstrating the environmental and social benefits of public transportation and align with a vision of systemic infrastructure enhancement.

## MADRID (Spain)

**1 - EMT Madrid, an example of a decarbonisation success story,** based on a liberal management model but not necessarily in the way we might think. Out of the whole fleet 0 buses are diesel, 1800 buses run on natural gas, and 300 are fully electric buses and they are operating a very gradual shift towards 100% electric fleet by 2033.

**2 - Liberal management and high reliance on EU Funds.** The main tool used to finance capital investment so far has been NextGenEU funds - and CEF for the future - which the EMT managed to snatch up. The company created a specific group to apply to EU funds and overcome the complex process of application. In terms of operations, to the EMT's delight, operating expenditures for gas and electric buses are actually lower than for diesel buses, mostly because maintenance costs are cheaper. This brings up the share of user fees revenue up to 40 to 45% of all income.



## LEARNINGS

### URBAN TRANSITION POLICIES

**1 - Coordinated urban actors play a significant role for sustainable transport planning:** they have a better understanding of socio-economic disparities and can implement and adjust policies more responsively.

**2 - Planning urban transportation systems require an integrated approach,** taking into account the location of jobs and the density of population, to avoid maladaptation and inefficient networks

**3 - The decarbonisation of the transport sector requires more investment at the global scale,** and a better government funding basis at the local scale.

### DECARBONISATION

**1 - Local authorities should adopt a long term transport strategy** answering urban and ecological challenges through the planning of efficient networks where people and jobs are located.

**2 - A modal shift in favor of public transportation** is needed to achieve the decarbonisation targets.

**3 - A serious pledge for the development of new technologies and the phasing out of fossil fuels by global authorities** is fundamental to lower transportation environmental impacts.

### TRANSITION IN PRACTICE

**1 - Budapest:** an extreme case showing the financial and institutional difficulties encountered to shift to green public transport.

**2 - Rabat:** green mobility as a growing strategy for achieving economic development and political targets.

**3 - Abruzzo:** illustrates the struggle of coordinating local authorities from a regional scale.

**4 - Madrid:** EMT, a successful liberal governance model for the decarbonisation and access to EU funding.

## FIND OUT MORE

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### **The Capstone project: an original educational tool**

Thanks to this original tool, students are placed in a work situation on a real problem posed by a public, private, or associative organisation. For all the Masters of the Urban School, the structure and management are identical: the project is jointly monitored by the the Urban School and the partners, at all phases of the project, and regular methodological supervision is provided by a professional or academic tutor specialised in the issue. The Capstone projects allow the partners to take advantage of the research and training acquired within the Urban School, to benefit from the production of studies and quality work, and to have a capacity for innovation.

Capstone projects are a great tool to study, diagnose, forecast, lead a comparative analysis, even to prepare for evaluation, and more generally to deal with any problem that can enlighten the organisation concerned in a logic of "R&D ". Each project mobilises a group of first-year students from one of the Urban School's Master's. Students work between 1.5 days and 2 days per week on dedicated time slots, for a period of 6 to 9 months (depending on the Master's concerned). In Executive education, collective projects concern the Executive Master "Territorial governance and urban development" and mobilize professionals for a period of 4 months.