



SHAPING THE FUTURE OF URBAN MOBILITY

GUIDELINES FOR NEW GOVERNANCE MODELS TOWARDS ORCHESTRATED,
EFFICIENT, COMPETITIVE, AND SUSTAINABLE MOBILITY SYSTEMS ACROSS
ALL MODES OF TRANSPORT

29/08/2021

Author: Pedro Homem de Gouveia, POLIS



This project has received funding from
the European Union's Horizon 2020
research and innovation programme
under grant agreement No 824273.

SUMMARY SHEET

Deliverable No.	4.1
Project Acronym	GECKO
Full Title	Governance principles and mEthods enabling deCision maKers to manage and regulate the changing mObility systems
Grant Agreement No.	824273
Responsible Author(s)	Pedro Homem de Gouveia, POLIS
Responsible Co-Author(s)	
Peer Review	Yannick Bousse (UITP), Bonnie Fenton (RC), Jayant Sangwan, Marusa Benkic, Rémy Russotto (CORTE), Caroline Busquet (ABK)
Quality Assurance Committee Review	n/a
Date	2021.08.26
Status	Final
Dissemination level	Public
Abstract	This document presents guidelines for new governance models towards orchestrated, efficient, competitive and sustainable mobility system across all modes of transport.
Version	1.0
Workpackage No.	4
Workpackage Title	New regulatory approaches to devise new regulatory schemes, frameworks and governance models
Programme	Horizon 2020
Coordinator	UITP – The International Association of Public Transport
Website	www.h2020-gecko.eu
Starting date	December 2018
Number of months	33

This report is subject to a disclaimer and copyright. This report has been carried out under a contract awarded by the European Commission, contract number: 824273. The content of this publication is the sole responsibility of the GECKO project.

PROJECT PARTNERS

Organisation	Country	Abbreviation
UNION INTERNATIONALE DES TRANSPORTS PUBLICS	BE	UITP
UNIVERSITY COLLEGE LONDON	UK	UCL
RUPPRECHT CONSULT - FORSCHUNG & BERATUNG GMBH	DE	RC
CONFEDERATION OF ORGANISATIONS IN ROAD TRANSPORT ENFORCEMENT	BE	CORTE
UNIVERSITA COMMERCIALE LUIGI BOCCONI	IT	UB



DOCUMENT HISTORY

Version	Date	Organisation	Main area of changes	Comments
0.1	26.07.2021	POLIS	Draft report	The first draft was developed during a lengthy period of time, and built on several inputs from project partners and stakeholders.
0.2	18.08.2021	UITP, RC, CHT, CORTE	Peer review	
1.0	27.08.2021	POLIS	Final review	Final version for submission to EC

TABLE OF CONTENTS

Executive Summary 7

Part I - Setting the Scene

1. Watch this!..... 9
2. Back to the Future 11
3. The Challenge of Urban Mobility 14
4. The COVID Stress Test 18
5. What to expect 20
 5.1 Climate crisis..... 20
 5.2 Economic recession 20
 5.3 Europe of Cities and Regions..... 21
 5.4 The Digital Exodus 21
 5.5 Powerful tech players..... 22
 5.6 The Big Deal 22
 5.7 Citizens are changing too 22
 5.8 Urgency, Inertia and Leadership 23
 5.9 A Monopoly that distorts competition and blocks innovation 24
 5.10 Capacity Gap..... 24

Part II - What (and who) are we dealing with

6. Brave New World 26
 6.1 Innovation..... 26
 6.2 Disruptive Innovation 27
 6.3 Platform Economy 28
 6.4 Sharing Economy..... 29
 6.5 Business model..... 29
 6.6 Market readiness 30
 6.7 Market positioning..... 31
 6.8 Market maturity 32
7. What we looked at 34
 7.1 Cooperative, Connected and Automated Mobility (CCAM) 35
 7.2 Infrastructure, Network and Traffic Management..... 35
 7.3 MaaS and MaaS platforms..... 36
 7.4 Shared on-demand mobility 36

Part III - Implications for Governance

8. Key Issues and Implications..... 37
 8.1 Business Ecosystem..... 37
 8.1.1 Competition 37
 8.1.2 Cooperation 38
 8.1.3 Compatibility 39
 8.1.4 Complementarity..... 39
 8.1.5 Lock-ins 40

8.2	Data Management	40
8.2.1	Data ownership	41
8.2.2	Data Quality	42
8.2.3	Data Integration.....	42
8.2.4	Data security	42
8.3	Existing governance structure.....	43
8.3.1	Economic instruments	43
8.3.2	Legislative aspects.....	44
8.3.3	Political aspects.....	44
8.4	Environmental Issues	45
8.4.1	Environmental impact.....	45
8.4.2	Rebound effect	46
8.5	Social aspects	46
8.5.1	Equity and accessibility	46
8.5.2	Ethical aspects	47
8.5.3	Cultural-cognitive aspects	47
8.5.4	Tragedy of the commons.....	48
8.5.5	Public Health	49
8.6	Customer Protection and Public Safety	49
8.6.1	Safety	50
8.6.2	Security	50
8.6.3	Liability.....	51
8.7	Different Actors and Motivations	52

Part IV - What is to be done?

9.	Governance Approaches and Instruments	54
9.1	Models of Governance	54
9.2	Approach and Instruments.....	56
9.3	Pros, Cons and Applicability.....	57

Part V - For a strategic approach

10.	Where do you want to go?	59
11.	Ten Recommendations for Local Government.....	61
11.1	Clarify Goals, plan for them, and be proactive	61
11.2	Pursue transport justice	61
11.3	Nurture and protect a multimodal ecosystem	62
11.4	Foster affordable, but fair	62
11.5	Demand sustainable solutions.....	63
11.6	Shape Infrastructure as destiny	63
11.7	Build capacity	64
11.8	Cooperate and integrate	64
11.9	Don't let subsidiarity be an obstacle	65
11.10	Explore the options.....	65

Executive Summary

The rapid proliferation of new technologies and disruptive innovations is threatening well established players across many sectors. None more so than in the mobility sector, where the public and private provision of passenger and freight transport is undergoing a revolution.

There are important opportunities and risks to consider, and public regulations have a key role to play. To ensure maximum benefits from innovation in mobility, we need the right regulatory framework, as well as **purposeful cooperation** between public authorities and industry, business, and operators.

The overall **goal of Project GECKO**¹ is to support authorities in developing the most appropriate regulatory frameworks and governance models, through guidance, recommendations, and case studies, to enable the transition to a new mobility era of cooperative, inclusive, competitive, sustainable, and interconnected mobility across all passenger and freight transport.

GECKO partners conducted **extensive research** on several disruptive transport innovations, analysing technology that enables them, business models that make them run, issues they raise, and their implications for governance and regulation. The **results of these research efforts can be accessed** through a set of tools, including a Knowledge Bank, a Compliance Map, and several publications, all available in the GECKO website². There is a wealth of information to benefit from.

The **goal of this document** is to provide strategic guidance to policy makers, and to base that guidance on a foundation of GECKO evidence-based research and stakeholder input. This will also, albeit indirectly, support players from the private sector, on the assumption that strategic clarity and a better understanding of key technology and business issues on the part of their public interlocutors will foster more constructive dialogues.

Because policy is developed at various levels, and what is relevant for some levels may not be useful at others, **this guidance focuses on the policy makers operating at local and regional governments and transport authorities** – this includes elected officials, political support staff and public administration workers who hold leadership positions, or participate directly in shaping, implementing, and managing policies at this level.

¹ GECKO is a Horizon 2020 European Project. The acronym “GECKO” stands for Governance principles and mEthods enabling deCisions maKers to manage and regulate the changing mObility systems.

² <http://h2020-gecko.eu/>

The impact of disruptive mobility innovations in European cities and regions is quite heterogeneous, as is the **organizational capacity** of local governments to deal with them. We must keep in mind that, of the ca. 800 European cities, approximately 700 are small or medium sized cities, which often do not have the resources nor the experience of some of the larger cities.

These innovations have also arrived to many of those small or medium sized cities, or soon will, and the sum of their responses is also very important for the European Union. This document is meant to support them as well, and because of that, **we do not assume our target audience is fully familiar with these issues.**

Furthermore, this document does not seek to provide universal, prescriptive, and rigid guidance, since contexts, needs, and leadership vary. It seeks, instead, to articulate some **basic concepts** that all can use as a shared reference, and to provide elements for a **strategic approach**, that can help public and private actors push together, at the local level, towards a common goal that is of critical importance for all: accelerating the shift to sustainable mobility.

This Guide is divided into **five parts**. Part I sets the scene: the key challenges we face, why governance is important, the context in which we will have to operate, and what we can (and should) build on. Part II explores what (and who) is the public sector dealing with: key concepts that must be understood, and what GECKO research looked at. Part III explores the implications for Governance. Part IV explains options: governance models and regulatory approaches. Finally, on Part V we set out some key ideas for a strategic approach by local authorities.

As mentioned above, setting a solid and shared foundation for strategic considerations is an indispensable part of constructive dialogue and governance. For that, these guidelines (especially in Parts II, III and IV) integrate a 'digest' of content developed by other partners and published in other GECKO deliverables, and credit is due to their authors for their most valuable contribution.



Part I – Setting the Scene

1. Watch this!

“Start where you are, use what you have, do what you can.”

Arthur Ashe (1943 – 1993)

One can say that the Summer of 2021 was, to use a euphemism, enlightening. As project GECKO came to a close, and these Guidelines were being finished, three things became ever more evident. To exemplify, look at what happened in the month of July:

First, scorching heat waves set a whole town on fire in Canada, and pushed 400.00 people closer to famine in Madagascar³. Then, flash floods wreaked havoc in central Europe and submerged to their necks trapped subway passengers in central China⁴, making it clear (if it wasn't already) that **the Climate Crisis poses a growing danger**, and requires firm action without further delays.

At around the same time, the European Commission announced its long-awaited “Fit for 55” package, pushing for a 55% cut in greenhouse gas emissions by 2030, making it clear (if it wasn't already) that **public policy can (and must) take a leading role** in responding to this crisis.

Finally, two billionaires launched (literally) their space tourism businesses, which will provide 15 minutes of zero gravity to a wealthy few, at the cost of several tons of CO2 in the atmosphere for all, making it clear (if it wasn't already) that **the private sector has the capacity to work wonders, but it can also push in the wrong direction**.

As our countries stagger out of the COVID-19 health crisis, an economic crisis awaits, and a looming environmental crisis demands action. All levels of European government have the **moral duty**, to their current and future citizens, to do all they can, during the coming decade, to deal with the Climate Crisis – to try to decelerate its advance, and to prepare for, and try to mitigate, its now inevitable impacts.

We all have to acknowledge that we are facing an unprecedented situation, with profoundly menacing consequences, which requires swift, decisive and sustained action on the part of all:

³ <https://time.com/6081919/famine-climate-change-madagascar/>

⁴ <https://edition.cnn.com/2021/07/21/china/zhengzhou-henan-china-flooding-intl-hnk/index.html>

citizens and organizations, public and private sectors. The next decade is critical, and “**business as usual**” will not protect our citizens.

The threats we face require substantive change in a limited amount of time – that implies making the most of the **available resources and opportunities**. The public sector can’t do it alone, and certainly not with the private sector rowing in a different direction. The energy, the creativity, and the capital of the private sector have a key role to play, and that is very much the case in Urban Mobility.

Innovation in transport can advance change – but which way do we want to go? And how can we **nudge** private dynamism in the right direction, for the benefit of all, entrepreneurs included? In democratic capitalist societies with no centralized planning, will this amount to herding cats?

It is common to point out – correctly – that transport is a derived demand, and many of its problems require intervention in other spheres, namely land use. True enough, and necessary indeed, but not fast enough. **We need to achieve substantive change during this decade.**

How to see and how to serve the public good remains, of course, a matter for heated discussions, the fundamental flame feeding political debate. The transport sector isn’t a “technological haven” isolated from these debates. Rather, **fundamental policy choices** on disruptive innovations in transport are declinations of these dilemmas at various scales, from massive national investments to detailed local regulations.

Advances in technology and regulation have been a common feature of the transport sector in modern times. Technology has usually preceded regulation, as one can hardly regulate what isn’t there, so some lag is to be expected. But as technological innovation accelerates, and is brought to the streets by business innovation, **keeping up the regulatory pace isn’t easy.**

Especially when the services provided through most of these innovations profoundly differ from traditional mobility by their business models and their way to reach customers, and some even deliberately explore regulatory gaps to create new markets⁵.

The governance of the multitude of disruptive mobility innovations is challenging because it is not immediately apparent what their **actual benefits** for society are and whether there will be **negative externalities** that need to be accounted for.

Many of these challenges converge in cities, and local and regional governments and transport authorities hold the keys for several fundamental changes. Many of these innovations can bring much needed support to accelerate the shift to sustainable urban mobility. But some may not, and how can we distinguish? Plus, even those who do bring a positive contribution, have downsides too, and what can we do to mitigate them? **This is a Governance challenge.**

⁵ “Blue Ocean Strategy”, W. Chan Kim and Renée Mauborgne, Harvard Business Review (October 2004).

2. Back to the Future

*“Creativity is thinking up new things.
Innovation is doing new things.”*

Theodore Levitt (1925-2006)

Governance and Strategy have to deal with the Present, but they’re mainly geared at the Future. More specifically, at shaping it in a certain, desired way. So the Future may be a land of dreams (or fears), but it’s also a topic for hard, pragmatic thinking.

Reactions to innovations may be fuelled by the way they contrast with current reality, but the most strategic question they pose, and a central one to which governance must respond, is what new reality they will usher in.

Is dreaming of the future an exclusive feature of modern times? Perhaps not. Although we don't know exactly how the future was envisioned in other eras, there was no scarcity of dreams during the 20th century, teeming with images of visionary urban landscapes with vanguardist transport modes running in their veins, from hovering cars to personal rocket backpacks.

Looking back at these past visions of the future, we can discern some trends that are of special interest when thinking about how to deal with transport innovation.

We can see, first of all, that dreams of future transport were often manufactured with **available technology**, e.g., futuristic looking trains, but trains, nevertheless. Being already available, these means were often ‘stretched’ in terms of capacity (two-story trams) or capability (planes landing on roofs in downtown).

We can also see that these dreams of future transport were also about **democratizing technological innovations**, i.e., making advanced solutions available to the common citizen. 1960s space-exploration excitement, for example, brought images of urban dwellers flying around with astronaut-like suits.

Advanced technology, stretched and applied to everyday life, and made available to the masses. Sounds familiar? What happened with personal computers, microwaves, smartphones, and many household appliances has also been happening with transport innovation.

In a short news piece from early April 1953, the Boston Globe⁶ quoted a statement from Mark Sullivan, then President of the Pacific Telephone and Telegraph: *“Just what form the future telephone will take is, of course, pure speculation. Here is my prophecy: In its final development, the telephone will be carried about by the individual, perhaps as we carry a watch today. It probably will require no dial or equivalent, and I think the users will be able to see each other, if they want, as they talk.”*

Mr. Sullivan stopped but a step away from guessing that the telephone would also be used as a portable public transport ticket, or to reserve a ride-hailing trip, or even to unlock a “floating bike”. These are just some of the ideas that “made it”. Many others didn’t, and for some reason were dropped along the way. Surely many of those were great ideas as well, full of potential. Why didn’t they make it? Can a great idea succeed by itself? Certainly not.

Look, for example, at the “Sunray Sedan”, a solar-powered car, announced in the Chicago Tribune as being *“closer than we think”*. The article quoted James Zeder, Chrysler Vice-President: *“we know how to get electrical energy from sunlight by means of silicon converters... if we continue to increase the efficiency of these converters, and if we are able to develop small, efficient energy storage cells, solar powered cars will be feasible”*. That was 1958, and the **scientific knowledge** was there. But that’s not enough.

Efficient technology has to be available, to convert the possibility into current use. What if that technology is available? In a famous vintage postcard from 1911, picturing future New York, “The City of Skyscrapers”, urban skies are teeming with activity, as planes seem to ferry urban dwellers around, the new transport in town. The technology was there. But that’s not enough.

Entrepreneurs have to come up with a promising **business model**, that can attract capital to launch and sustain its development, and **effective marketing strategies**, that can make new offerings appealing to customers. Like the Winton Motor Company did in an 1896 advertisement for the Winton Horseless Carriage⁷: *“Dispense with a horse, and save the expense, care and anxiety of keeping. To run a motor carriage costs about ½ cent a mile”*. But that’s not enough.

Scaling up is a big challenge, and for that to happen, customers have to be able to afford it. Ask Henry Ford, who proclaimed⁸, *“I will build a car for the great multitude.”* In October 1908 he did so, offering the Model T for \$850. This price kept dropping in the following years, and during its 19 years of production, the Model T sold more than 15 million units in the United States alone. This was a sharp turn in the history of the car, since it was a very expensive product, manufactured for higher classes. To help this process even more, Ford facilitated the purchase of his vehicles by his own employees. But that’s not enough.

⁶ <https://www.newspapers.com/clip/38556227/the-boston-globe/>

⁷ <https://clevelandhistorical.org/files/show/2303>

⁸ Library of Congress, <https://www.loc.gov/item/today-in-history/july-30/>

Can government authorize this new product or service? How is it to be **regulated**? There are several legitimate questions that public authorities (national, regional, or local) must ask when considering the introduction of new vehicles or transport services. For example, is it safe for the user? Is it safe for the other users of the public right of way? Who's liable in case damage occurs? How will this new business impact the existing market and the jobs and businesses this market currently sustains? What legitimate rights and expectations have to be respected? These and many other questions have to be addressed and regulated for the business to have a stable context to survive and thrive. And this is definitely not a straightforward process: it's often mired by ethical dilemmas – just look at the introduction of the private car in cities, and the dramatic effect it had on the safety of pedestrians, especially children⁹. But anyway, that's not enough.

Transport requires **infrastructure** – roads and rails, ports and airports, and digital infrastructure as well. Somebody has to finance, plan, build and maintain that infrastructure. Without massive public investments in roads and motorways, traffic signs and traffic police, the automotive industry wouldn't have gone far, literally. Manufacturing and selling cars, car parts and car insurance became a lucrative business because its paying customers had somewhere to drive their cars.

So, looking back at the future, what we can clearly see is that, beyond all the hype, transport innovation isn't just about having an idea nobody ever heard before, or coming up with technology that doesn't exist yet. On the contrary, it's about picking up a technology that already exists, devising a business model that can use it to generate profit, scaling it up, regulating it with the public good in mind, and ensuring the infrastructure on which it runs is there.

For positive transport innovation to succeed, public and private stakeholders have to cooperate, and it's important to highlight that the public sector isn't just 'sitting' at the end of this process: its contribution to scientific advancement and technological development, among other things, has been fundamental¹⁰. Strategic clarity, and constructive dialogue, are key.

⁹ "Fighting Traffic: the dawn of the motor age in the American City", Peter D. Norton, MIT Press (2011).

¹⁰ "The Entrepreneurial State: Debunking Public vs. Private Sector Myths", Mariana Mazzucato, Penguin (2018)

3. The Challenge of Urban Mobility

“You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete.”

Buckminster Fuller (1895-1983)

What’s there to cooperate about? Life, no less. Every day, **urban mobility systems** (infrastructure and vehicles, services using that infrastructure, and public and private organizations regulating, overseeing, and operating those services) enable millions of residents in the European Union to reach their homes, jobs, schools, hospitals, shops, parks, museums, hotels, and much more.

Urban transport networks are the stage where the choreography of daily routines takes place, including the first and last miles of countless passenger and freight trips that go well beyond City limits. As the Trans European Network for Transport¹¹ emerges and consolidates, connecting several **urban nodes** across the Union, the performance of each of these nodes will become more and more important for the performance of the whole network.

It’s therefore critical to improve urban mobility systems¹² – because European mobility is, mainly, **urban**: at least 70% of the Union’s population lives in urban areas, and passenger and freight trips starting or ending in urban areas account for an overwhelming majority of all movements. Urban mobility is also at the **crossroads of key policies**, like energy, air quality, health, economic recovery and social inclusion. Sustainable mobility is an indispensable for Sustainability policies.

Because of the central role mobility plays in urban life, policy changes and measures at the local level (from congestion charging to pop-up bike lanes) easily gain public attention and often generate and fuel intense debates. Policy change in the **urban arena** can be complex and protracted – but it can also be fast, audacious, and inspiring.

¹¹ The Trans-European Transport Network (TEN-T) policy addresses the implementation and development of a Europe-wide network of railway lines, roads, inland waterways, maritime shipping routes, ports, airports, and railroad terminals. The ultimate objective is to close gaps, remove bottlenecks and technical barriers, as well as to strengthen social, economic, and territorial cohesion in the EU. Find out more here: https://ec.europa.eu/transport/themes/infrastructure/ten-t_en

¹² Of course, rural mobility is also important – it is not covered in greater depth in this Report only because we opted to focus mainly on urban mobility. Beyond urban areas, there is also a mobility gap to tackle in rural areas, where much lower densities and larger distances discourage many from dropping car ownership and adopting more environmentally friendly modes. This challenge may grow with an “exodus” to the countryside fostered by the rise of teleworking.

Changes in urban mobility systems are highly visible, and their advances, or delays, are taken by most Europeans as a true measure on the commitment of the State, including all its levels of governance, and on the **capacity of democratic leadership to deliver**. This assessment subsequently has a direct impact on the behaviour change of citizens themselves.

Cities hold the keys for critical changes – but how can they use these keys in the best way? Political courage to make the necessary decisions, and political commitment to follow-through on those decisions, are definitely important ingredients. But they are not very useful in the absence of clear goals and an effective strategy.

Of course, few organizations (both in the public and private sector) will admit to not knowing what they want and how they're going to get it. But in reality, it's difficult to break free from the 'gravity pull' of everyday traffic management, and to think of, and plan for, a different, better, reality.

Those who don't have a strategy usually complain of a lack of **opportunities**, and avoid changes to the status quo. On the other hand, those do know where they want to get, and how, are able to see the opportunities that others fail to notice, and are drawn to (at least) consider the potential in what others treat as a threat. This is especially the case with transport innovations.

Most innovations in transport are taking place in urban areas. This is mainly because the deployment of new mobility services is naturally oriented towards areas of greater economic potential, where more people and jobs are located.

The way these innovations are changing urban mobility raises key challenges for Europe. New mobility services often take advantage of **regulatory gaps**, grow very fast when fuelled by venture capital, are owned by international corporations, and run operations that raise new issues for which there are few or no regulations or precedents, and for which the public sector, at all levels, has a very limited capacity to understand, monitor and enforce.

The fast rise of this "brave new world" of transport offers opportunities, but also risks – and they will be played out, first and foremost, at the **local level**.

For example, **digitalization** has accelerated the trends towards a **sharing economy**, which is bound to play an essential role in the future of urban transport. Car/bike/scooter/e-scooter sharing, ride hailing, demand-responsive transport, along with other flexible and shared modes, are increasing their presence in our urban landscape. Their usage is bound to grow, and slowly replace individual vehicles, reducing congestion and freeing up precious public space that today is still monopolized by parking for private cars.

On the other hand, the rapid growth of **e-commerce** is revolutionizing the entire supply chain (transport organization, warehouse management, deliveries in the city, etc.) and raising customer expectations on the speed and flexibility of deliveries. These "logistics of whim" create a very

pressing demand for an optimization of urban logistics, and encourage disruption from new business models as well as new technologies that are likely to reach market readiness over the next 10 years (including drones and autonomous ground vehicles).

The fact is, the arrival in the transport sector of new actors from different sectors (information technologies, media, automotive industry, venture capital, etc.) is generating new **mobility products with an added value that many policy makers want to harness**.

“Harness”, yes, but to pull what plough? That’s the strategic question.

A key step in strategy design is choosing the solid, reliable assets that are to be kept as a foundation, on which to build anew. That’s what progress is about. Otherwise, and paraphrasing Tomasi di Lampedusa (1896-1957), if everything changes, everything will stay the same.

So what’s the foundation that we must build on, and protect from erosion?

In urban democracies, **public transport** is a fundamental infrastructure through which the state ensures the human right to freedom of movement. It remains the backbone of urban mobility systems, and the best available tool to accelerate the shift to sustainable urban mobility.

What if we move from looking at public transport as a ‘collection’ of bus, tram, and train services (to put it simply), to redefining it as a **portfolio of integrated transport options that serve public goals**?

That’s a critical step for growing the offer of sustainable mobility. If everybody switched overnight to commuting in public transport, the capacity probably wouldn’t be there. We must grow capacity, and public investment in public transport infrastructure is, of course, indispensable. But it has limits – both in size, speed and impact. Improving efficiency is also indispensable, and much can be done, from redesigning networks and implementing bus lanes to improving bus stops for faster boarding and alighting. But that path can only go so far, as well.

Mass public transport is an “urban right” but serving low demand with large empty vehicles may be an urban wrong. Mass transit has been planned and operated to serve **mass transit corridors**, which connect areas with “masses of people” commuting to areas with “masses of jobs” where they work. But life doesn’t take place in a uniform place and time:

- What about people whose trip origin or destination lies outside of these corridors? How do they get there? How can they reach mass transit? Or, to put it another way, how can the public service reach them?
- What about people who do not commute to those jobs, or whose life takes place between these corridors, or fully within one of its nodes, or even those who commute “across” corridors, and not radially towards the urban centre?
- And what about people who start the commute very early, or end it very late, e.g., working as security guards, cleaning office buildings, cooking in restaurants, filling up supermarket

shelves – or simply leave the office late? Are they well served by bus nightlines, with lower frequencies and usage?

Serving low density areas, off peak hours, and non-massive demands, creates efficiency and economic **problems for both operators and users**. In many areas it also creates security problems, especially affecting women, subject to systematic sexual harassment.

A 60-seat bus running almost empty of a fixed line with one-hour intervals often isn't the best way to serve these demands. They require **tailored solutions** – or, better still, solutions that can easily adapt to each user's needs, providing reliable, safe, and affordable options to passengers, and at the same time complementing public transport, and helping it fulfil its mission in a way that is financially and environmentally sustainable.

Developing these tailored solutions isn't a 'minor detail' regarding the big shift we need to accelerate towards sustainable urban mobility. They have a central role to play in nudging current private car users to adopt more sustainable travel behaviours.

A growing number of new solutions have been emerging from the private sector – new mobility services, but also new tools that can make public private partnerships work. **They can help, but** we often see them deployed not where they could make the better difference – lower density suburbia – but instead where they're expected to make more money, and faster – the city centre.

There's room – and much need – for innovation here. How can we benefit from it? Harnessing the power of private initiative in urban mobility requires **an integrated governance approach**.



4. The COVID Stress Test

“Insanity is doing the same thing over and over again but expecting different results.”

Rita Mae Brown¹³ (1944 -)

Learning must be acknowledged as central component of the policy development process. A lot has been said and discussed about what has been happening since countries and cities started locking down to deal with the COVID-19 pandemics. It was certainly an atypical situation, from which we should be careful to extract indications for the future.

But if we look at it as a stress test¹⁴ of our urban mobility systems, we can clearly see some very useful lessons for the future:

- **Local and regional authorities stepped forward into the front lines** to deal with the health crisis, which was tackled in hospitals, but also in streets and plazas, buses and trams, trains and subways. As the pandemic put our societies and economies under pressure, cities and regions kept things moving, supporting essential workers, local deliveries, and several public and private services.
- There was **intense cooperation between cities and regions** from different countries, without any mediation from national governments, building on the strong bonds created through years of European cooperation and networking. Peer communication and support fostered the quick transfer of good practice.
- While several private actors in the transport sector went broke or ‘closed shop’, **public transport kept going**, often incurring huge operational losses, to ensure urban mobility. Like national banks protect economies in times of acute economic recession, public transport was what was left standing, and what all could depend upon.
- Public transport was, and remained, the **mobility lifeline** for many often forgotten professionals deemed “essential workers” during the crisis: nurses tending to thousands of

¹³ Please note the origin of this quote is disputed. Rita Mae Brown did include it in her book “Sudden Death” (Bantam Books, New York, 1983), but it appears she was paraphrasing a quote already written elsewhere.

¹⁴ Stress testing is a form of deliberately intense or thorough testing used to determine the stability of a given system, critical infrastructure, or entity. It involves testing beyond normal operational capacity, often to a breaking point, in order to observe the results.

patients, and many others, cleaning buildings and vehicles, filling supermarket shelves, and keeping supply chains moving. They are essential every day and will remain essential for the next crises (and most will not be teleworking).

- With biological ecosystems and gene pools, **diversification breeds resilience**. The same applies to urban mobility systems. Creating conditions for safely and comfortably walking, cycling, or using shared micromobility, became top of the agenda for many large cities to reduce the pressure on public transport, make lockdowns bearable, and help local economies bounce back.
- Air pollution, especially including emissions from transport, **worsened the impact** of the health crisis. It made people even more vulnerable, but also even more aware of the importance of radically cutting emissions. That awareness now expects follow-up in terms of public policies and measures.
- Empty streets, with smaller volumes of motorized traffic, encouraged speeding, and led to deadlier crashes. The safety of an infrastructure cannot vary with fluctuations in its use. What happened means that **many road and street networks are intrinsically unsafe**, because of structural characteristics that encourage speeding. Traffic calming must be deployed *en masse*.
- As health measures are eased, the progressive return to previous unsustainable mobility patterns, from lockdown back to gridlock, shows urban mobility needs **systemic change** – one can't expect the same system to produce different results.
- Public authorities can achieve massive and fast **behaviour change in European democracies**. People need a compelling reason, public leadership, and well founded, purposeful regulations. Innovation, fast-tracking of new measures, acceleration of change, agility – all these are possible in the public sector too.
- As ridership numbers dropped, and only slowly recover, alleged **'fear of public transport'** has been a hot topic for many discussions. Does this fear exist, and is it driving people away from buses and subways? It's a fact that ridership numbers are low, but establishing its cause is quite something else. Allegations are rarely (if ever) substantiated by hard evidence collected through surveys or focus groups. The rise of unemployment, furloughs and teleworking provide an easier and more direct explanation, and actually beg for a much more relevant discussion about deep changes ahead in the job market (e.g., teleworking, platform microtasks, etc.) and their cascading implications for real estate, land use, and urban mobility, especially commuting, deliveries... and public transport.

5. What to expect

“I’m more interested in the future than in the past, because the future is where I intend to live.”

Albert Einstein (1879 – 1955)

A strategic approach must address the future, something that will be brought by unknown events, shaped by existing trends and, hopefully, influenced by the strategy. As for urban mobility, it’s possible to base this assessment on some trends already visible – some of which were accelerated by the health crisis. Among many, we’d outline here the following:

5.1 Climate crisis

The climate crisis has advanced over some no-return points, and whatever the progress we are able to achieve in terms of sustainability, some aggravated consequences are to be expected¹⁵. The transport system must be prepared for them – not only for events in themselves, e.g., acute weather phenomena, but also for the systemic consequences these may have. Climate change may trigger economic instability and social unrest, and those won’t make governing easier.

Cities will be at the front line, both in terms of social impact, but also for action. Ensuring mobility services may become a challenge, especially because of disruptive climate events, economic instability and social unrest. We need to mobilize new players, and make sure they operate in a framework that serves the public interest and needs, and that makes multimodality bring added resilience to urban mobility systems.

5.2 Economic recession

The COVID-19 health crisis may trigger a long-term economic recession. So far, responding to this crisis, and mitigating its social effects, has been achieved at the cost of rising public debt, which may further increase volatility. Unemployment is rising and disposable income for many families will plummet.

¹⁵ “Climate Change 2021: the Physical Science Basis”, Summary for Policymakers, Intergovernmental Panel on Climate Change, 2021 (available here: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf)

Work opportunities found in digital platforms will not provide the same pay nor the same stability, leading to growing turnover on both ends of the urban commute, as people more frequently change their job and their place of residence. Urban populations will need an urban mobility system that is capable of providing them with affordable mobility options and with flexible new combinations. A monomodal system where private cars continue to take precedence will not serve these needs.

5.3 Europe of Cities and Regions

The rise of the TEN-T network will increase the importance of its urban nodes as drivers of economic growth and European cohesion. The transport quality, safety and sustainability provided to those moving inside each of these nodes will be seen as a mark of European progress, or lack of it.

Cities and regions are becoming the ‘battleground’ for transport innovation. Because they are being challenged by innovations “landing on their doorstep”, but also because they are cooperating ever more intensely with each other to deal with common challenges, develop new European solutions in bottom-up processes. Cooperation between cities and regions for urban mobility will further consolidate economic, cultural, and political integration of the Union, and question current governance models.

5.4 The Digital Exodus

E-commerce and teleworking were already growing significantly before the crisis, but the lockdowns imposed during the health crisis accelerated their growth even more. In the US, for example, online retailing grew by 44% during the pandemic in 2020¹⁶, and now makes up for 21.3% of all retail sales and may have permanently reset consumer habits.

There are immediate consequences for cities: “delivering — literally and figuratively — on the success of the online shopping business model relies on a failing transportation model, with home delivery turning public streets into pop-up parking lots, loading zones and distribution facilities for e-commerce businesses.”¹⁷

But there will be deeper long-term consequences as well: this will also accelerate changes in urban retail and office routines, as well as in the movement patterns of people and goods they generate and sustain. These are structural changes – we may not be able to guess the change rate, but they seem very strong, and will fuel a plethora of other changes: the growth of deliveries

¹⁶ <https://www.digitalcommerce360.com/article/us-ecommerce-sales/>

¹⁷ Quoting Janette Sadik-Kahn, <https://www.bloomberg.com/news/articles/2021-06-17/a-fix-for-cities-drowning-in-delivery-vans>

across urban areas, the decrease in parking needs in city centres, and with all these, the need to repurpose and reallocate space in the urban right-of-way.

5.5 Powerful tech players

As public transport operators sustained losses to keep on serving the public interest, and as the automotive sector struggled to stay afloat, large amounts of revenue were flowing to key players from the tech sector. Their businesses grew with the health crisis, and promises of future growth attract even more capital. These powerful tech companies are investing in urban mobility, e.g., in autonomous vehicles¹⁸, and available capital will provide them with a strong hand in the future of transport and related critical domains (e.g., communications).

Innovations will arrive faster, address wider scopes, and will attain dominant positions earlier. These are not high-flying concerns beyond the scope of local and regional governments, quite the contrary. Deployment and growth of these services (from robotaxis to delivery drones, and more) requires figuring out several operational details necessary for operating in city streets – regarding circulation, pick up and drop off of passengers, where to wait for the next trip, etc. There are essential issues to be dealt with – e.g., around kerb management – and cities will have a key role to play.

5.6 The Big Deal

With the Green Deal and the Recovery & Resilience Facility, the European Commission stepped forward and showed that the Union is “alive and kicking”. It also raised the ante, and now must deliver on its ambitions. The recent release of “Fit for 55” shows that seems to be the case. These regulatory and funding policies will have a deep influence on the transport sector and effectively reshape the market, determining what several transport stakeholders can manufacture and operate – from cars and buses to maritime and air travel.

Political commitment is clearly moving away from *laissez faire*, and into setting bars high, and tightening time frames. There are, of course, open questions: how fast, how far, and how well, will each individual Member State follow on these ambitions? How much will local and regional governments be empowered to deliver?

5.7 Citizens are changing too

People are shifting to sustainable mobility; this trend was also accelerated by the health crisis. The shift has several underlying causes, environmental conscience being one of them, but not the

¹⁸ See, for example, see Google’s parent company, Alphabet, investing in Waymo, and Amazon investing in Zoox.

only, and not necessarily the leading one. Shared electric bikes and e-scooters have given many a taste of cycling, along the way making the issue of inclined streets irrelevant, and renewed bus fleets are a clear sign of progress in public transport.

Those who are shifting to sustainable transport choices often have to brave menacing roadways on their bikes and endure poor sidewalks and run-down bus stops. Many do this because they have to – either because their disposable income is going down, or because it isn't going up. Or simply because of the general attitudes of the generation they belong to: research¹⁹ confirms “the existence of generational gaps in the attitudes toward mobility options”, and indicates “these attitudinal disparities are likely to persist and remain at significant magnitudes, reflecting the unique views and values of the Millennials”, particularly the preferences for transit and alternative modes and less reliance on private vehicles, which are “more of a reflection of their preferences in lifestyle choices and not so much constrained by their socioeconomic status as the previous generation”.

5.8 Urgency, Inertia and Leadership

The shift to sustainable urban mobility is happening and will keep on growing with or without the support of public authorities. This shift is happening much slower than we need, but it could be made to go faster. So, the real strategic question is: will public authorities and the private sector capitalize on this momentum and lock in change?

The urgency of tackling the climate crisis, air pollution, road safety and traffic congestion has consistently been underestimated in public policy for transport. Public commitments have rarely been matched in ambition and determination by policy change. Legitimate concerns for a just transition have often been used to argue for delays, not to design and deploy fair transition measures.

Proactive leadership is needed to unlock these situations, otherwise the immobility of the many sustains the immobility of all – if one waits for others to move first, nobody moves. We can see at the urban level how some cities (like Paris, Barcelona, Brussels, and more) are encouraging many others to step ahead.

The good measure for designing national and European policies at this critical moment should not be taken from those who stand behind, but from the dynamism of those who are stepping forward.

¹⁹ Rahimi, Alireza; Azimi, Ghazaleh; Jin, Xia (2020): “Investigating generational disparities in attitudes toward automated vehicles and other mobility options”, *Transportation Research Part C: Emerging Technologies*, Volume 121, December 2020 (<https://www.sciencedirect.com/science/article/abs/pii/S0968090X20307403>)

5.9 A Monopoly that distorts competition and blocks innovation

When shared micromobility arrived, and thousands of dockless e-scooters started floating in several cities, public outcry followed, revolted with the fact that they were being run on the sidewalks and strewn all over the place. This primary reaction deserves a careful second look, because a good reason for users to ride on the sidewalk was fear of using a carriageway where 1-ton motorized vehicles reign supreme; and a good reason for their parking being chaotic, is the lack of dedicated spaces for proper parking, since space is usually dedicated to private cars.

These problems were not exclusive to e-scooters – people walking, and cycling are also especially vulnerable when crossing or rolling along the carriageway, and lack of parking affects not only bikes, but also logistics. Over the past century, we've created a monomodal infrastructure, designed and managed for private cars, and over which private cars hold a monopoly. This monopoly – like any monopoly – distorts competition, and blocks, or at least seriously constrains, innovation.

If this happened with e-scooters, what is going to happen with the next innovations? We need a multimodal infrastructure, planned, designed, and managed with a multimodal mindset. This won't be solved by electric private cars, and technological innovation will not exempt us from making the tough, necessary choices – including reallocation of space in the public right of way. Furthermore, massive investments in car marketing over the past decades have effectively moulded contemporary culture and attitudes about not only the cars, but mobility itself, distorting discussions and often triggering emotional responses when public policy reduces the number of parking places or traffic lanes, or imposes lower speed limits. Things seem to be changing, but slowly.

5.10 Capacity Gap

Today's urban mobility innovations involve fast-paced developments in digital technology. Collecting, sharing, managing, and analysing data, for monitoring performance, obtaining strategic insights, and developing regulations (as well as enforcing them) is becoming more and more important for local and regional authorities. Regulating and supervising new urban mobility services is, thus, placing a growing volume of requests for digital technology-related tasks, for which many local public authorities aren't yet equipped with the proper training and experience, the necessary software and hardware, the necessary operational procedures to ensure respect for legitimate concerns (e.g., data privacy and confidentiality of commercially sensitive data) and the strategic purpose and guidance (e.g., to know what to prioritize, and what to work for).

Naturally, there is a capacity gap between private shared mobility operators, for whom digital technology is the core business, and public authorities, namely regional and public authorities²⁰. We must understand this gap has a structural nature and should be expected, as it flows from the core mission of these entities. We must also be aware that this capacity gap is bound to grow.

This is a problem for public authorities (obviously), but also for emerging new urban mobility services, because to survive and thrive, these businesses need the understanding and the trust of public authorities. It's difficult to build a stable and supportive relationship when the difference in goals between public and private players is compounded by a stark asymmetry in know-how, which further fosters defensive postures, more inclined to reactive and restrictive approaches, rather than a proactive posture, able to generate win-win solutions and reap strategic benefits.

²⁰ See, for example, the POLIS survey report on “Sharing Data for Shared Micromobility” (2021) (available here: https://www.polisnetwork.eu/wp-content/uploads/2021/01/SHARING-DATA-FROM-SHARED-MICROMOBILITY_FINAL.pdf)

Part II – What (and who) are we dealing with

6. Brave New World

“HIC SVNT DRACONES”
Hunt-Lenox Globe (1504)²¹

“Here be Dragons”. This expression was used in the Hunt-Lenox Globe to indicate dangerous or unexplored territories, in imitation of a medieval practice of putting illustrations of dragons, sea monsters and other mythological creatures on uncharted areas of maps where potential dangers were thought to exist.

These “dragons” menaced the bold, but stayed away in distant lands, meaning little for more circumspect entrepreneurs, who carefully kept themselves to known lands and reliable trades. This is not the case anymore: disruptive innovations don’t ‘stay away’, and those who’d prefer to just stick to ‘business as usual’ are forced to deal with change.

Not an easy dealing – as a poet from the XVI century²² wrote, “even change has changed”. That has definitely been the case with several disruptive innovations in urban mobility: they come fast, grow fast, and quickly become unavoidable.

This brings added challenges to policy makers, especially considering that those with the most power to decide don’t necessarily have all the knowledge that one would consider indispensable, nor the opportunity to consider the issues at hand with the necessary depth or context. The use of technical jargon may aggravate this, discouraging some from asking fundamental questions, and enabling others to disguise lack of understanding.

So let’s look underneath the jargon, to better understand some key concepts that may seem too obvious, or too distant, like innovation, disruptive innovation, platform and sharing economy, business models and market readiness, positioning and maturity.

6.1 Innovation

An innovation is **an idea, practice, or object that is perceived as new** by an individual or other unit of adoption. It matters little, so far as human behaviour is concerned, whether or not an idea

²¹ In Latin, means "Here be dragons".

²² Luís Vaz de Camões (1525-1580)

is ‘objectively’ new as measured by the lapse of time since its first use or discovery. The perceived ‘newness’ of the idea for the individual determines his or her reaction to it – if an idea seems new to an individual, it is an innovation.²³

Innovation may hold much promise for urban mobility and the future of cities, but when we discuss innovation, three things must be clear.

- *First*, innovation isn’t only about new technology or advanced gadgetry, it can be also about new ideas and principles, new value hierarchies and priorities, and new strategies and low-tech solutions that common practice ignores or discards – for example, reallocating public space and prioritizing walking, cycling and public transport in car-centric urban areas.
- *Second*, that the process of innovation goes beyond ‘inventing’, it is also the dissemination of the new idea, and its adoption by a growing number. The diffusion of innovations is, essentially, a social process²⁴, made up of individual choices to adopt an innovation, which are guided by more than a rational appraisal of its benefits.
- *Third*, that innovation isn’t necessarily good, or only good – it may bring benefits, but it may also bring negative impacts, both direct and indirect, many of them not being apparent from the start.

6.2 Disruptive Innovation

The commonly accepted definition of disruptive innovation is the definition from Clayton Christensen, according to which disruptive innovation is: “a **process** by which a product or service initially takes root in simple applications at the bottom of a market—typically by being less expensive and more accessible—and then relentlessly moves upmarket, eventually displacing established competitors”.²⁵

Use of this concept is growing, although not always for the right reasons. There are three elements for a business innovation to qualify as disruptive:

- *First*, there must be an enabling technology, an invention that makes a product more affordable and accessible to a wider population (e.g., the smartphones, or the internet);
- *Second*, there must be an innovative business model which targets non-consumers, new customers who previously did not buy a product, did not use a service in a given market or were the least profitable customers;
- *Third*, there must be a coherent value network, in which suppliers, partners, distributors, and customers are each better off when the disruptive technology prospers.

²³ “Diffusion of Innovations”, Everett M. Rogers, The Free Press (2003).

²⁴ Idem.

²⁵ Harvard business institute, what is disruptive innovation?

To better understand this concept, it's helpful to clarify what disruptive innovations are not²⁶: new technologies that make good products better²⁷. For example, according to this definition, the first car developed by Carl Benz in 1886 does not qualify as a disruptive innovation, because the vehicle was targeting exclusive consumers, a training was required to learn how to use it, and it included high-end features. On the other hand, the Ford model T from 1908 is considered disruptive, because it was affordable, easy to use and included only basic features.

6.3 Platform Economy

The platform economy is economic and social activity facilitated by platforms. Such platforms are typically online sales or technology frameworks, digital infrastructure that enables interactions between two or more groups, positioning themselves as intermediaries between different users, and even as the place where their activities take place. By far the most common type are "transaction platforms", also known as "digital matchmakers", like Amazon, Airbnb, Uber, and Baidu.

It's important to point out, first, that this 'marketplace' approach (the operation of the platform as a 'matchmaker' of buyers and sellers), enables platforms to externalize various costs, namely labour costs (providers are 'entrepreneurs', who have to support their own social benefits), operational costs ('entrepreneurs' only get paid for worked time, thus assuming the cost of their 'down time'), and even capital costs (ride-hailing 'entrepreneurs' have to purchase vehicle, delivery 'entrepreneurs' have to buy their branded uniform and pizza-bag, etc.). This enables platforms to offer much lower prices, but also to cut their losses (during the recent pandemic lockdowns, ride-hailing revenues may have suffered steep drops, but it was the 'entrepreneurs' who had to keep paying the bank loans on their vehicles).

Another important aspect of these platforms is that they produce and rely on the network effect: the more users a platform has, the more valuable that platform looks for other potential users, with the reverse also being true. Fast growth is of the essence, and that's why "growth before profit" has been a strategic mantra for many of these platforms, both for their managers and for their investors, willing to incur losses during many years (e.g., Amazon, who did not turn a profit in its first decade), as long as the numbers – of the different types of users, and their transactions – keep growing.

It can be argued that this externalization of costs and the rush for the network effect, compounded with the willingness to incur losses, encourages dumping (i.e., "impossibly" low prices) and pushes other types of companies off the market, creating an inherent tendency of these platforms for monopolization.²⁸

²⁶ Harvard business school online, 4 keys to understanding Clayton Christensen's theory of disruptive innovation, Chris Larson.

²⁷ Disruptive innovations, Clayton Christensen institute.

²⁸ Nick Srnicek, "Capitalisme de Plateforme : l'hégémonie de l'économie numérique" (2018), Lux Éditeur

6.4 Sharing Economy

A sharing economy is an economic system based on people sharing possessions and services, either for free or for payment, usually using the Internet (more often a platform) to organize it.²⁹ This is made possible by the technological advancement of the Internet, combined with the democratization of the use and ownership of smartphones.

The interconnection between sharing and platforms is so strong that the European Commission (EC) actually uses the term “collaborative economy” and defines it as “business models where activities are facilitated by collaborative platforms that create an open marketplace for the temporary usage of goods or services often provided by private individuals”.³⁰

These global trends lead to regulatory challenges. According to the platforms themselves, these only offer matchmaking services, whereas, according to some authors, they act as a classic employer (‘platform paradox’³¹). In the logic of this platform paradox the platforms are not doing a passive matchmaking, but instead rely on rating systems and algorithmic control to ensure that each aspect of the worker’s task is completed in compliance with company policy and customer instructions. This paradox plays a crucial role for purposes of EU law and the most relevant example is the Case C-434/15 *Asociación Profesional Elite Taxi v Uber Systems Spain SL*.³²

6.5 Business model

Transport organizations need to develop a sustainable business model in order to survive in today’s competitive environment. The term “business model” refers to a company’s plan for making a profit. It identifies the products or services the business plans to sell, its identified target market, and any anticipated expenses.

It articulates the logic, the data, and other evidence that support a value proposition for the customer, and a viable structure of revenues and costs for the enterprise delivering that value. It’s about the benefit the enterprise will deliver to customers, how it will organize to do so, and how it will capture a portion of the value that it delivers.³³

²⁹ Cambridge Dictionary, Sharing economy.

³⁰ Communication from the European Commission, a European Agenda for the Collaborative economy.

³¹ European Confederation of Trade Union, Collective voice in the platform economy: challenges, opportunities, solutions.

³² Case C-434/15 *Asociación Profesional Elite Taxi v Uber Systems Spain SL*. In the frame of this judgement, Uber, a strong example of platform and collaborative economy, suggested that its platform was an ‘information society service’ so the rules of the EU’s electronic commerce directive were to be applied. The European Court of Justice (ECJ) disagreed with the suggested reasoning, given the tight control exercised by Uber over drivers. The company offers more than an intermediation service and offers also urban transport services via its platform.

³³ Teece (2010), Business models, business strategy and innovation.

A business model can be described through multiple elements that show the logic of how an organization intends to make money, which is known as business model canvas³⁴, a strategic management tool for developing new or verifying existing business models.

The business model canvas uses nine **building blocks**³⁵:

- Customer segments – the different groups of people or organizations an enterprise aims to reach and serve);
- Value propositions – the bundle of products and services that create value for a specific customer segment;
- Channels – how a company communicates with and reaches its customer segments to deliver a value proposition;
- Customer relationships – the types of relationships a company establishes with specific customer segments;
- Revenue streams – the cash a company generates from each customer segment (costs must be subtracted from revenues to create earnings);
- Key resources – the most important assets required to make a business model work;
- Key activities – the most important things a company must do to make its business model work;
- Key partnerships – the network of suppliers and partners that make the business model work;
- Cost structure – all costs incurred to operate a business model.

Research done by the GECKO project used this model to analyse several business cases. Results of this comprehensive research can be studied in Deliverable 1.4, “Final Update of New Mobility Services and Business Models”.

6.6 Market readiness

The definition of market readiness is not unique, and there is no scientific consensus on it. NASA first used it in the 1980's³⁶, albeit with a mainly technological approach, with Technology Readiness Levels (TRLs), a systematic metric/measurement system that supports assessment of the maturity between different types of technology³⁷.

Market Readiness Levels assume a complementary role to TRLs. The purpose of achieving ‘market readiness’ is to develop a commercial offering for a group of customers. This concept can be also applied to developing a service offering for a group of users or stakeholders.

³⁴ Osterwalder and Pigneur (2010), Business Model Generation: A handbook for visionaries, game changers and challengers.

³⁵ Hossain (2014) Business Development Model of Canvas: The 9 Building Block Approach

³⁶ Sadin, Povinelli, Rosen, 1989

³⁷ J. C. Mankins, Technology Readiness Levels, a White paper

Market readiness levels (MRLs) feature four business process-oriented phases, from Ideation to scaling business to a sustainable – and resilient – commercial operation³⁸. For a full overview, here’s the **Market Readiness Scale**:

0	Perception of a need	IDEATION	
1	Basic research		Need is described, no evidence
2	Needs formulation		Articulation of needs based on customer/user stories
3	Needs validation		Initial stakeholder interest on the product
4	Small scale stakeholder campaign	TESTING	Campaign with stakeholders (friendly, usual customers, business partners, etc.)
5	Large scale early adopter campaign		Campaign with early adopters (target groups, intended customers)
6	Proof of traction	TRACTION	Paying customers
7	Proof of satisfaction		Positive feedbacks from paying customers
8	Proof of scalability	SCALING	Stable pipeline and strong understanding of the market, solid revenue projections
9	Proof of stability		KPIs matched and predictable growth

6.7 Market positioning

Innovative mobility services must identify the market position in which they plan to operate. There are different models to describe market positioning. Steven G. Blank³⁹ describes four different types of market positioning, with the second and third types being a subset of the first. Each of these four types has its own characteristics and implications:

- **Existing market**

The users, the market and the competitors are known. One competes on product features and performance.

- **Re-segmentation of an existing market as a low-cost player**

This approach is based on a belief that a “large enough” market segment will start using a product that may be inferior in terms of features but “good enough” to solve the problem as long as the price is low enough. If such conditions exist and you can be profitable under such

³⁸ Adapted from CloudWATCH2 - H2020

³⁹ “The Four Steps to the Epiphany”, S. G. Blank. Self-published: Cafepress.com (2005)

circumstances, the strategy is viable. The emergence of low-cost airlines exemplifies such a strategy.

- **Re-segmentation of an existing market by employing a niche strategy**

This strategy is viable if you can identify a part of the market which can be captured through a more focused solution than anything currently available. The idea is that a more focused solution will provide higher value to a particular market niche than any of the existing alternatives. The challenge is to demonstrate enough value to motivate a sufficient number of customers to abandon existing market relationships.

- **New market**

Pursued if your product enables a large number of customers to do something they were unable to do before you came along. In a new market, customers and their preferences are unknown and direct competitors are non-existent. In the absence of competition, product features take on less importance; identifying customers and making them believe in your vision are the name of the game. This is more time-consuming than if you were in an existing market, which puts extra emphasis on managing cash flow.

6.8 Market maturity

While market readiness research analyses the level of readiness for a product/service to be introduced in the marketplace, the market maturity analysis, describes the different stages of life of a marketplace.

As written by Theodore Levitt⁴⁰ in 1965, the product life cycle has 4 very clearly defined stages, each with its own characteristics that mean different things for business that are trying to manage the life cycle of their particular products:

- **Introduction/ Development Stage**

This stage of the cycle could be the most expensive for a company launching a new product. The size of the market for the product is small, which means sales are low, although they will be increasing. On the other hand, the cost of things like research and development, consumer testing, and the marketing needed to launch the product can be very high, especially if it's a competitive sector.

- **Growth Stage**

The growth stage is typically characterized by a strong growth in sales and profits, and because the company can start to benefit from economies of scale in production, the profit margins, as well as the overall amount of profit, will increase. This makes it possible for

⁴⁰ "Exploit the Product Life Cycle", Theodore Levitt, Harvard Business Review (1965). Available here: <https://hbr.org/1965/11/exploit-the-product-life-cycle>

businesses to invest more money in the promotional activity to maximize the potential of this growth stage.

- **Maturity Stage**

During the maturity stage, the product is established and the aim for the manufacturer is now to maintain the market share they have built up. This is probably the most competitive time for most products, and businesses need to invest wisely in any marketing they undertake. They also need to consider any product modifications or improvements to the production process which might give them a competitive advantage.

- **Decline Stage**

Eventually, the market for a product will start to shrink, and this is what's known as the decline stage. This shrinkage could be due to the market becoming saturated (i.e., all the customers who will buy the product have already purchased it), or because the consumers are switching to a different type of product. While this decline may be inevitable, it may still be possible for companies to make some profit by switching to less-expensive production methods and cheaper markets.



7. What we looked at

The GECKO project conducted extensive research on the disruptive transport innovations, analysing the technology that enables them, the business models that make them run, the issues they raise, and their implications for governance and regulation.

Following up on the concept of disruptive innovation (discussed in a following chapter), and the digitalization and big data trends, GECKO research efforts were oriented towards **three thematic areas** from which the development of new mobility products and services often stems:

- **Technologies**

Automation and emerging technologies, namely disruptive automated and emerging innovations in transport sector, such as Connected and automated vehicles (CAV), drones and flying vehicles, information and communication technologies (ICT) development, and ticketing solutions with the application of blockchain technology. These emerging technologies provide a solid foundation for different stakeholders to develop disruptive products or services, which in turn transform the mobility industry in a significant way.

- **Business models**

Shared mobility, public transport, and Mobility as a Service, including new and traditional mobility services for passenger and freight transport, plus a wide range of innovative business models (e.g., car sharing, bike sharing, ride sharing, ride hailing, public transport, smart parking, electronic vehicle, charging infrastructure, crowdsourcing operators, and smart delivery) across different types of cities (i.e., mega-cities, large cities, and small cities).

- **Data utilization**

Digitalization and data-driven models, including the development of digital data platforms and the application of big data, and, specifically, how transport regulators, transport operators, service providers, and other relevant stakeholders face the trend of big data. Big data is critical to the future development of transport industry, if we're able to transform the ubiquitous data into meaningful models and statistics, enabling all actors to spot patterns, make real-time decisions, and develop innovative offerings to the industry. Plus, control over data correlate to control over market.

In this chapter, we will first (and briefly) look at each of these three thematic areas, and then at what their combinations enables, through **four categories of transport innovation** that are the among most disruptive: Cooperative, Connected, and Automated Mobility (CCAM); infrastructure, network, and traffic management; MaaS and MaaS platform; shared on-demand mobility.

7.1 Cooperative, Connected and Automated Mobility (CCAM)

A connected vehicle is defined as a motor vehicle “that connect to other vehicles and or devices, networks and services outside the car including the internet, other cars, home, office or infrastructure”⁴¹.

Most of modern vehicles and drones already have connected devices. In the future, they might directly interact with each other and with the road infrastructure. This interaction is the domain of cooperative mobility, which is enabled by digital connectivity between vehicles and between vehicles and transport infrastructure⁴².

An **automated vehicle** is defined as “a motor vehicle which has technology available to assist the driver so that elements of the driving task can be transferred to a computer system⁴³.” In contrast, an **autonomous vehicle** is defined as “a fully automated vehicle equipped with the technologies capable to perform all driving functions without any human intervention⁴⁴.”

Disruptive innovations in this category include, for example, connected and automated vehicles, passenger urban air mobility, and drone last mile delivery.

7.2 Infrastructure, Network and Traffic Management

Innovations in Infrastructure are focusing on infrastructure management, pricing, taxation and finance, digitalization, and integration⁴⁵.

Network and traffic management can be defined as the system controlling traffic. Traffic can be controlled through a properly implemented system of signals, as well as (in a predictive manner) through information. Signals are the most important tool for a city to manage traffic in a safe and efficient manner, and their timings are determined by traffic circulation plans.

Network and traffic management conceived as information “provides guidance to the European traveller and hauler on the condition of the road network. It detects incidents and emergencies, implements response strategies to ensure safe and efficient use of the road network and optimizes the existing infrastructure, including across borders. These incidents can be unforeseeable or planned: accidents, road works, adverse weather conditions, strikes, demonstrations, major public events, holiday traffic peaks or other capacity overload”⁴⁶.

⁴¹ Gowling WLG, Are you data Driven?

⁴² [Intelligent transport systems](#)

⁴³ European Parliament, Briefing January 2016, Automated Vehicles in the EU.

⁴⁴ European Parliament, Briefing January 2016, Automated Vehicles in the EU.

⁴⁵ Transport Infrastructure Expert Group.

⁴⁶ Intelligent Transport Systems, Traffic Management

Disruptive innovations in this category include, for example, big data for fleet management and logistics, TM 2.0, and Hyperloop.

7.3 MaaS and MaaS platforms

“Mobility-as-a-Service (Maas) is a user-centric, intelligent mobility management and distribution system, in which an integrator brings together offerings of multiple mobility service providers and provides end-users access to them through a digital interface, allowing them to seamlessly plan and pay for mobility.”⁴⁷

The MaaS Platform is the IT structure that is used by the MaaS Operator to provide the final service of mobility to the end-users. Example of disruptive innovations in this category includes MaaS and MaaS platforms.

7.4 Shared on-demand mobility

Shared mobility can be defined as the usage of shared resources, in this case vehicles, which are made available to registered users at various locations in the city. On-demand mobility, on the other hand, is service provided ‘on-demand’, i.e., when requested by the customer, and not based on a fixed schedule.

Shared mobility and on-demand mobility are two trends emerging as a response to the change in traveller needs for cheaper transport (e.g., sharing the cost of travel), for easy access to a transport (service) at a given moment, and to reduce traffic congestion due to private vehicles circulation.

Shared mobility and on-demand mobility can also reduce congestion and space occupied by private vehicles in cities.

Example of disruptive innovations in this category include car-pooling, bike sharing, e-scooter sharing/ micromobility, ride-hailing and TNC, and on-demand ridesharing.

⁴⁷ [The MaaS Dictionary](#)

Part III – Implications for Governance

8. Key Issues and Implications

Disruptive innovators in mobility have to fight for their market entry, survival and growth. Support from public authorities is very important. For that support to come, authorities have to consider the ‘fit’ between the value propositions of these disruptive innovations and existing, or new, policies or regulative frameworks.

More and more firms develop an integrated solution instead of a single product or service to their customers. This means that they often combine resources from other industries to address underserved customer needs, such as entertainment, hotel, or shopping services. This creates added opportunities and risks, and further complexity for policy makers.

Innovation isn’t necessarily only good (even gold coins have two sides). New smart approaches can encourage sharing, reduce carbon footprints, and address new generational needs. But they can also, for example, propose lower prices through externalization of costs, which will have to be paid down the road by the community, along the way distorting competition, threatening, or blocking more environmentally and socially sustainable, business models, and creating a void if they fail or just opt to leave.

Laissez faire is, in itself, already a choice – often not the best one, and definitely the worst if it lets the “invisible hand of the market” blind us to the implications for public governance

8.1 Business Ecosystem

8.1.1 Competition

In general, competition has positive effects on the mobility sector, because it increases innovation, diversity of solutions, and drives companies to improve the quality of their products and services. However, there are situations when different aspects of competition lead to unwanted results and may require certain governance.

In particular, mobility innovations often bring competition to existing and established transportation modes, which are highly regulated. Established actors, who have factored the constraints and the costs of these regulations into their business models, expect competition to have to follow the same rules.

An illustrative example is the competition between traditional taxi services with shared on-demand mobility service providers like Uber. Taxi drivers normally need to acquire licenses for providing taxi services in a municipality, which are recouped after years of operations. Thus, it is often argued that the introduction of Transportation Network Companies (TNC)⁴⁸ creates unfair competition, with newcomers freed from the costs of a taxi license and strict regulations.

Such detrimental results of competition between old and new business ecosystems are impossible to avoid when system shifts are happening, but they need to be anticipated, for their negative effects on society to be minimized. Moreover, a too strong opposition of incumbent businesses can prevent potentially more sustainable mobility solutions from entering the market and realizing the expected benefits. Also, too fierce competition leads to loss of efficiency or even business viability. While a certain degree of ‘healthy’ competition helps satisfy end-users’ needs and develop the services further, there is a potential for quickly reaching market oversaturation.

For example, when dockless (‘floating’) shared bikes were introduced in China, innumerable companies joined after the first success of the business model. The market saturation was reached in a short term. As a result, user depreciation towards offered products started to increase. Vandalism forced bike sharing companies to renew their fleet, even to sell old bikes as recyclable iron⁴⁹. Such market oversaturation might require government intervention.

8.1.2 Cooperation

Cooperation is especially relevant for the mobility innovations that require the involvement of multiple actors of different nature (public and private), data sharing and coordination of different services, such as, for example, traffic management and MaaS. If cooperation is achieved, it results in market building, interoperability of data and mobility solutions and open innovation.

In order to materialize the benefits of MaaS solutions, it is necessary to attain a critical mass of users. This, in turn, requires orchestration between different modes of transport to provide convenient door-to-door journeys. Lack of cooperation between stakeholders, lack of agreement that could preserve mutual interests can lead to market disequilibrium and the need of authorities to address market failures. For example, transport operators may refuse to adjust their business models to integrate the Cooperative Intelligent Transport Systems (C-ITS) due to the fear to reveal certain internal information, leading to the failure of MaaS introduction.

On the other hand, too extensive cooperation can potentially lead to oligopoly, which creates entry barriers for new mobility solutions, and decrease incentives for remaining innovative.

⁴⁸ Transportation Network Companies (e.g., Uber) provide users with transportation through an online platform that connects them to drivers that are nearby.

⁴⁹ The Development and Policy Recommendations for Dockless Bike Share (DBS) in China

8.1.3 Compatibility

Introduction of mobility innovations requires integration in existing infrastructure, which includes among others road infrastructure, electric grids, and ICT infrastructure, which are governed by norms and regulations. For instance, the adoption and development of non-open-sourced ICT systems by different automotive manufacturers may cause additional requirements to regulators to ensure compatibility to regulatory schemes. On the contrary, the adoption of proprietary software⁵⁰ not compatible with a commonly agreed regulation would cause lobbying against the adoption of common standards.

Another important factor is that city and road infrastructure are planned for long term, and while it is difficult to predict the coming innovations in mobility sector, it is crucial to realize that spatial planning and infrastructure investment decisions of today will significantly affect the ease of introducing mobility innovations in the future. For example, in many cities infrastructure has been developed with a special focus on serving motorized vehicles (cars, buses, trucks, motorcycles), which has degraded conditions for walking and cycling, and is now creating growing difficulties to the safe deployment and growth of new types of vehicles and services, from shared micromobility to micro deliveries.

8.1.4 Complementarity

For disruptive mobility innovations to be successfully implemented there is a need for an enabling business ecosystem to exist. For example, e-mobility needs to be conceived as a full ecosystem including manufacturers of electric vehicles and their parts, charging operators, service providers, users, etc. Its economic relevance and environmental sustainability can be analysed only with a systemic perspective.

Also, maintenance of electric vehicles requires totally different qualifications compared to traditional ICE vehicles. The use of batteries in electric vehicles involves new raw material value chains into mobility industry, bringing new types of companies as well as economic and political considerations⁵¹. Another challenge is a big choice of technologies and solutions for charging electric vehicles, such as, e.g., battery swapping, charging through an outlet, induction charging, dynamic induction charging etc. This creates an opportunity to adjust charging to local conditions and need, while also creates ambiguity regarding the choice and what actor will be in the business ecosystem for e-mobility.

A specific need for complementarity concerns ICT infrastructure required for implementation of certain mobility innovations. There is a need for an adequate telecommunications network that allows the transfer of significant volumes of data. This requirement is especially relevant for data-

⁵⁰ “Proprietary software” (sometimes referred to as closed source software) is software that legally remains the property of the organisation, group, or individual who created it.

⁵¹ GECKO D2.4 ‘Regulatory schemes and governance models for disruptive innovation’

intensive mobility solutions such as traffic managements systems and autonomous driving. To enable TMS, it is necessary that various complementary technologies are developed to an adequate degree and are available: sensing and surveillance technologies, communication technologies used to transfer data, technologies for data processing and analysis, including machine learning, traffic control systems, etc.

8.1.5 Lock-ins

A “lock-in” is a length of time during which you are not allowed to end or change a financial arrangement.⁵² The current ways of working and existing relationships between different actors form the structure of business ecosystems and can have a limiting effect on ecosystem development and introduction of disruptive mobility innovations. In particular, existing long-term contracts and framework agreements with suppliers and customers may restrict rapid uptake of innovative technologies.

Industry standards are beneficial for ensuring safety and compatibility in mobility industry. They may, however, have the effect of imposing barriers for potentially sustainable mobility technologies.

Not all of the lock-ins need to be addressed through governance, but it is necessary to be able to identify them and their potential effect on implementation of disruptive mobility solutions. Such lock-ins can delay market entry or lead to the situation when a potentially beneficial mobility solution remains uncompetitive or does not realize all the expected benefits.

8.2 Data Management

Every day big volumes of data are generated about, for example, passenger numbers, vehicle locations and movements, and ticket purchases. Who owns the data? What can it be used for? How should its use be managed? This big data⁵³ is critical to the future development of transport industry.

However, this big data will be less valuable if we cannot transform it into meaningful models and statistics. The output of big data analysis will help all actors to spot patterns, make real-time decisions, and develop innovative offerings based on understanding customer behaviours, predicting their needs, and developing personalized add-ons and enhancements. Therefore, data utilization is another critical area for disruptive innovations.

⁵² Cambridge Dictionary, <https://dictionary.cambridge.org/pt/dicionario/ingles/lock-in>

⁵³ “Big data” is an expression commonly used to designate extremely large data sets that may be analysed computationally to reveal patterns, trends, and associations, especially relating to human behaviour and interactions.

It brings, however, a completely new set of challenges. These challenges include unclear ownership of data and sharing practices, requirements to the quality of data in order to be useful and trustworthy, the need for integrating data to achieve the desired outputs, and, importantly, the need for ensuring security of collected private data. Sustainability of data management is also challenging, with an exploding environmental footprint related to data storage and processing.

Let's look at some key variables related to data management.

8.2.1 Data ownership

Disruptive mobility solutions are offering a new transport paradigm which becomes more and more connected and therefore requires more and more data to be collected, analysed, and stored.

Such data is generated, for example, through sensors in passenger counting and vehicle locator systems and ticketing and fare collection systems. In a connected mobility ecosystem, data needs to flow between the different actors so that the right services can be offered at the right time. As a result, ownership of the data will also change along the data flow. The question is how data can be shared in a way that also respects the customer's privacy and does not breach their permissions.⁵⁴

Uncertainty regarding data ownership in mobility solutions brings further concerns about data security and data usage ethics. These implications will need to be addressed in order to gain and keep consumers' trust to collect this data and convert it into successful services and solutions.

In a big data context, different third-party entities may try to claim ownership in (parts of) a dataset, which may hinder the production of, access to, linking and re-use of big data, including in the transport sector. Currently, no specific ownership right subsists in data and the existing data-related rights do not respond sufficiently or adequately to the needs of the actors in the data value cycle.⁵⁵

Such data value cycle can consist of a significant number of actors, making it challenging to manage data ownership and use.⁵⁶ Look at the potential variety of actors involved in a C-ITS context where the movement of a car generates data: the public or private road operator, the employer of the car driver, the leasing company, the car manufacturer, the software/algorithm developer, the chip manufacturer, the telecom provider, the security certificate provider, the connected sensors provider, and potentially others more.⁵⁷

⁵⁴ KPMG Global Strategy Group, 2018. Mobility 2030 - Data Rules

⁵⁵ LEMO project D2.2 'Report on Legal Issues'

⁵⁶ There are regulations addressing the reuse of data by the public sector. See, for example, Open Data Directive (2019) and the PSI Directive (2013)

⁵⁷ Source: LeMO deliverable D2.2 'Report on Legal Issues'

8.2.2 Data Quality

In terms of big data analytics solutions, one of the main risks is related to the confidence about the data quality and the predictive model a company is producing.

The question of data quality is especially relevant for mobility innovations relying on integration of data from different sources. This includes MaaS, network and traffic management systems, and autonomous vehicle operations.

In particular, to ensure a smooth MaaS experience the data from different transport service providers needs to be of high quality and reliability, which would allow for data interoperability. Real-time data sharing is also crucial for the quality of transportation services.

8.2.3 Data Integration

High-quality reliable data (on traffic, transport schedules, position of vehicles, etc.) is a prerequisite for efficient data integration. Data integration is crucial for such mobility innovations as MaaS, traffic and network management, autonomous vehicle operation, and any other data-driven mobility solutions.

For example, the insufficient coordination and integration of data from different sources can reduce the contribution of connected vehicles to the implementation of innovative mobility schemes by limiting the potential of interactions between vehicles and infrastructure. Then, poor data interoperability can be a barrier for successful implementation of TMS, because the vast amount of data that can even be available for traffic management can be collected and organized according to various principles, making it difficult to compare, combine and use it for traffic management.

8.2.4 Data security

Big data can support people to make smart choices, but it can also lead to data misuse and unfairness. For example, surveillance of transport data, such as traffic data, can facilitate TMS. At the same time, there are challenges of social-ethical concerns, such as possible population-level monitoring and privacy invasion. For autonomous vehicles there is an added critical risk, with the possibility of hackers remotely taking control of the car.

When using mobile ticketing or digital transport solutions, most of the time, users need to provide information regarding their credit cards. It is therefore crucial to ensure the security of the users' private and financial information. Other private data includes, for example, geolocation data.

Protection of personal data in shared and on-demand mobility is crucial as well. The GDPR has had a considerable impact in the domains of privacy, transparency, consent, and control in data-driven businesses. The strengthened legal framework is likely to respond to several ethical issues and thus improve end-users' trust in the use of personal data in a big data context.⁵⁸

8.3 Existing governance structure

This section addresses the institutional support, but also the barriers that are created, through policy and current governance structures: politics, legislation, tax, subsidies, etc.

While certain measures can promote some solutions over others, they might also restrict the adoption of potentially more beneficial mobility solutions or limit the benefits they are able to deliver to the society.

8.3.1 Economic instruments

Economic support plays an important role in successful implementation of disruptive mobility solutions because it is able to help in breaking status quo and giving the initial momentum to new transportation modes that face significant resistance from the incumbent business ecosystem.

Such support can be both financial in the form of tax relief or subsidies, and non-monetary, e.g., through providing access to restricted areas, reserved lanes, and parking areas exclusively to the providers of novel mobility solutions. An example of the latter category is in-kind support in the form of free parking for shared vehicles provided by certain municipalities in city centres.

While it is clear that economic incentives can give unfair advantage to disruptive mobility innovations against incumbent businesses, the challenge is to define which innovations require – and merit – this support, and to what extent. The multitude of various economic instruments form complex structures at local, national, and supra-national level, and become an institution on its own. That is, support of one mobility solution can further on create challenges for other more beneficial solutions to enter the market, because the former solutions have an advantage in the form of economic incentives.

Moreover, too extensive subsidizing of certain technology or business model can obstruct the development of its actual competitiveness against other transportation modes or solutions, i.e., once the economic support is withdrawn, the mobility solution would quickly face low profitability or fierce competition.

⁵⁸ GECKO D1.1 'Review of new mobility services and technologies and set-up of knowledge bank'

8.3.2 Legislative aspects

A critical variable related to legislation concerns the incompliance of new mobility solutions with existing legislation. This potentially creates entry barriers and prevents new mobility businesses from fully realizing the potential for improved mobility.

Missing or slowly adapting legislation also influences the implementation of disruptive mobility innovations. It creates uncertainty and slows down user adoption of new mobility solutions, and may harm the public interest.

To provide an example, the lack of regulatory environmental standards and the lack of awareness of impact of innovative mobility such as electric cars may cause an overestimation of the attractiveness of the new market, especially in the short run, which might cause environmental negative impact. The latter – once perceived by the society – may slow down the innovation and the public demand that would trigger it.

8.3.3 Political aspects

Similar to economic instruments and legislation, current political situation is able either to promote or create entry barriers for disruptive mobility innovations. In general, since such innovations disrupt the current business logics, it is rather natural that political tensions will arise: incumbent business will resist change, lobbying organizations will continue lobbying for status quo, and there will be competition for political support.

Public sector and policymakers influence the mobility sector through infrastructure investments, public transport, zoning laws, building standards, and agricultural subsidies. When disruptive mobility innovations are introduced, current public interventions might not optimally steer future outcomes at a system level.

In particular, geographical competence boundaries and lack of cooperation between neighbouring political agents may hamper the value proposition of seamless and integrated shared mobility services. For example, the persistence of fragmented public ownership of transport services in urban areas may hamper the trend towards data integration, as a key basis for supplying MaaS. A lack of interest in integrating shared mobility services and public transport to increase flexibility and cost efficiency will reduce the potential of co-modality.

Smart solutions are not enough for changing inefficient transport scenarios. Low usage rates of vehicles, energy, and infrastructure cannot be solved only through technological and business

model innovation. There is a need for political leadership and suitable economic shifts that can solve current social and structural inefficiencies.⁵⁹

8.4 Environmental Issues

Transportation creates negative externalities, including unwanted environmental impacts such as pollution, greenhouse gas emissions, noise, and congestion. And if the whole value chain is considered, there are other environmental impacts related to the production of fuel or mining of non-renewable substances that are required for, e.g., vehicle production.

In order to assess whether a disruptive mobility innovation is a sustainable option, it is crucial to consider its environmental impact on a system level, as well as predict and account for potential burden shifts and rebound effects. Let's look at some variables.

8.4.1 Environmental impact

While many mobility innovations claim to be green and sustainable, the assessment of their environmental impact is not a trivial task.

Taking the example of autonomous cars, it is not clear how their environmental impact will differ from current transport modes. The potential for reducing environmental impact lies in more even driving, which reduces energy consumption or the preference of electric vehicles for autonomous operations and consequent reduction in noise and direct emissions compared to gasoline-powered cars. The systemic effect of more balanced driving when there are more autonomous and connected vehicles on the streets also adds to reduced environmental impact.

On the other hand, autonomous vehicles confined to a geographical area might be obliged to ride empty to find a passenger or return to base. This causes underutilization and thereby unnecessary energy consumption. Further, the multitude of on-board sensors and computers will require additional energy use. And the expected lower cost of transportation and potential for new user groups to ride autonomous cars (children, elderly, disabled) can lead to rebound effect⁶⁰, i.e., increased use of transportation⁶¹ (this effect is discussed in the next section).

Similarly, the source of energy used for charging electric vehicles (fossil fuels, renewable energy, nuclear energy, etc.) in the end defines environmental sustainability of e-mobility. There is a need to assess the full lifecycle of driving an electric vehicle in order to ascertain sustainability of e-mobility in each particular case.

⁵⁹ The Conversation, 2018. Smart mobility alone is no substitute for strong policy leadership

⁶⁰ Rebound effect is defined as the reduction in expected gains from new technologies that increase the efficiency of resource use because of behavioral or other systemic responses

⁶¹ Forbes, 2019. A green future of transportation: how self-driving cars will be make or break

8.4.2 Rebound effect

Rebound effect in transportation can be defined as the reduction of expected gains from more efficient transport modes by increased traffic, congestion, and energy consumption, because of lower prices or other social effects such as increased usability.

In particular, the prospected cost efficiency and easiness of use associated with TNCs like Uber or Lyft may dis-incentivize sustainable trips and make users prefer ride-hailing and taxi services instead of public transportation.

High accessibility and affordability can even make users choose ride-hailing instead of walking or cycling very short distances. Research showed that only about 20% of TNC trips replace personal car trips, while 20% of the trips replace traditional taxi services, and the rest 60% replace transit, cycling, and walking, or would not have been made without the availability of TNCs⁶². This ultimately leads to more vehicles on the road, congestion, and increased pollution.

8.5 Social aspects

Even if a mobility solution promises unquestionable benefits, and the local authorities and relevant actors are ready to implement it, the resistance or uncertainty associated with the society can lead to poor realization or failure of any initiative.

The way a disruptive innovation is embedded not only in a business ecosystem, but also into social system at large, is not evident and bears high level of uncertainty. This concerns the changes in the mindsets of people and public acceptance of innovations, their integration with the newly introduced artefacts (be it e-scooters or mobile apps) and the effect those innovations will have at people in general.

That is why it is important to acknowledge such potential challenges and be prepared to resolve them. Five variables related to social aspects are discussed below. There are other factors, such as effect on employment, that are not discussed, but are also relevant for disruptive mobility solutions as much as for any other disruptive innovations.

8.5.1 Equity and accessibility

The choice of one mobility solution over another is usually guided by the benefits provided to that part of the population that travels more often. These people usually have higher income, which means that the interests of lower-income part of population that cannot bear high travel costs is overlooked.

⁶² Ecolane, 2018. Ride-hailing vs. ride-sharing: the key difference and why it matters

It has been argued that accessibility (both financial and physical) should be an important factor to consider when choosing between different transport projects as reduction in travel time or mitigation of negative impacts of transportation⁶³.

The prevalence of digital access channels and immaterial payment systems within shared mobility or MaaS, for example, can lead in some cases to the partial exclusion of potential users, e.g., elderly, or low-income citizens. MaaS raises an additional challenge to operators, of being economically sustainable while guaranteeing accessibility and affordability of the transport system for everybody (including, specifically, people users with lower incomes).

8.5.2 Ethical aspects

As new digitalized, automated, and data-driven mobility solutions proliferate, a number of new ethical concerns arise. These include, for example, privacy and cybersecurity, or dilemmas raised when programming computers to act on decisions that raise deep moral dilemmas.

The questions of data ownership and sharing has been discussed above. The main issues related to surveillance using big data include the risks of asymmetries in the control over information and privacy concerns. The latter issue relates to potential privacy threats due to the wrongful use of data generated in mobility sector.

Another concern for privacy comes from transport drone operations. The question of where the drones are to be allowed to fly and how much they would actually invade people's privacy are crucial to resolve in order to achieve public acceptance of urban air mobility.

Autonomous mobility presents a whole set of ethical concerns related to the choices that a machine would need to make when driving. These choices include, for example, running over pedestrians or sacrificing the vehicle and their passengers to save the pedestrians⁶⁴ – a wretched dilemma indeed, but in which we must also consider the fact that human-driven cars are already killing, dilemma-free, thousands of pedestrians every year; and also the fact that, if low speed limits (e.g., 30 km/h) are imposed in all streets and roads where people have, according to law, the right to walk and cycle, the dilemma won't even arise.

8.5.3 Cultural-cognitive aspects

The resistance to change due to culture and competence through 'patterning' (forming of fixed ways of behaving) is a very strong barrier to the shift of paradigms towards innovative mobility technologies.

⁶³ Di Ciommo and Shiftan, 2017. Transport equity analysis

⁶⁴ Bonnefon et al., 2016. The social dilemma of autonomous vehicles

The limited perception of the real total cost of ownership (TCO) and of the related economic advantages of sharing leads to subjective decision making. Uncertainties in the generalized cost of transport, which also include the value of time, are a barrier towards the shift from private car use to shared mobility and MaaS for multimodal journeys.

People need to change their mindset from owning a car to using shared mobility, in order to start actively using the latter. There is a need to ensure that psychological costs related to shared on-demand mobility are not too high and can be overcome: confidence in the driver, fear of lack of security, obligation to talk, insurance etc.

Another example of cognitive-cultural shifts required for successful implementation of mobility solutions is the willingness to transfer responsibility from a human to the vehicle when it comes to autonomous vehicles. A study conducted by MIT in 2017 found that nearly half of 3,000 respondents said they would never purchase a car that completely drives itself. The respondents said they feel uncomfortable with the loss of control and that they do not feel self-driving cars are safe⁶⁵ (then again, things change, and current attitudes don't necessarily predict future ones – as Henry Ford said, “if I had asked people what they wanted, they would have said faster horses”).

8.5.4 Tragedy of the commons

The “tragedy of the commons” is a situation in a shared-resource system where individual users, acting independently according to their own self-interest, behave contrary to the common good of all users, by depleting or spoiling that resource through their collective action. The pursuit of individual interest without collective coordination ends up in collective disaster (and, with it, individual one as well).

In the original article exploring this expression was coined⁶⁶, author Garrett Hardin illustrated the situation with a community owned plot of land used for pasture and open to all. Each herdsman benefits totally and exclusively from each head of cattle he adds to this pasture (all benefits go to him), while the costs of each extra head of cattle (i.e., less pasture) are shared by all. If the benefits are not shared, but the costs are, the individual benefits will always seem larger to the individual himself, nudging him to pursue his individual benefit at the expense of the community.

For an immediate application of this metaphor to the transport sector, suffice to look at what has happened over the past decades with the use (and abuse) of private cars in public space. But this metaphor can also come to apply to disruptive mobility innovations. Look, for example, at what happened to shared micromobility: fierce competition led to an ‘invasion’ of the sidewalks in

⁶⁵ GECKO D1.1 ‘Review of new mobility services and technologies and set-up of knowledge bank’

⁶⁶ “The Tragedy of the Commons”, Garrett Hardin, *Science*, no. 162 (1968). Original article available here: <https://science.sciencemag.org/content/sci/162/3859/1243.full.pdf>

many cities by large numbers of e-scooters. Companies overusing this public resource were able to obtain direct benefits of doing so, while incurring no direct cost⁶⁷.

8.5.5 Public Health

It is important to assess whether a mobility innovation will ultimately have a positive effect on the citizens' health. There are many ways in which disruptive mobility solutions can positively affect Public Health, e.g., by reducing congestion, improving the quality of the air, suggesting travel routes that stimulate walking and cycling through MaaS applications, etc.

Negative effects are also possible and can “hide” behind good intentions: autonomous cars will enable those who cannot drive (e.g., the elderly) to benefit from them, but if children start using these vehicles instead of walking or biking over short distances, this may aggravate already worrying child obesity rates.

Such long-term effects on society need to be addressed by a holistic policy which defines ‘public good’ in many dimensions.

8.6 Customer Protection and Public Safety

The term **safety** is broadly used to refer to the protection of individuals, organizations, and assets against threats that can be directed to such entities hence rendering them inactive. **Security**, on the other hand, mostly refers to the deliberate actions that are geared towards inflicting harm to an individual, organization, or even assets.

When a new mobility solution is introduced, one of the key responsibilities of governing organizations is to ensure that the new technologies and business models do not harm people physically or psychologically. It is therefore necessary to identify how safety and security can be compromised due to new mobility solutions. In this section we discuss the safety and security of anyone potentially affected by disruptive mobility innovations: actual users, passengers, and society in general.

The question of **liability** also arises when disruptive mobility innovations are introduced. Since they often redefine current ways of working and bring novel technologies and business concepts on the market, it is not always clear who is liable for damages in case of accidents, equipment malfunction, etc.

⁶⁷ Blanco, 2019. Beyond avoiding the micromobility tragedy

8.6.1 Safety

Some disruptive mobility innovations rely on new technologies that naturally bear risks of malfunction and require certain safety control. These technologies might not be more dangerous than existing alternatives, but due to their novelty, not all of their potential impacts are yet accounted for.

For example, electric vehicles. They are very quiet when driven, especially compared to ICE and diesel cars⁶⁸ – and while noise reduction is a welcome benefit for reducing noise pollution in urban areas, it also poses a certain risk to the safety of people, especially people with visual disabilities, because they can miss an approaching vehicle and be less alert about potential danger. Another aspect is that battery technologies currently under development are likely to introduce the need for consumers and EV stakeholders to be informed about personal protection, handling electrical grid voltage under the hood, and fire suppression.

Other solutions can compromise safety due to misuse and improper human behaviour, especially when that type of behaviour is enabled – and even fostered – by existing infrastructure. For example, users of e-scooters riding on the carriageway run a risk of being hit by fast moving cars and trucks, if traffic calming or segregated lanes (whichever applies best to each area) don't impose lower speed limits; but they can also raise the risk for pedestrians if they use the sidewalk for circulating or parking.

Drones pose safety risks both due to potential malfunction of the equipment and human error when operating them.⁶⁹ Concerns regarding the technology centre around the battery life, lift capacity, airworthiness, and reliability of the drones. The primary criticism with the flying of commercial drones over public space is that small mistakes could result in crashes that threaten the health, well-being and property of the public. Furthermore, if they crash into public infrastructure such as electricity poles, or wanders into airports and other protected airspaces, it could result in dangerous scenarios that put many lives in danger.⁷⁰ This poses the question whether there is a need to regulate who can operate drones, if any licensing is required, impose minimum vehicle requirements, etc.

8.6.2 Security

There are different types of security concerns related to disruptive mobility solutions. The more traditional ones include, for example, e.g., robbery, sexual harassment, physical abuse of passengers – not only the occurrence of these, but also the plain and simple fear of their occurrence (which has an impact on transport choices).

⁶⁸ GECKO D2.4 'Regulatory schemes and governance models for disruptive innovation'

⁶⁹ GECKO D1.1 'Review of new mobility services and technologies and set-up of knowledge bank'

⁷⁰ Rao et al., 2016. The_societal_impact_of_commercial_drones

These concerns apply to more established transportation options (like taxis and public transport) but also to new mobility services, like ride-hailing, ridesharing and autonomous vehicles (e.g., will children be sharing rides in autonomous vehicles with unknown strangers?).

There is a set of new security threats related to digitalization as well as remote and autonomous vehicle operation. They can be collectively named cybersecurity issues. One particular problem related to digital mobility solutions, taking an example of shared mobility, is a break-in and or manipulation of data, which can bring severe consequences for the safety of drivers and passengers of a carpool.

Another type of cybersecurity threats relates to the potential of hacking autonomous or remotely operated transportation systems such as drones and autonomous cars. Criminals can take control of such equipment. Drones, for example, can be ‘spoofed’, i.e., hijacked from their programmed paths. It is difficult to track the signal that overwhelms drones GPS antenna and thereby leads to the loss of control. Thus, the consequences would be attributed to the drone operator. An integrated cybersecurity strategy (e.g., firewalls, encryption support, and network security mechanism) is required to avoid potential cyber-attacks.⁷¹

The question of privacy related to drone operations can be also related to security: in public spaces, such as parks or streets, but also in private property that is visible from public spaces, there is no legal basis for submitting a request for infringement of privacy as long as the view is limited to eye level. Drones disregard expectations of reasonable privacy since they are operated in a public place yet can capture videos and sounds that are not traditionally available to the public.⁷²

8.6.3 Liability

While integrating new digital solutions into society, developers may focus on improving the technology. Nevertheless, the question of liability is arguable when a system starts faulting and causes injuries.

Clear definition of liability is important. First of all, to clarify who’s responsible for safety, and to encourage those responsible to take preventive action (which may include public authorities). But also because it will affect insurance costs, which can be a very important part in the cost structure of a business

Take, for example, autonomous cars. Over the past century, human beings (drivers, pedestrians, cyclists) have “absorbed” much of the liability in car crashes. “Human error” is frequently considered the “leading cause”, and car manufacturers only respond in case of mechanical failure for which they can be directly held accountable.

⁷¹ GECKO D1.1 ‘Review of new mobility services and technologies and set-up of knowledge bank’

⁷² Ibid

What if, with a fully autonomous vehicle, the “human element” is taken out of the equation, and car occupants are no more than passengers? Who will be responsible when a crash involving an autonomous vehicle happens? The details of the specific case will matter, of course, but the point here is that this opens up direct connections to several actors – it could be the vehicle manufacturer, or the software provider, or the fleet operator, or the infrastructure provider, etc.

Following the example of spoofing drones presented above, involuntary and planned collisions seem to be inevitable, especially in an unregulated environment. Several incidents have occurred without the persons responsible being identified.⁷³

8.7 Different Actors and Motivations

The wide range of mobility innovations with the potential to cause major shifts in transportation sector and other areas of social life and business brings up a complex ecosystem of different actors, which affect or are affected by the rapidly changing mobility sector.

These actors have differing interests and motivations: for example, citizens prize accessibility and ease of transportation, regulators (e.g., local authorities) seek to improve and protect the mobility system and its users, and the mobility industry seeks profitability. This is a rather simplified description: in reality, things tend to be much more complex.

But the fact of the matter is that different actors naturally have different points of view and motivations. And even if they may share some general goals, that doesn't necessarily lead to full alignment nor compatibility of positions. For example, private mobility providers are naturally more interested in the profitability of their business, which often means they are interested in 'more mobility' rather than less, which can contradict with the interests of society in general.

Misaligned goals and motivations can be negotiated. But they naturally tend to create obstacles to the cooperation between all these actors. A lack of mutual understanding on the roles, obligations, constraints and needs of each sector can breed unhelpful stereotypes, misplaced expectations, frustration and mistrust. These will in turn make it very difficult to establish and conduct a constructive dialogue that can help all parties negotiate and find win-win solutions.

Further, the variety of disruptive mobility solutions makes it challenging to choose which of them need to be implemented and in what combination, because they are all part of the mobility mix in a location, and their benefits cannot be evaluated in isolation from each other and the conditions in the target area.

⁷³ Ibid.

Finally, the mobility sector cannot be seen in isolation from other areas of social activity. Transportation creates positive and negative externalities that affect the environment, job market, public health, concentration of population in certain areas, etc. In order to achieve strong sustainability in transportation sector, it is crucial to find a balance between the impacts of disruptive mobility innovations, social needs, and existing conditions (infrastructure, technology, regulations, etc.). This way, the benefits offered by mobility solutions can be realistically assessed and maximized.



Part IV – What is to be done?

9. Governance Approaches and Instruments

"It doesn't matter whether a cat is black or white, as long as it catches mice."

Deng Xiaoping (1904 – 1997)

One can say that, like cats, governance models and regulatory approaches also come in more than one 'colour'. It's important to go over these options, since none of them is "good for all seasons". As we'll see, some policy instruments are compatible with some governance models, but not others, and different levels of decision, or stages of the policy process, may recommend some, and not others.

9.1 Models of Governance

Models of governance can be classified according to three categories⁷⁴:

- **Hierarchical** governance – top-down approach, "traditionally" used on a national level, relying on binding rules or procurements (legal form, boards, votes, IP mechanisms ⁷⁵);
- **Market** governance – uses policy instruments to influence economic variables (competition, pricing, taxes, subsidies) in order to achieve policy goals, e.g., for environmental policies in order to incentivize the use of alternative fuels for vehicles, through gas taxation;
- **Network** governance – a relatively new mode of governance, which relies on collaboration between different relevant stakeholders for the decision-making process (whether public or private parties, non-profit or for-profit organizations).

⁷⁴ "Urban planning and transport policy integration: the role of governance hierarchies and networks in London and Berlin", Philipp Rode, *Journal of Urban affairs*, 2019.

⁷⁵ <https://hal-mines-paristech.archives-ouvertes.fr/hal-01488631v2/document>

A report by Bouwma et. al.⁷⁶ focused on two governance models that can be particularly relevant regarding environmental policy. These models can be part of network governance, as they involve several actors, and form a more inclusive approach:

- **Self-governance** – business or industry actors impose upon themselves rules in order to achieve policy objectives (e.g., the definition of standards regarding the Hyperloop with the consortium of industries that develop this technology);
- **Knowledge** governance – knowledge production and dissemination can be key influencers regarding the decisions that have to be done regarding policies.

Each of these models has advantages and drawbacks:

Governance mode	Advantages	Drawbacks
Hierarchical	<ul style="list-style-type: none"> • Efficient way to reach policy goals • Clear chain of command • Efficiency regarding long-term actions • Uniform solutions: norms and standards 	<ul style="list-style-type: none"> • Poor flexibility • Exclusive approach (few stakeholders): hard adhesion • Risks of lack of social acceptancy
Market	<ul style="list-style-type: none"> • Innovation enhancement • Efficient way to achieve policy goals 	<ul style="list-style-type: none"> • Risk of market failure, disequilibrium of the ecosystem if there is not independent supervision
Network, Self-governance, Knowledge	<ul style="list-style-type: none"> • Innovation capacity • Flexibility • Awareness raising • Inclusive rulemaking: great adhesion for the achievement of public policy goals 	<ul style="list-style-type: none"> • Possible barriers through protection of mutual interests, lack of trust within stakeholders • Difficult to get outcomes

⁷⁶ I.M. Bouwma et. al., “Policy instruments and modes of governance in environmental policies for the European Union”

9.2 Approach and Instruments

For each of these three categories, different regulatory approaches and policy instruments can be employed⁷⁷:

Category	Regulatory approach	Definition	Example of policy instruments	Example for mobility
Hierarchical	Binding rules	Legislative acts, 'traditional' laws or directives	EU Directives and Regulations National/ regional /local laws	Directive 2010/40/EU related to the deployment of Intelligent Transport Systems ⁷⁸
	Market	Influence on economic variables to achieve policy goals	Taxes/charges Call for bids	Dynamic fees regarding parking, like in San Francisco ⁷⁹
Network governance	Adaptive regulation	Policy that can be adjusted over time, relying on data collection and analysis	Self/co-regulations Adaptive licensing	The SUMP (Sustainable Urban Mobility Plan) process
	Regulatory sandboxes	Deployment of the innovation on restricted and controlled conditions for impact analysis	Subsidies and incentives	Automated vehicles experimentations, pilot zones
	Outcome-based regulations	Stakeholders impacted by the regulations achieve policy goals without constraints on the process	Self-regulations	GDPR set up a list of objectives to relevant stakeholders (e.g., Art. 17)
	Risk-based regulation	Regulatory activities and resources activities allocated on evidence-based assessment risks	All policy instruments can be used	Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft
	Collaborative regulation	All stakeholders involved in the definition of the regulation/policy	Co-regulation	Memorandum of Understanding in Lisbon to regulate shared mobility

⁷⁷ See GECKO report D2.4 'Regulatory schemes and governance models for disruptive innovation'

⁷⁸ <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32010L0040&qid=1555677931095&from=EN>

⁷⁹ http://www.eltis.org/sites/default/files/report_summary_reviews_of_measures.pdf

9.3 Pros, Cons and Applicability

Each regulatory approach has advantages and disadvantages, either in terms of flexibility, implementation costs, or inclusion of stakeholders in the decision-making process. Taking advantage of each governance model helps to define which approach is most appropriate.

Let’s look at the advantages and disadvantages of different regulatory approaches in the context of mobility, and **where** each of them could work best: ⁸⁰

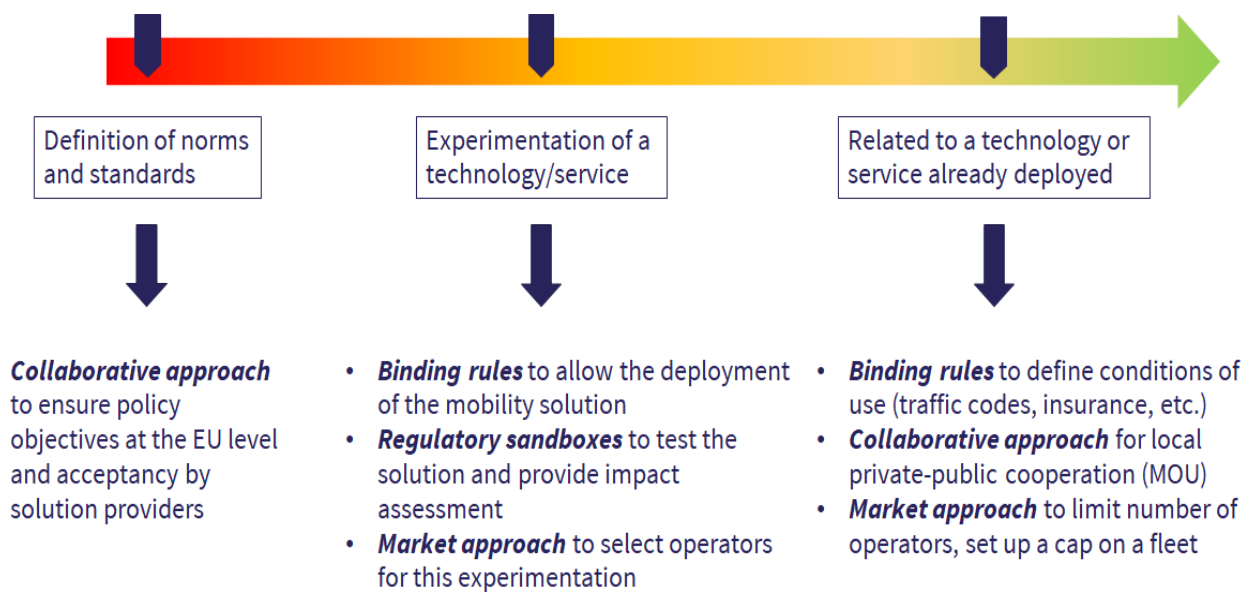
Regulatory approach	Pros	Cons	Where could it work best?
Binding rules	<ul style="list-style-type: none"> • Clear chain of command • Efficiency regarding long-term actions 	<ul style="list-style-type: none"> • Poor flexibility • Exclusive approach • Risks of lack of acceptance 	<ul style="list-style-type: none"> • Long-term policy objectives • Definition of standards • Cybersecurity, environmental data • Transnational mobility • Solution operation
Market	<ul style="list-style-type: none"> • Innovation enhancement 	<ul style="list-style-type: none"> • Risk of market failure, disequilibrium of the ecosystem 	<ul style="list-style-type: none"> • Negative externalities • Behaviours (e.g. ULEZ incentivize behavioural changes such as shift towards e-vehicles or other sustainable modes)
Adaptive regulation	<ul style="list-style-type: none"> • High flexibility • Compliant with fast evolving framework 	<ul style="list-style-type: none"> • Higher cost for impact assessment 	<ul style="list-style-type: none"> • Impact assessment
Regulatory sandboxes	<ul style="list-style-type: none"> • Innovation fostering • Reduced time-to-market • Higher acceptance 	<ul style="list-style-type: none"> • High costs • Risks for consumers testing the solution 	<ul style="list-style-type: none"> • Pilot projects • Impact assessment
Outcome-based regulations	<ul style="list-style-type: none"> • High flexibility • Higher acceptance 	<ul style="list-style-type: none"> • Lack of guidance • Higher cost for impact assessment 	<ul style="list-style-type: none"> • Impact assessment
Risk-based regulations	<ul style="list-style-type: none"> • Better decision-making 	<ul style="list-style-type: none"> • Higher cost for impact assessment 	<ul style="list-style-type: none"> • Pilot projects • Impact assessment
Collaborative regulation	<ul style="list-style-type: none"> • Inclusive approach, sharing of knowledge and resources 	<ul style="list-style-type: none"> • Time consuming • No clear leadership 	<ul style="list-style-type: none"> • Definition of standards

⁸⁰ The contents of this table are based on desktop research and discussions at the second GECKO workshop with stakeholders in London in October 2019

Thus, various governance models appear to be suitable depending on the context. But, time-wise, **when** can each of them work best?

Depending on the stage of deployment of the solution in the market, the choice of appropriate governance model can be different, as illustrated below. Various governance models can be applied during different stages of the implementation of a mobility innovation.

Let's look at some examples of suitable governance models for mobility innovations based on Regulation Readiness Level:⁸¹



⁸¹ See GECKO deliverable D2.4 '[Regulatory schemes and governance models for disruptive innovation](#)' for more details on Regulation Readiness Level

Part V – For a Strategic Approach

10. Where do you want to go?

The **most important advice** for dealing with disruptive innovations in urban mobility was provided almost 2.000 years ago by Lucius Annaeus Seneca the Younger (c. 4 BC – AD 65), a Roman philosopher, statesman and dramatist usually known as Seneca: *“If one does not know to which port one is sailing, no wind is favourable.”*

This is the key issue of any **strategic approach** – having a clear goal. If you don’t, anything goes – or, most probably, doesn’t. Countless innovations are already here, or about to arrive, and to deal with them one has several policy options. Having a goal provides a purpose. Without it, countless arrangements are possible, and endless debates will drag. When a goal is clear, choices are clear – and necessary.

Shifting to sustainable urban mobility is one of the key challenges (if not ‘the’ major challenge) of the transportation sector, and is certainly a top priority for local and regional governments and transport authorities.

But let’s be clear: the challenge these days isn’t proving this shift makes economic sense, nor tentatively ‘trying out’ small steps, nor even ‘promoting’ this shift. The urgency imposed on us by the mounting climate crisis requires fast and substantive action – we need to **accelerate the shift to sustainable urban mobility**. We have to ensure, at the same time, that from this shift emerges a mobility system that is more resilient, and more just, i.e., that this transition works to alleviate, rather than aggravate, existing inequalities in terms of Transport Justice⁸².

This is a demanding but indispensable goal. To pursue it, one must deal with inefficient urban sprawl grown during decades of car-centric policies, ingrained habits and attitudes, and social and organizational inertia. One must also channel public and private investment to new approaches and solutions and provide the community with a good portfolio of options which, taken as a whole, provide people with a **reliable and versatile alternative** to private car ownership and use.

With this understanding, we can see that disruptive innovations can be extremely useful if, and only if, they help the urban mobility system become more multimodal, affordable, safe, and

⁸² Karel Martens, “Transport Justice: Designing Fair Transportation Systems” (2017), Routledge.

sustainable. And if they do help, then it's critical for the public sector to frame and support their cooperation.

Lack of **political will** is often cited as a major impediment to policy change. Of course, one shouldn't underestimate the challenge faced by elected officials with 'skin in the game'⁸³ when pushing for sustainable mobility, but this risk seems to be decreasing, as the public becomes more aware of the need for these changes to happen; and successful mayors from several cities can point to their case as proof that courage and re-elections aren't incompatible.

To understand best how these innovations can support policy change, it's important to look at the structural aspect of policy change, and specifically at the **three 'ingredients'** that John Kingdon⁸⁴ argues must come together for policy change to happen – the acknowledgement that a problem exists, the awareness that solutions are available, and the 'need for change' triggered by the political agenda.

For decades, the lack of available "alternatives" to the private car has long been a recurrent argument against sustainable mobility policies. Regardless of the solidity of those arguments, usually of a circular nature, the fact is that bringing up those alternatives was often expected to be a job for the Public Sector. If it ever was, it's not anymore. These disruptive innovations are bringing a wealth of options, which, if properly integrated and harnessed to serve the public good, can provide alternatives and trigger behaviour change at a massive scale.

By taking a more proactive approach to the governance of disruptive mobility solutions, it should be possible to **direct innovation in the desired direction**. For example, companies developing disruptive mobility innovations can be involved in a constructive dialogue with local transportation authorities that focuses on solving the city's problems such as congestion, pollution, poor transportation service in remote areas, etc. This way, the focus shifts from reactively addressing new challenges brought by mobility innovations to more focused search for those that can actually create benefits for the local society rather than only for direct users.

⁸³ Nassim Nicholas Taleb, "Skin in the Game: hidden asymmetries in daily life" (2018), Penguin Books

⁸⁴ John Kingdon, "Agendas, Alternatives and Public Policies" (2nd edition, 2003)

11. Ten Recommendations for Local Government

11.1 Clarify Goals, plan for them, and be proactive

What do you want from (and for) your urban mobility system? Involve your community, set your goals, make them clear to all stakeholders, pursue them, and use them as reference to evaluate new, eventually disruptive, transport innovations – asking the question: do they help us get closer to our goals?

The problem with reactive approaches is that they miss a lot of opportunities and cannot create any new ones. Furthermore, they provide a deceptive feeling of control – after all, if you’re not following your agenda, you’ll be following somebody else’s.

Goals are of little use if they aren’t served by a strategy. The shift to sustainable mobility won’t go far, and it certainly won’t advance fast, without a Sustainable Urban Mobility Plan (SUMP)⁸⁵, developed with public and broad stakeholder input.

11.2 Pursue transport justice

For several decades, transport planning and management often focused on serving the needs and priorities of middle-class men who commuted to office work in peak morning and afternoon hours. This car-centric paradigm downplayed (or forgot) the needs of several types of users and has left millions of urban dwellers locked into car dependence or captive public transport users.

Exploring a gender perspective on urban mobility is key, because transport is not gender neutral, and several structural factors create and sustain disadvantages for women, in terms of access, convenience and security. Beyond principle, bear in mind the numbers: women are neither a “minority” nor a “market niche”, they account for over half the population.

Demanding universal design of services and vehicles is also essential – experience shows that, when well done, it always produces substantive benefits in terms of safety, functionality and comfort for all. It’s the best way to ensure the rights of all, and to prevent the exclusion of persons with disabilities and of a growing ageing population.

⁸⁵ “Guidelines for developing and implementing a Sustainable Urban Mobility Plan” (2nd Edition), available here: https://www.eltis.org/sites/default/files/sump-guidelines-2019_mediumres.pdf

Don't let technological innovation aggravate existing inequalities, and defend inclusive approaches not only as a Human Rights issue, but also as a driver for innovation and quality.⁸⁶

11.3 Nurture and protect a multimodal ecosystem

Nature teaches us that diversity is key for resilience. A multimodal system is more resilient, and also more capable of fostering cooperation and encouraging the emergence of combined solutions which will provide more versatile and reliable options.

Overreliance on the private car has distorted the transport market, created dependence, and is harming the emergence of several new mobility services. Creating a truly multimodal transport ecosystem implies, first of all, dealing with this monopoly.

It also requires special attention to the health of this multimodal ecosystem, especially upon the introduction of new 'species' – make sure they add value, not cannibalize, on the portfolio of options that provide an alternative to the private car, and that they don't drive out useful and socially responsible mobility businesses.

11.4 Foster affordable, but fair

The economic recession and the rising unemployment will significantly reduce the disposable income of many Europeans, who will not be able to afford their previous mobility habits, namely all the costs associated with private car use. They will need affordable transport.

Don't let technological hype blind you to tech-free or low-tech solutions, especially to the cheapest and most democratic mobility modes, walking and cycling.

Don't let lower prices blind you to the fact that they are often provided through the systematic externalisation of costs, which others can't match, especially highly regulated transport services, and socially responsible businesses (which create jobs, not microtasks, and pay social benefits for their employees).

Low prices may generate direct individual benefits for clients, but at the cost of indirect collective costs for the workforce (diminishing rights and bargaining power), for the local economy (lower paying and less stable jobs, outflows of capital from the local economy), and for the public sector (which, sooner or later, has to pick up the tab for social support).

⁸⁶ Horizon 2020 projects Inclusion (<http://h2020-inclusion.eu/>) and Hi-Reach (<https://hireach-project.eu/>), to mention just two, provide several good examples.

11.5 Demand sustainable solutions

There is a growing number of regulatory and funding instruments pushing for energy efficiency, low emissions and clean energy sources, so little has to be added on that topic here, but this: follow the rules, support existing players in making the transition, and encourage newcomers to raise the bar.

But reducing the energy consumed by mobility also means, necessarily, reducing mobility itself, i.e., the total distance travelled (with the exception of walking and cycling). It is difficult to align public and private positions on this matter, especially from businesses that monetize mobility.

More competition doesn't necessarily mean more efficiency – not rarely, it leads to the opposite, with parallel offers. It's critical to push for efficiency (e.g., integrating logistics for last-mile delivery), and to design an incentive system (using, e.g., space allocation, access restrictions, tolls or fiscal subsidies, etc.) that rewards accessibility (i.e., ease of access) instead of mobility (distance travelled).

11.6 Shape Infrastructure as destiny

Don't design for the traffic you have, design for the traffic you want. In urban areas, providing distinct modes with segregated spaces has been the default procedure over the past decades. Through this procedure, the core of the right-of-way has been systematically assigned to motorized vehicles (which are heavier and sturdier, and move faster), and its remaining margins to the other modes, namely walking and cycling.

Intuitively, this segregation seems the most effective way to simultaneously ensure traffic flow and road safety. Reality, however, has shown this isn't necessarily so. Space and time are finite resources and providing their 'best parts' to motorized vehicles has encouraged their use, and seriously discouraged the use of other, more sustainable, modes, including public transport. This has resulted in urban congestion, traffic fatalities, and resistance to behaviour change towards sustainable mobility.

But today this default procedure is also blocking transport innovation, forcing new modes and services to try to fit into an infrastructure that has little or no place for them. When e-scooters arrived in our streets, a few years ago, there was public outcry because they were circulating on sidewalks, and parked chaotically – in fact, there was hardly other way to ride or park them, as users were afraid to ride in roadways designed and managed for cars, and on-street parking was (and remains) mostly dedicated to private cars.

Deliveries in urban streets are another good example, and their rapid growth, along with emerging technologies, lays bare the limits of segregating modes and spaces in consolidated urban areas. Places for loading and unloading are chronically lacking in city streets, as curb space

is mostly dedicated to private car parking, bus stops and a growing amount of segregated bike lanes. This ignores practical needs and creates several inefficiencies for citizens and public authorities – among which, very dangerous situations for people walking and cycling, loss of time for public buses and trams, and (not rare) damages to sidewalk surfaces and underlying infrastructure.

We know that space is a finite resource, and there's only so much you can slice it. So, should this century-old segregation of modes go on as the default solution? And if we keep it going, where will we get the space to fit the new modes and services? We must think of new approaches, including low-speed and multimodal shared spaces. And in doing that, we must ensure Road Safety, since sustainable mobility has to be safe, or it won't be adopted.⁸⁷

11.7 Build capacity

The public sector is a nebulous set, made up of diverse agencies whose actions need to be coordinated. In general, it is observed that cities which established a Public Transport Authority (PTA) are likely to do better in light of the current disruption, compared to those cities which did not. This is because cities with a PTA tend to already implement consistent transport policies, creating the conditions necessary for sustainability.

The establishment of PTAs comes with a certain form of consolidation at the institutional level. It often starts from integrating all transport functions within a single organizational structure at the local sphere of government. It then consists in separating political, strategic and tactic decisions from operational concerns.

PTAs are capable of making sense of Urban Mobility Systems as a whole, and articulate strategies that consider all modes and their impacts in the city. Plus, cities are complex systems and transport should not be seen in isolation, and PTAs can work horizontally to maximize citizen's welfare., e.g. fostering synergies between transport and land development.

11.8 Cooperate and integrate

If a high number of private car users suddenly shifted to sustainable modes, the capacity wouldn't be there, especially in suburban areas. Public transport would be overwhelmed, sidewalks and bike lanes crammed, and electric vehicles would be outsold and waiting in line at the few existing charging points.

⁸⁷ See the Declaration on “The New Paradigm for Safe City Streets” (available here: <https://www.polisnetwork.eu/wp-content/uploads/2019/11/The-New-Paradigm-for-Safe-City-Streets.pdf>)

Nevertheless, we have to accelerate that shift – and for that, we have to quickly grow the capacity of transport modes that, taken as a whole, provide a functional alternative to private car usage, help decouple the connection between people and their private cars, and widen the affordable and sustainable multimodal portfolio.

Investment in public transport is critical, but alone it is not enough. We must find ways to direct the private initiative to contribute to this challenge, helping sustainable offer grow in capacity and capillarity, i.e., serving lower density areas and lower use periods. The time to shape and deploy these partnerships is now.

Integration is key, to make the whole bigger than the sum of the parts, and benefit from the network effect. But integration can have different stages and grow progressively. MaaS is a very appealing concept, but a very demanding puzzle, for which several institutional, regulatory, technological and infrastructural pieces have to be in place – quite too much to ask from some cities. If you can have MaaS, make it happen; if it's too early, then don't let a high bar blind you from low hanging fruits, i.e., easier partnership opportunities that can provide short term solutions and, at the same time, also set in motion momentum for evolution and higher forms of integration and cooperation.

11.9 Don't let subsidiarity be an obstacle

Implementing the Green Deal goals and dealing with emerging innovations will bring several challenges to the future of urban mobility in Europe, and to European governance as well.

Local and regional authorities are a specific level of European governance. They are run by elected officials who have their own democratic legitimacy – and the subsidiary nature of many of their powers does not mean, nor imply, subordination to central governments.

Subsidiarity has been – and must remain – a key building block for European governance but it must not be used to build walls to European innovation, nor to impede, delay or pervert the diffusion of European goals, priorities, and innovations throughout European cities.

The first to deal with transport innovations are the local and regional authorities. They hold the keys for proper deployment, sound regulation and, very importantly, the shaping of public private partnerships that can nudge the private sector to serve the public interest. The most efficient way to support the diffusion of innovations is to support the early adopters and make their success visible. Fast development of effective policies for sustainable urban mobility requires closer city-to-city cooperation (among cities dealing with these issues), and cities-to-Commission cooperation.

11.10 Explore the options

Theologian Reinhold Niebuhr famously said, “*grant me the serenity to accept the things I cannot change, the courage to change the things I can, and the wisdom to know the difference.*” If he was pondering the governance of disruptive urban mobility innovations, he should have probably added “*...and to take the time to go through the options*”.

There are no one-size-fits-all solutions. But there are options – several options, comprehensively researched by the GECKO project, and made available through three easy to use tools, and a wealth of publications available in the project’s website.

So, no matter how enthusiastic or concerned you are about the innovations ‘knocking at your door’, take the time to go through the options, and check the GECKO website.



GECKO CONSORTIUM

The consortium of GECKO consists of 9 partners with multidisciplinary and complementary competencies. This includes leading universities, networks and industry sector specialists.



@H2020GECKO

#H2020GECKO



<https://www.linkedin.com/groups/8744013/>

For further information please visit www.H2020-gecko.eu



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824273.

The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union. Neither the INEA nor the European Commission are responsible for any use that may be made of the information contained therein.