URBAN MOBILITY INNOVATION INDEX 2021

Leading transformations with innovation for inclusive, sustainable and resilient urban mobility

UMii

UITP (Union Internationale des Transports Publics) is the International Association of Public Transport and a passionate champion of sustainable urban mobility. Established in 1885, with more than 135 years of history, it is the only worldwide network to bring together all public transport stakeholders and all sustainable transport modes. UITP has over 1,900 members, spread out over more than 100 countries. While UITP's main office has always been located in Brussels, Belgium, various regional divisions have been established in the last 15 years. Seeking a local presence with its members, UITP opened 14 liaison and regional offices, two Centres for Transport Excellence and regional Training Centres across the globe.

With its unique global expertise and worldwide network bringing together all types of mobility stakeholders, UITP is best placed to support cities to further enhance their mobility systems and services, with the ultimate objective that they become more liveable.

UITP has always recognised the challenges that cities are facing to respond to a growing demand of mobility but also to different mobility needs, and to address, at the same time, political goals of a healthier, fairer, more integrated, accessible and sustainable urban transport.

With "Innovation" and "Sharing" being part of its core values, UITP saw in the creation of the 1st Urban Mobility Innovation index a fantastic opportunity to support cities to share knowledge and to gather insights about how innovation is apprehended today to address urban transport challenges and why some cities seem to be more successful than others in maximising the benefits of innovation.

The first UMii report was delivered in 2017. Since then, the world has been through many important transformations and cities have had to face many challenges. UITP, with the support of the Roads and Transport Authority of Dubai (RTA) wants to capture those changes in a new report, to highlight how cities have progressed and adapted to a new normal.

Thanks to the review of the UMii framework and with more cities involved, the new UMii report captures all the recent changes and identifies best practices, translating them into practical and actionable recommendations for cities, to strategically integrate innovation as part of urban transport planning and to develop greater urban mobility services.

Innovation is more than ever a key element in rethinking Urban Mobility, and UITP with its members wants to be at the forefront of this transformation.

Mohamed Mezghani
UITP Secretary General
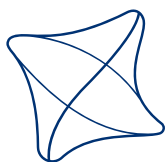
The University of Žilina (UNIZA) is one of the largest technical research and learning institutions in Slovakia, with a tradition for transportation research covering economic and social sciences and all branches of engineering. At present there are about 8,000 students being educated at seven faculties in 184 accredited fields of study in all forms and degrees of university studies at the University. In the field of research and innovation (R&I) UNIZA is involved in 200 national and 65 international scientific projects and organises about 60 scientific and professional events annually.

The Department of International Research Projects – ERAdiate+ has been established as a follow up to the successfully finished FP7 ERA Chair project ERAdiate - Enhancing Research and innovation dimension of the University of Zilina in intelligent transport systems. ERAdiate+ is a small but dynamic, international, and multidisciplinary research team currently participating in a wide range of European and international R&I projects in transport and mobility.

Urban Authorities have been working on delivering innovative mobility models for many years within local, national, European, and worldwide initiatives. Many have put in place Sustainable Urban Mobility and Logistic Plans (SUMPs & SULPs), which embed a shared long-term vision in cities' mobility strategies. Looking at mobility challenges and opportunities across three dimensions (Readiness, Deployment and Liveability) - innovation enablers and mobility indicators - the framework developed for UMii has been a unique opportunity and exciting exercise for our team. Data has always been essential for strategic mobility planning and policy. The UMii framework goes further, it engages directly with city governments to collect data, provides compelling data visualisation and offers a guide to foster innovation in urban mobility systems and services back to the cities. Using the UMii framework, cities and urban authorities can take strategic decisions and develop policies which lead to innovation, economic competitiveness, and sustainable growth.

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Foreword

GLOSSARY

Accessibility	Accessibility to transport services for groups vulnerable to exclusion because of a physical disability or impairment (SUMI indicator). Furthermore, access indicator is used to represent access to locations of interest in general including frequency of public transport services as a proxy to easiness of travel.
Affordability	Affordability indicator is represented and measured as the share of the poorest quartile of the population's household budget required to hold public transport passes (unlimited monthly travel or equivalent) in the city (SUMI indicator).
Alternative mobility services	Alternatives to private vehicles and conventional public transport such as bikesharing, carsharing, carpooling, pedibus, demand responsive transport, connected autonomous shuttles and other first and last mile solutions.
City	A city or municipality is a large human settlement, which can be defined as a permanent and densely settled place with administratively defined boundaries.
Geographical scope of strategy	What the strategy owner considers to be the right scale of action, e.g., city, metropolitan area etc.
Innovation	The implementation of a new or significantly improved product, service, planning process, organisational structure or partnership method. Innovations do not have to be game changers or new worldwide solutions: an innovation is contextual. For example, innovations can consist of mobility or technological innovations, novel planning and appraisal processes, or ways to engage stakeholders in designing, financing, experimenting or deploying innovative mobility solutions. Innovations are solutions: they aim to address and improve wider societal imperatives.
Intermodal integration	The more modes available at an interchange, the highest level of intermodal integration. An interchange is any place where a traveller can switch from one mode of travel to another, with a minimum/ reasonable amount of walking or waiting (SUMI indicator).
Living Lab	An engagement approach based on user research methods, from which innovations are developed. It differs from a test bed in the sense that users are not only observed subjects, but an active element of the process, contributing to the development of an innovative solution.
Metropolitan area	A metropolitan area is the economic area containing the bulk of daily home – work journeys, sometimes referred to as the "labour catchment area". It can also be a functional urban area, which is an area consisting of a city and its commuting zone. It consists of a densely inhabited city and a less densely populated commuting zone whose labour market is highly integrated with the city.
Micromobility	Micromobility refers to a range of small, lightweight devices operating at speeds typically below 25 km/h and can be either human-powered or electric, privately owned or shared.
Mobility vs transportation	Mobility is transportation seen from the wider perspective of travellers, citizens, and future generations. Mobility planning is a transdisciplinary approach to planning transportation systems.
Natural and semi-natural areas	Natural areas 'retain ecological assemblages, functions and species composition that are attributable to natural evolutionary processes and have not been substantially modified by human activities'. Semi-natural areas 'have ecological assemblages that have been substantially modified in their composition, balance or function by human activities[1].' This indicator is used as a proxy for indicating the presence of biodiversity in a city.
Pilots	Pilots are small scale projects implemented to test the viability of a new idea, solution or approach.
Strategic Urban Mobility Plan	The core plan or document which outlines the strategic directions of the city in terms of urban mobility.
Strategy owner	The organisation that owns or leads the local innovation agenda for urban mobility, usually communicated in the form of a strategic document.

[1] European Investment Bank. (2018). European Investment Bank, Environmental and Social Standards. Luxembourg.

Sustainable Development Goals	The Sustainable Development Goals (SDGs) are a collection of 17 interlinked global goals designed to be a "blueprint to achieve a better and more sustainable future for all" developed by the United Nations General Assembly. The SDGs are adopted by all United Nations Member States in a global partnership, and address the global challenges we face, including health and well-being, gender equality, climate change, environmental degradation, sustainable cities and communities and .
Transformation	Transformation is a framework for systemic change, it represents the innovative capacity to transform and to create a fundamentally new system when ecological, economic, or social structures make the existing system untenable. In practice, a system transformation is based on a package of innovations serving as stepping stones towards a desirable vision of the future.
Transport mode	Any available transport mode with a significant share (more than 0.1%). The categories used in the modal split of the UMii framework are walking, cycling (including electric bikes and bikesharing), public transport and car (including taxi and carsharing). The modal split refers to commuting trips to work or school.
Users	Any person who benefits from any opportunity the city provides including citizens, commuters, tourists. Female users include both women and girls.

ABBREVIATIONS

AI: Artificial Intelligence

BRT: Bus Rapid Transit

CAV: Connected and Autonomous Vehicle

Covid-19: Coronavirus disease 2019

EV: Electric Vehicle

GHG: Greenhouse Gas

HGV: Heavy Goods Vehicle

I2V: Infrastructure to Vehicle

ICT: Information and Communication Technology

IoT: Internet of Things

IT: Information and Technology

ITCM: Intelligent Traffic Congestion Management

ITS: Intelligent Transport Systems

MaaS: Mobility as a Service

MDS: Mobility Data Specifications

OMF: Open Mobility Foundation

PM: Particulate Matter

SDG: Sustainable Development Goal

SUMI: Sustainable Urban Mobility Index

SUMP: Sustainable Urban Mobility Plan

TOD: Transit Oriented Development

ULEZ: Ultra-Low Emission Zone

UMI: Urban Mobility Innovation

UMii: Urban Mobility Innovation Index

V2I: Vehicle to Infrastructure

INDEX

🚶	Walking
🚴	Cycling
🚌	Public Transport
🚗	Car
💬	Other
♀	Share of women working in transport/innovation department
🌳	Proportion of natural or semi-natural area
PM2.5	Annual mean PM2.5 concentration
🚗💥	Road fatalities per 100,000

THE NEED FOR SYSTEMIC, TRANSFORMATIONAL CHANGE

Urban mobility transformations are not new. More than a century ago, horse-drawn carriages were displaced by electric tramways, which were later displaced by automobiles[4]. A third transformation is underway, driven by digitalisation, diversification and densification trends, centred around innovations to improve urban quality of life[5], but also addressing greater demographic, climate, ecological and sanitary challenges.

Transformations imply that small incremental steps are not enough to resolve chronic congestion, pollution, climate and safety struggles in cities. Transformations illustrate the need for wide and rapid change towards a different and desirable vision of the future. It implies a fundamental change in the way transport is provided and experienced, enabled by innovative thinking in all aspects of transport and urban planning[6].

Introduction

Urban mobility is transforming: vehicles, services, infrastructures and practices are rapidly diversifying and digitising. Some metropolitan areas have succeeded in curbing the trend for car-based urban sprawl with stronger urban planning legislation, and as a result these cities are also diversifying and densifying. Based on the three Ds - **diversification, digitalisation and densification** - a new mobility paradigm is unfolding: cities today find themselves in the driving seat when it comes to experimenting new approaches to repurpose limited city space to better meet travel needs, also compelled by the pressing requirement to bring net transport carbon emissions to zero within a narrowing timeframe.

Transportation has been attracting researchers and practitioners from a growing variety of backgrounds, such as human geography and urban planning, environmental and geosciences, social and behavioural sciences, economics and management, information sciences, and more recently from the health sciences. 'Urban Mobility' is now understood as a complex, multi-faceted, 'wicked' topic[2], for which there is no single silver-bullet solution. But it is also understood as much more than providing the means to travel quickly from A to B: the field of **mobility is giving travellers and citizens a central role**, where their needs and preferences in terms of transport modes and the quality of their travel time in a full door-to-door trip become the defining ingredients in selecting "smart" transport solutions - and not the other way around.

The Urban Mobility Innovation Index (UMii) initiated by the Roads and Transport Authority of Dubai (RTA) in 2015 and led by UITP is using a framework putting together these multidisciplinary perspectives. Its original goal was to share knowledge and to gather insights into the way cities foster innovation to address urban transport challenges worldwide. With this new report, UMii aims to inspire and energise city administrations to learn, experiment, implement and lead mobility innovations that contribute to a transformation towards better, safer, healthier, quieter, cleaner, and happier cities[3] for all.

A primary goal of this report is to bring to light the **numerous innovations** currently ongoing that, if taken together by a critical mass of cities, could help transform mobility systems from the current unsustainable and carbon-dependent system into new mobility futures: a new normal that is **tuned to citizen needs and respectful of environmental boundaries.**

In terms of key enablers: the main approach to facilitate adoption of new solutions is experimentation. **Experimentation is a form of testing in real-life settings**, which typically involves stakeholders and citizens suggesting, then trying out and adjusting new solutions to their own context. Living Labs and pilots are approaches often adopted where multi-stakeholder design and experimentation takes place, allowing buy-in to be built in the change process and to reduce implementation risks - and costs.

Innovations - and innovative experiments - are therefore at the core of UMii and this report. Bearing in mind the complexity of systemic change, it is important to state that innovations are not to be understood as simply 'smart' technological or digital innovations. Here the **innovations are approached in their wider sense**: they can relate directly to mobility innovations in terms of mobility modes, services and infrastructures, or they can refer to 'smart' uses of data e.g. intelligent transport systems. They can refer to novel planning processes, tools and engagement practices, or to novel regulatory, financial or institutional enablers facilitating the work of transport planning agencies.

Finally, innovations are contextual, and should be judged by their ability to solve real life problems in their societal context of application. Innovations do not have to be game changers or new worldwide solutions. For example, while the humble bicycle solves daily mobility needs in cities like Copenhagen or Hamburg in an affordable, healthy and green way, it would be considered a radical innovation in other contexts where cycling is simply not an option due to various infrastructural, cultural, regulatory or political barriers. Similarly, innovations like flying taxis seem attractive from a novel technological point of view, but they might not meet the needs of the majority of the urban population, and they risk exacerbating further existing social or environmental stresses if their potential use is not carefully assessed. In both these cases it is important for the transport authority to anticipate regulatory needs and citizens' acceptance, both by facilitating experimentation in real life and ensuring market-driven innovations are well integrated in the existing system and work to contribute directly to addressing wider societal imperatives.

This report highlights lessons from a diverse set of innovative cities worldwide and offers evidence on the conditions under which the four types of mobility innovations listed above might serve as transformative stepping stones towards a genuinely inclusive, sustainable and resilient future vision of mobility.

[2] Lyons, G. (2018). Getting smart about urban mobility – Aligning the paradigms of smart and sustainable. Transportation Research Part A: Policy and Practice, 115, 4–14.
https://doi.org/10.1016/j.tra.2016.12.001
[3] Montgomery, C. (2013). Happy City: Transforming Our Lives Through Urban Design.
https://thehappycity.com/the-book/
[4] Geels, F. W. (2005). The dynamics of transitions in socio-technical systems: A multi-level analysis of the transition pathway from horse-drawn carriages to automobiles (1860–1930). Technology Analysis & Strategic Management, 17(4), 445–476. https://doi.org/10.1080/09537320500357319
[5] Gehl, J. (2010). Cities for People. https://gehlpeople.com/shopfront/cities-for-people-2010
[6] UITP (2022). Better Urban Mobility Playbook. https://www.uitp.org/publications/better-urban-mobility-playbook/

Approach

The Urban Mobility innovation index (UMii) is an indicator framework that assesses the maturity of a city's innovation ecosystem in urban mobility, using a collection of qualitative and quantitative indicators that capture multiple features of the innovation value chain. The index is based on 9 composite indicators covering 3 dimensions: Readiness, Deployment and Liveability. **Readiness** is concerned with future-looking innovation levers: the ambition and scope of the city's **strategy** and its concrete goals, the institutional **capability** and skills to work towards those goals, and the **soundness** of its data collection, accessibility and usability. **Deployment** is concerned with key enablers of the strategy: the ability to address **regulatory** barriers to innovation, the ability to attract **investments** from a wide range of stakeholders and to incentivise innovation, and the level of citizen and stakeholder **engagement** in co-designing and testing the deployment of innovative mobility solutions. **Liveability** is concerned with assessing the final impacts of the resulting transport system in terms of **connectivity** (mobility options and their integration), **wellbeing** (health, fairness, accessibility), and the **environment** (air quality, energy consumption, noise and natural areas).

UMii is based on the premise that in each city there is one stakeholder who (officially or unofficially) leads the innovation agenda for urban transport – regardless of any city-specific differences. The information for the assessment of the participating cities is collected through a combination of three data collection activities:

1 A desk-based research, to collect all publicly available information such as the latest published strategic urban mobility plans and information from websites about current urban challenges, citizen and stakeholder engagement activities and ongoing or planned innovation initiatives.

2 A quantitative survey, to compile key data about standard mobility indicators such as mode share, accessibility to public transport services, statistics about road fatalities and air pollution, and the share of women working in the mobility/innovation department.

3 A structured interview with city planners and innovation managers, to explore in more detail the gaps from the first two steps, based on the UMii framework questions exploring all 9 indicators[7].

The results for each question are scored based on an assessment grid and summarised in a spider graph. To ensure consistency within and between cities, at least two researchers scored each city based on the evidence collected. The city profile reports on the strengths and opportunities for future improvement for each of the three dimensions. Finally, a significant part of the city profile is used to **showcase planned and ongoing innovations** which may be inspiring to other cities pursuing similar objectives. A classification of innovations allows a better understanding of the synergies and potential gaps for packages of innovations.

The UMii framework is more than an indexed measuring system and a report: it is a process focused on generating conversation, reflection and learning, rather than scoring and ranking cities competitively.

As with any assessment framework, UMii can only claim to capture a partial view on the complex and dynamic process of urban mobility innovation. Results are dependent on the quality of the material collected, but also recognising the natural tension of the framework as both an external communication and an internal learning tool: on one hand cities want to 'look good', on the other hand a level of humility and openness is needed to unlock learning and reflection. The strong evidence-based approach of the UMii framework aims to strike the right balance between both aims.
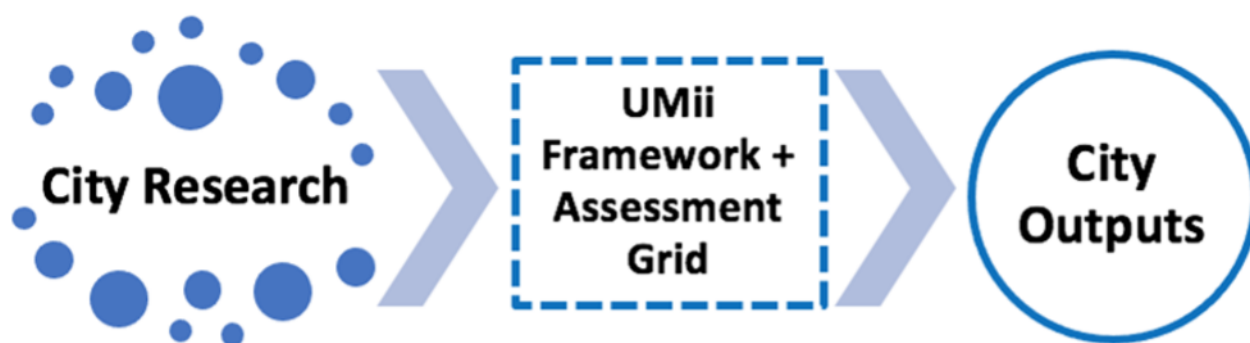
[7] In some cases, it was not possible to secure interviews with planners. Some city profiles relied exclusively on desk research, based on material available publicly. These cities are marked with a *

CHANGES IN THE 2021 EDITION

Building on a five-year history and three phases of the project, the UMii Framework has been continuously reviewed and improved. With more cities involved, this new UMii report continues to capture recent changes and to identify best practices, with a goal to translate them into practical and actionable recommendations for cities and to strategically integrate innovation as part of urban transport planning.

For this 3rd phase of the project, the framework was updated with the following **five improvements** in order to better address new contextual realities.

First, because innovations do not take place in isolation, the **Strategy Development** sub-indicator was updated to consider the extent to which t**he global Sustainable Development Goals (SDGs 2015-2030)** were considered as part of the development of the strategy and future vision, and how innovation plans contribute to stepping stones towards achieving these wider goals. The 17 SDGs embed the most urgent environmental, social and economical challenges of our epoch, including addressing climate and ecological stress, adequately providing for basic human needs, realising human rights (particularly in terms of gender equity and empowering women and girls), and ensuring an inclusive and sustainable economy by design. The Goals are more than a value system: they represent the result of an extensive and worldwide consultation process, they apply to all countries, and they were universally endorsed by all 193 member states of the United Nations. As such, they ground innovation to their wider purpose, and help city stakeholders realise the important role urban mobility innovations can play beyond the more obvious need for decarbonisation.

Second, the **Strategy Scope** sub-indicator was updated to incorporate aspects for using innovation to deal with emergency scenarios and making transport more resilient to shocks and disturbances. The framework now assesses the extent to which **emergency planning**, **risk management and resilience** are embedded in strategic documents, and explores for example whether innovative solutions were adopted as part of the response to the Covid-19 pandemic.

Third, **gender equity** was more systematically included across the framework, particularly the role of women in

transport planning and catering to women's needs, both in the operation of transport and as travellers. This is in response to research showing that in many contexts, transport planning and operation to this day remains predominantly male-dominated, and as such it tends to marginalise other identities and to reinforce gendered stereotypes. This highlights a need for more systematic equity impact assessments to quantify but also to qualify inequalities in transport and to integrate the feedback into planning processes.

Fourth, **quantitative indicators** were aligned to the SMP2.0 standard originally developed by the World Business Council for Sustainable Development[8], and later adopted by the European Commission and supported by UITP under the name **Sustainable Urban Mobility Index (SUMI)**[9]. Around 50 cities worldwide have adopted the standard as a way to ensure better comparability of key mobility indicators such as affordability, accessibility, safety, emissions, mode split, multimodal integration, space use and traveller satisfaction. Although quantitative indicators represent a smaller portion of the UMii framework (mostly under the Liveability dimension), adopting a common methodology and indicator definition for measuring impacts of the transport system can go a long way to benchmarking novel mobility interventions.

Fifth, more focus overall was given to **showcasing urban mobility innovations (UMIs)** themselves. For this purpose, the definition of an innovation was further clarified, and a novel Urban Mobility Innovation classification was adopted to help make sense of the wide range of innovations cities are engaging with.

An UMI can fall within the following four types:

PROCESSES AND TOOLS
Innovations related to planning processes, appraisal and decision-support tools, organisational structures, partnership methods, stakeholder engagement or citizen feedback practices;

REGULATORY OR FINANCIAL
Innovations related to breaking down regulatory, financial or other institutional barriers to unlock innovation and experimentation;

MOBILITY SERVICES AND INFRASTRUCTURES
Novel transport modes or services, improvements in existing modes, or infrastructure interventions related to spatial planning;

INTELLIGENT TRANSPORTATION SYSTEMS AND DATA
Innovations related to the digitalisation of mobility, mobility modelling and monitoring systems, or the collection and sharing of mobility data.

Fig.1: Examples of Sustainable Develop Goals and targets where innovative mobility planning and interventions can contribute directly (https://sdgs.un.org/topics/sustainable-transport).

3 GOOD HEALTH AND WELL-BEING

3.6 Halve death and injuries from road traffic

3.9 Reduce deaths from hazardous chemicals and air pollution

5 GENDER EQUALITY

5.2 Eliminate all forms of violence against all women and girls in the public sphere

5.5 Ensure women's equal participation at all levels of decision-making

8 DECENT WORK AND ECONOMIC GROWTH

8.3 Support decent job creation, entrepreneurship, creativity and innovation

8.4 Decouple economic growth from environmental degradation

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, with a focus on affordable and equitable access for all

11 SUSTAINABLE CITIES AND COMMUNITIES

11.2 Provide access to safe, affordable, accessible and sustainable transport systems for all … (*)

11.3 enhance inclusive urbanization and capacity for participatory, integrated and sustainable planning

11.6 reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

12.c Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by restructuring taxation and phasing out harmful subsidies to reflect their environmental impacts

12.7 Promote public procurement practices that are sustainable

13 CLIMATE ACTION

13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters

13.3 Improve institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

SUSTAINABLE DEVELOPMENT GOALS

(*) … by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

[8] SMP2.0 Sustainable Mobility Indicators – 2nd Edition (2015). World Business Council for Sustainable Development. https://www.wbcsd.org/Programs/Cities-and-Mobility/Sustainable-Cities/City-Business-Collaboration/SiMPlify/Resources/SMP2.0-Sustainable-Mobility-Indicators-2nd-Edition
[9] Sustainable Urban Mobility Indicators (SUMI) project (2017-2020). Directorate-General for Mobility and Transport. https://transport.ec.europa.eu/transport-themes/clean-transport-urban-transport/sumi_en

Innovations can also be classified in terms of their strategic contribution to wider societal imperatives. For the purpose of analysing packages of interventions, it helps to ascribe a primary contribution to each innovation. With the unfolding climate and biodiversity crisis[10] and the short window of opportunity to transform the transport sector, innovations can first be assessed in terms of their contribution to decarbonising transport (SDG goals 13 and 7). These environmental goals are best summed up by the **Avoid-Shift-Improve** framework, first introduced by the United Nations Environmental Programme[11]. Innovations can also significantly improve social goals, such as **mobility for all** (universal access, SDG goals 1 to 5) and **wellbeing** (for both travellers and citizens, SDG goal 11). Innovations can improve the system's resilience (SDG goals 9 and 12). A special set of innovations are those which came as a direct result of the Covid-19 epidemic, which may be temporary. Some innovations (particularly process- or data-oriented ones) can serve as general enablers to any of those strategies. Finally, there is always a risk of some interventions for which benefits are unclear, or where research is warning of a high risk of unwanted, rebound or unintended effects.

[10] Steffen, W., Richardson, K., Rockstr m, J., Cornell, S. E., Fetzer, I., Bennett, E. M., Biggs, R., Carpenter, S. R., Vries, W. De, Wit, C. A. De, Folke, C., Gerten, D., Heinke, J., Mace, G. M., Persson, L. M., Ramanathan, V., Reyers, B., & S rlin, S. (2015). Planetary boundaries: Guiding human development on a changing planet. Science, 347(6223). https://doi.org/10.1126/science.1259855

[11] Bakker, S., Zuidgeest, M., de Coninck, H., & Huizenga, C. (2014). Transport, Development and Climate Change Mitigation: Towards an Integrated Approach. Transport Reviews, 34(3), 335–355. https://doi.org/10.1080/01441647.2014.903531

[12] Hensher, D. (2018). Tackling Road Congestion – What Might It Look like in the Future under a Collaborative and Connected Mobility Model? Transport Policy 66 (February): A1–8. https://doi.org/10.1016/j.tranpol.2018.02.007

An UMI can contribute to the following strategies:

AVOID

Reducing overall travel needs e.g. city densification, improving walkability, demand management, space reallocation, TOD, 15min city etc.

SHIFT

Increasing use of low carbon modes e.g. diversification of services: micro-mobility services, multimodal integration, etc.

IMPROVE

Making current modes low carbon e.g. vehicle and fuel technologies, efficiency improvements, traffic management, etc.

ACCESS

Improving universal access to mobility for a wider range of people, including women, children, the elderly, vulnerable or disadvantaged groups.

WELLBEING

Improving citizen safety and wellbeing, and traveller satisfaction.

RESILIENCE

Making mobility resilient to shocks.

COVID-19

Addressing issues related to the Covid-19 pandemic e.g. ensuring appropriate social distancing and clean travelling environments.

ENABLER

May benefit any of the strategies; enablers are crosscutting e.g. realtime data collection systems.

REBOUND

Some innovations may have known or expected unintended deleterious effects under certain conditions e.g. automated private cars will most likely increase traffic[12]. This last category allows to mark these innovations as a potential blind alley.

In order to give visibility to the wide range of innovations planned or already taking place, the report adopts the same structure as the 2018 UMii update, where two dedicated sections were added (Upcoming projects and Innovative solutions) and direct web links to each innovation are provided where possible.

UMII
framework

UMII FRAMEWORK EXPLAINED

The UMii Framework is made up of three dimensions which capture elements of the different innovation stages: readiness, deployment and liveability. Housed within the UMii dimensions are nine innovation levers. Each of these nine levers then expands into multiple qualitative and quantitative indicators, which measure how cities are performing in specific domains. A sample of these indicators is presented below.

SCORING AND REPORTING METHODOLOGY

The aim of the framework is not to rank cities, but to engage in a process of reflexion, to share best practices, and to showcase innovative solutions.

The core of the process is the structured interview, based on a set of specific questions for each of the 9 levers (3 to 7 interview questions per lever, for a total of 35 questions). Interview questions are scored against a grid, typically consisting of specific criteria for 0, 0.25, 0.5, 0.75 and 1, where 1 is considered best of class. Two researchers are assigned to each city, and both score each question based on the combined evidence from the anonymised interview transcripts and the publicly available documents gathered during the desk research[13]. This is complemented by an additional questionnaire with 10 quantitative indicators in total, with data provided by the cities themselves. These quantitative values are normalised between 0 and 1 in comparison with all other cities. In some cases, a min-max value is set beyond which the score is set to 0 or

1 automatically (e.g. a combined mode share of public transport and active mode above 80% gives 1).

To account for possible bias in assigning equal weights to all questions, cities were also given the opportunity to assess the importance of each of the 45 qualitative and quantitative questions from 0 to 5. In this edition, assessments were provided by 6 cities and 6 internal experts (as a rule of thumb, 12 independent judgments are considered adequate). Weights were computed by ranking questions based on the cumulative points from the assessments and applying rank-order distribution (ROD) weights within each of the nine levers (e.g. 52.3%, 32.4% and 15.3% for the most to least important of three questions), which allows a better spread than simple normalisation. A spider graph summarises visually the final result for each city for each of the 9 levers. These results serve as a basis for selecting the main strength (usually the highest score or most notable achievement) and main opportunity (usually the lowest score or where most opportunity for improvement was found) for each of the three indicator dimensions (readiness, deployment and liveability). This was then reported in the first half of the city profile, with the second half consisting of notable innovations. Although the assessment grid is confidential, participating cities received the full indicator framework description and interview questions in written prior to the interview, and they are also consulted for the revision of the final text of their profile.

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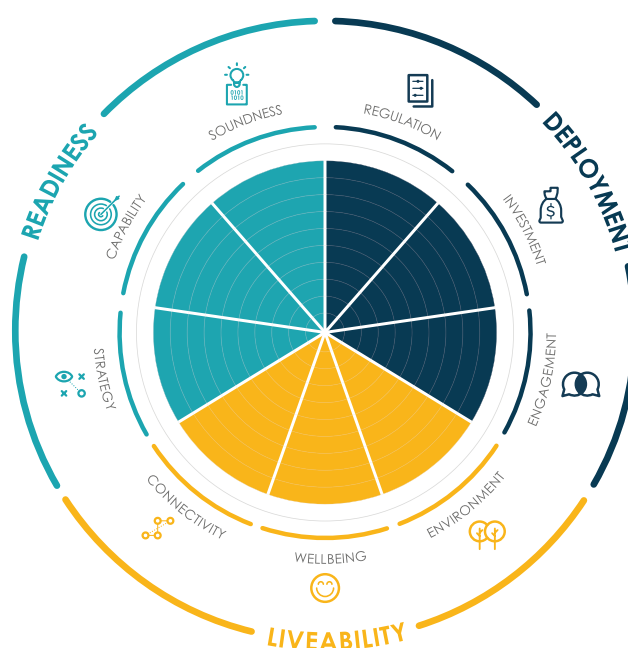
[13] In this 2nd edition, 10 cities were not interviewed, so the assessment was done by one researcher on the basis of online material. Some of those 10 profiles have been checked by external stakeholders and completed afterwards by additional information provided by contacts in the cities.

Readiness

Does the city have a grounded view of how to approach innovation and the capability to deploy it?

STRATEGY

Strategy investigates how city stakeholders look at innovation in urban mobility, uncovering the underlying drivers for the strategy, the process through which they will achieve a common vision, and who takes ownership of the strategy and whether the strategy is translated into specific actions. This lever combines a set of indicators, which assess the following features:

- What's the city's strategy for innovation in mobility?
- How have stakeholders across the city been engaged in the development of the strategy?
- Is the strategy supported by a vision, goals and objectives and how informed are those?
- Does the strategy incorporate any aspects for using innovation to deal with emergency scenarios or/and resilience in the transport system?
- How will the strategy be materialised and monitored?

CAPABILITY

Capability looks at how the city builds internal capacity to support innovation and leverages the skills and capabilities of external stakeholders. This indicator also investigates the maturity of the open innovation ecosystem. This lever combines a set of indicators, which assess the following features:

- Is there a dedicated department, team or role in the city accountable for driving the future mobility innovation strategy?
- How does the strategy owner engage and attract external stakeholders to secure the required skills to work towards the mobility innovation strategy?
- Does the city have the capabilities to test and pilot innovative ideas through a 'Living Lab' platform?

SOUNDNESS

Soundness focuses on data as a catalyst for innovation, exploring how the city is harnessing data to inform its strategy, as well as how it is encouraging the use and sharing of data, both internally and externally, to support the development of new and improved mobility solutions in the city. This lever combines a set of indicators, which assess the following features:

- What transport and non-transport data is collected by the city and how?
- How is this data stored, processed, used and shared to support the delivery of the city's strategy and vision?
- Does the strategy owner encourage use of the data by internal and external stakeholders?

Deployment

How effectively does the
city enable innovation to
be deployed?

REGULATION

Regulation investigates how the city is looking at barriers that prevent innovation from being introduced in the city, and the extent to which it uses the powers available to address these failures. Regulation also looks at how changes in the regulatory environment impact the creation of new business models. This lever combines a set of indicators, which assess the following features:

- What are the main regulatory, policy or legislative barriers to the development of innovation in urban mobility across the city?
- How are these barriers identified and overcome?
- Are there any examples of innovative mobility projects being deployed which were initially constrained by regulation/policy/legislation challenges?

INVESTMENT

Investment focuses on the level of financial resources cities have committed to supporting R&D projects in urban mobility and how much risk they are ready to take when investing in innovation. Investment also assesses the type of incentives on offer, which encourage third-party innovation and how the city leverages investment to multiply the funds available. This lever combines a set of indicators, which assess the following features:

- Is there a specific budget allocated to urban innovation activities?
- Does the city provide any financial incentives to promote third-party innovation from developers, start-ups, students or members of the public?
- How does the city attract funding for innovative mobility projects?

COMMUNITY ENGAGEMENT

Engagement explores how the city engages and interacts with its users (citizens, commuters, tourists and businesses) and how the city acts upon users' insights to inform decision-making, improve local services and drive local innovation. This lever combines a set of indicators, which assess the following features:

- How does the strategy owner engage and communicate with citizens and businesses to gather insights on their needs?
- How does the strategy owner enable the same stakeholders to communicate back?
- How is the information and data from citizens used to inform strategies, innovative projects or future decision making?

Liveability

**How well is the city performing when it comes
to connectivity, quality of life and the environment?**

CONNECTIVITY

Connectivity assesses the quality of a typical journey through the transport system – based on how integrated the system is, the ease of interchange between modes and how easy the system is to navigate at both a physical and digital level. This lever combines a set of indicators, which assess the following features:

- How well integrated are mobility services across the city?
- Which modes of transport benefit from a smart, integrated ticketing system?
- What is the level of intermodal integration in the city?

WELLBEING

Wellbeing explores how the city is performing in terms of access to healthy and sustainable mobility options by understanding the spectrum of options available to users and their travel habits. Wellbeing also looks at road safety, accessibility and equity of the transport system as a proxy for happiness. This lever combines a set of indicators, which assess the following features:

- What is the level of safety, accessibility and affordability of the transport system?
- How accessible and inclusive are the different mobility services in the city?
- What innovative services, initiatives or tools are available to female users to safely use the city's transport network?
- What alternative mobility services do users benefit from and what is the modal split of commuters?

ENVIRONMENT

Environment looks at three key environmental pressures to assess the performance of the city and its progress regarding air pollution, noise and coverage of natural areas as markers for environmental sustainability. This lever combines a set of indicators, which assess the following features:

- What efforts and initiatives has the city made towards using technology and innovation to improve air quality?

- Does the city measure and monitor the noise pollution and implement reduction measures? Does the city inform its citizens about noise pollution?
- What proportion of the city comprises natural or semi-natural areas?

City
profiles
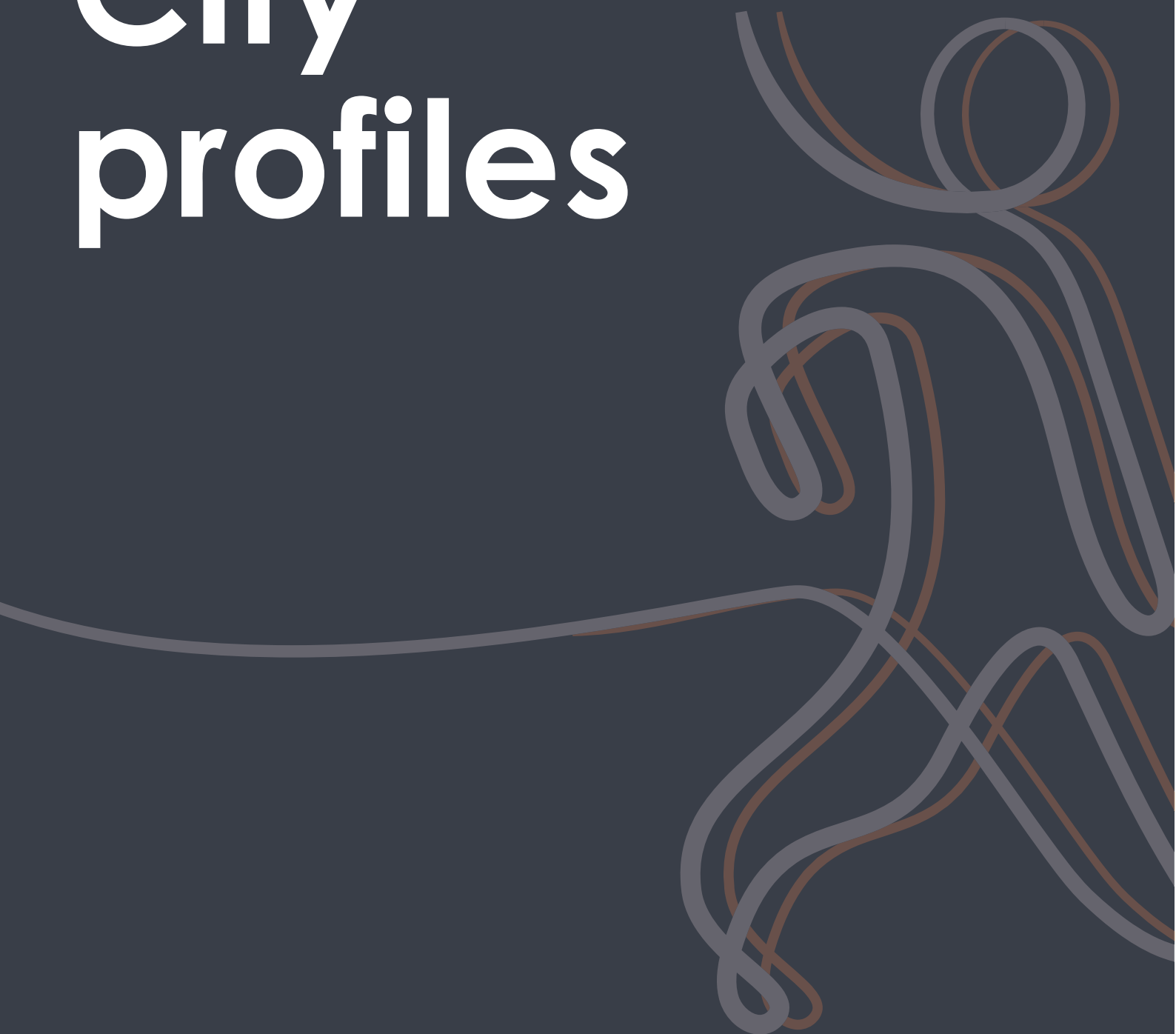
- AMMAN
- AMSTERDAM
- ATHENS
- BARCELONA
- BOGOTA
- BRUSSELS
- BUDAPEST
- CAPE TOWN
- CASABLANCA*
- COPENHAGEN*
- DELHI*
- DUBAI
- HAMBURG
- HELSINKI*
- HONG KONG*
- ISTANBUL
- JACKSONVILLE
- JOHANNESBURG*
- LAGOS
- LISBON

- LONDON
- LOS ANGELES
- MADRID
- MANCHESTER
- MEXICO CITY
- MILAN
- MONTEVIDEO
- MONTRÉAL
- MOSCOW
- NAIROBI*
- NEW YORK*
- OSLO
- SÃO PAULO
- SEOUL
- SINGAPORE
- SYDNEY
- VANCOUVER
- VIENNA
- WARSAW

*Based on desk research

Main Findings

Thanks to the review of the UMii framework and with more cities involved, this new UMii report captures recent changes and translates best practices into practical and actionable recommendations for cities **to strategically integrate innovation as part of urban transport planning**. This section summarises the main learnings from applying the UMii framework to 40 cities during the course of 2021, and can serve as a quick table-of-content to the individual city profiles in the next section.

One main take-away is that cities are proactively engaging with innovation more than ever, and they are also experimenting with a wider range of innovations. Underpinning these innovations are a wider set of goals which cities aim to achieve. Inspiring examples of goals found in strategic and innovation plans are:

Improving the quality of the **public transport experience**, to address increasingly demanding travellers who may otherwise fall back to the private car;

- Providing novel, safe and affordable mobility solutions to **poorer neighbourhoods** who might otherwise become car captives;
- Considering the complex travel needs of everyone else beyond the daily commuter, such as children, students, women, the elderly or people with impairments;
- Integrating new, shared, automated and/or active forms of mobility to the public transport backbone to ensure adequate coverage for the **first- and last-mile**;
- Implementing **open and adaptive governance principles**, with a renewed commitment to bottom-up stakeholder and citizen engagement processes on one hand, and ensuring mobility data is collected, shared and used on the other hand;
- Creating a community of innovators, by reaching out to and involving universities, NGOs, businesses and other players;
- Caring for wider goals beyond transport which transport impacts indirectly, **such as health and quality of life** in general;
- Finding novel ways to **co-finance innovative transport** infrastructures and services, which may bring wider but not-easily monetisable benefits to

society as a whole (e.g. the health care savings from reduced traffic noise or increased active mobility);

- Navigating and steering national legislation to allow for experimentations with new solutions to take place in the city realm;
- Implementing interventions towards a **vision zero** for road fatalities and serious injuries;
- **Reducing the energy needs per person-kilometre** transported and bringing to zero the carbon footprint of transport to proactively address climate change;
- Rolling back **urban sprawl**, providing more green spaces, and finding novel ways to support urban development without further encroachment on nature;
- Reintroducing ecology, **circular economy principles** and nature-based solutions to counter the intersecting ecological crisis induced by human activity, of which transport plays a growing role;
- And increasingly, preparing for worst-case scenarios and unexpected change as climate and other types of disruptions impact cities and stresses their **resilience**.
- The list goes on...

The table below summarises the 150+ innovations that were collected and classified based on their innovation type and their main expected strategic contribution. (Detailed information about strategies can be found in the "Approach section")

Table1: Share of innovations per type and per strategic contribution. In grey, two areas with potential for future innovation: 1) Regulatory or financial innovations 2) Innovations contributing to reducing overall travel needs (Avoid strategy).

As a result, the following **10 key topics were identified as clear ongoing trends and success factors** for highly innovative cities. The focus is on highlighting the most common innovations, but also the most needed and most unusual. These were selected based on the UMii framework aggregate results, particularly those sub-indicators where either many cities performed exceptionally well, or where a handful of cities performed well, but many did not.
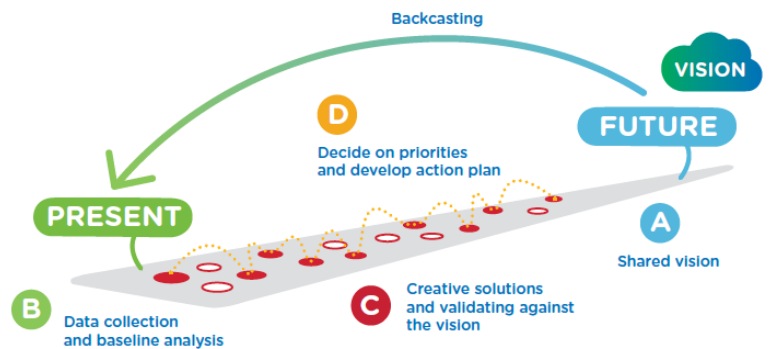
INNOVATION TYPES --> STRATEGIES	PROCESSES AND TOOLS	REGULATORY OR FINANCIAL	MOBILITY SERVICES AND INFRASTRUC-TURES	ITS AND DATA	TOTAL SHARE
AVOID	5%	0%	8%	7%	**6%**
SHIFT	0%	20%	46%	6%	**23%**
IMPROVE	9%	20%	18%	14%	**18%**
ACCESS	2%	0%	3%	23%	**5%**
WELLBEING	2%	0%	3%	27%	**3%**
ENABLER	82%	60%	5%	18%	**38%**
COVID-19	0%	0%	15%	9%	**6%**
REBOUND	0%	0%	2%	5%	**1%**
TOTAL SHARE	**29%**	**3%**	**40%**	**5%**	

Processes and tools

Innovations relating to planning processes and support tools are less visible to end users, but they still represent a significant share of innovations (29%). Since most of them relate to internal planning processes and tools such as novel management practices and engagement methods, most are classified as enablers to other goals.

#1: AMBITIOUS CLIMATE GOALS AND HIGH SHARE OF LOW-CARBON TRANSPORT

Vision-led planning, from Sydney's Future Transport 2056 plan (inspired by the Natural Step's ABCD process[15])

One key UMii success factor is for cities to demonstrate a structured process to identify the challenges and role for innovation. In practice, many cities have adopted a climate-neutral goal by 2050 approach. This openly endorses the need to address the climate crisis and the major role of transport in doing so. However climate experts are warning that this is likely to be 'too little too late': it is incompatible with the Paris agreement to keep temperature rise within 1.5C, and thereby to avoid domino effects and ecological collapse scenarios.

There is therefore a trend for cities to ground their innovation efforts towards a goal of climate neutrality by 2030 (net carbon zero), which is better aligned with remaining carbon budgets[16]. Many cities have also translated higher climate goals into concrete and ambitious modal split goals, where public and active transport would represent 80% or more of all daily trips to work or school, complemented by concrete plans to improve the take-up of various micromobility solutions in combination with public transport.

[14] https://thenaturalstep.org/approach/ , see also Broman, G. I., & Robèrt, K.-H. (2015). A Framework for Strategic Sustainable Development. Journal of Cleaner Production, 1–15.

[15] See Table 2 (p38) in IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. https://www.ipcc.ch/report/ar6/wg1/

Notable innovation examples include Copenhagen, which aims to become the world's first carbon neutral capital by 2025. The city aims to cut transport-related emissions, among others, by incorporating green mobility into urban planning, increasing the attractiveness of active modes and supporting green mobility technology innovations. Barcelona has designated Energy Transition and circular economy as one of the action lines of its Mobility Master Plan 2020-2025. The city commits to greening the private- and company-vehicle fleets and ensuring the necessary infrastructure for developing the most energy- and environmentally efficient vehicles, especially electric vehicles. The Strategic Plan for Sustainable Mobility of Madrid (2013 - 2025) incorporates the objectives set out in the Air Quality and Climate Change Strategy of the Community of Madrid 2013-2020 (Plan Azul+), as well as the EU 20-20-20 climate targets. In accordance with these guidelines, Madrid aims at reducing air pollutants and GHG emissions, and increasing the share of renewable energy in the overall consumption deriving from the transport system. In its draft Delivery Plan 2019, Manchester set out an ambition to improve the transport system so that 50% of all journeys in Greater Manchester are made by public transport or active travel by 2040. This initiative was titled 'the Right Mix' and through it, Greater Manchester has adopted an adaptive, vision-led approach to transport planning. The strategic goals of Sydney align with the UN SDGs and Transport for New South Wales has developed and continuously updates Sustainable Design Guidelines to help them and its stakeholders deliver sustainable development practices by embedding the sustainability initiatives into the planning, design, construction, operation and maintenance of transport infrastructure projects.

Jacksonville's Wellness of Wheels, repurposing a bus as a mobile vaccination unit during the Covid-19 pandemic

#2: RESILIENCE AND CRISIS MANAGEMENT E.G. COVID-19

Another key strategic UMii success factor is for cities to incorporate innovation for dealing with emergency scenarios and ensuring resilience of the transport system. Most cities already have some form of operational resilience plans, such as crisis management and measures to respond to extreme weather events, fire or crime. However, few include crisis management and resilience planning in their innovation strategy. Faced with turbulent environments and the growing pace of unprecedented climate events, cities are learning to 'expect the unexpected' and to build up their organisational resilience capabilities.

The Covid-19 crisis is a case in point, where some cities were successful in quickly responding to the sudden needs for social distancing and hygiene. In many cases, cities pushed for temporary changes in legislation to allow citizen- or business-led initiatives to take place, such as repurposing parking spaces as public terraces. In other cases, it allowed cities to leapfrog on their existing plans, for example, to widen pedestrian areas and to roll out more kilometres of protected lanes for cyclists.

Notable innovation examples include Jacksonville Transportation Authority (JTA), which developed a roadmap to navigate the economic and social impacts of the pandemic on the Authority's overall operations. Sydney, Mexico City, Bogota and Brussels have been rolling out temporary cycling infrastructures in strategic corridors as a response to Covid-19.

Discussions are now ongoing to transform some of these newly established pop-up cycleways to permanent infrastructure, while in the case of Bogota and Mexico City the interventions are now permanent. Los Angeles, Montreal, Bogota, and Montevideo have been closing portions of residential streets to cars to give pedestrians and cyclists more room to travel, to enjoy outdoor activities and to be protected from motorists during the pandemic. Los Angeles is now exploring legal possibilities to make the Slow Streets program, as it is called, permanent. Amman has a Resilience Strategy and a Green City Action Plan to guide its Smart City Strategy, which includes recovery actions from Covid-19 impacts.

#3: COMMUNITY ENGAGEMENT

One striking improvement from previous UMii reports is the general trend for deeper and wider stakeholder involvement earlier in strategic planning and throughout the innovation process. **UMii specifies as success factors the significant and regular involvement of traditional mobility-related and non-traditional stakeholders** in the development of the strategy, for gathering insights on traveller needs and preferences using innovative tools or deliberative engagement methods, and for obtaining expertise from universities or consultancies.

In practice, participatory methods bear many names: co-design and co-creation processes, Living Labs (which imply a more formal coalition of actors, sometimes at a designated and regular location), or the Quadruple/Quintuple Helix Innovation model (which formalises the direct collaboration of government, society, academia, business, and as a fifth stakeholder, 'nature'). Some European countries have adopted a Societal Readiness Level scale (SRL) to assess the level of societal adaptation for an innovation to be integrated into society (e.g. Innovation Fund Denmark[16]), which complements the Technology Readiness Levels (TRLs) used to assess the technical maturity of a particular technology. Combined with concrete pilots, these participatory approaches can help move the urban status quo.

On the positive side, stakeholder and particularly citizen engagement start from a point of inquiry, which can help (re)build trust in local decision-making and in government in general. On the other hand, it requires skills and resources both to engage with and to attract willing participants, particularly for reaching out to minorities or for running more demanding processes such as living labs (for innovation design) or variants of citizen assemblies (for policy development).

Notable innovation examples include Montevideo, which hosts a web-based platform for citizen engagement called Montevideo Decide. Hamburg also developed an integrated digital citizen participation system (DIPAS) with touch tables to streamline the user co-creation in urban planning. When implementing innovative projects, Lisbon starts with the so-called 'user research' using various quantitative and qualitative tools (research, surveys, street observations) followed by in-depth interviews. Bogota involves a group of social scientists with a good knowledge and links to various communities in the city, which is very valuable in the mapping of all the stakeholders and actors. Budapest seeks to better understand the motives behind transport mode choices, and user insights gathered for the micromobility and bike sharing services resulted in major improvements to both services. Milan and Warsaw implemented various activities to account for different actors and needs in the stakeholder engagement process for the development of their urban mobility strategies. Similarly, Lagos considers vital the need to bring together all stakeholders and sensitise them on planned actions, while adhering to the World Bank standards. The Mobility Ministry of Mexico City incentivised participation of native communities in the proposal for ideas in community projects of improvement, rehabilitation and reconstruction.

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[16] https://www.doa.go.th/plprotect/wp-content/uploads/2020/08/4.9-Societal-Readiness-Levels-SRL-and-Techology-Readiness-Levels-TRL.pdf

#4: NOISE IMPACT ASSESSMENT

Noise is usually classified as an environmental impact, however it is a proxy indicator for urban quality of life in general. Long-term overexposure to noise poses mental and cardiovascular health risks and reduces cognitive performance, particularly for the young people. Most urban citizens are exposed to traffic noise at night above the risk level of 55dB, and far beyond the safe WHO guideline of 40dB. **The UMii framework assesses mechanisms in place to monitor, model and inform about day and night noise pollution** (both from transport construction projects and for regular road traffic), and city plans to support innovative projects to decrease noise levels.

Notable innovation examples include Madrid, which deployed an extensive network of static and mobile noise measurement stations which are continuously monitoring the noise levels throughout the city. The city uses the data as input to urban planning, and it has been publishing them on a daily basis for over 20 years in an open-data fashion to allow third-party analyses. Brussels' public transport operator STIB is tackling noise on its tram tracks by installing special rubber mats that serve as a high performing vibration attenuation system. Brussels also has launched an ambitious and comprehensive "quiet.brussels" plan, putting together a range of interventions and innovations to tackle urban noise. Moscow is also installing noise-protection screens to minimise the level of noise in residential areas and is working on frameworks for noise measurement and noise emission mitigation. Lisbon informs its citizens regarding environmental noise and its effects, monitors exposure to noise, produces Strategic Noise Maps and develops action plans aimed at preventing and reducing environmental noise. Warsaw measures and monitors noise pollution and has created acoustic maps of the city which illustrate noise pollution with its main sources, i.e. road, rail and tram, air transport and industrial centres.

Quiet.brussels comprehensive plan for tackling urban noise
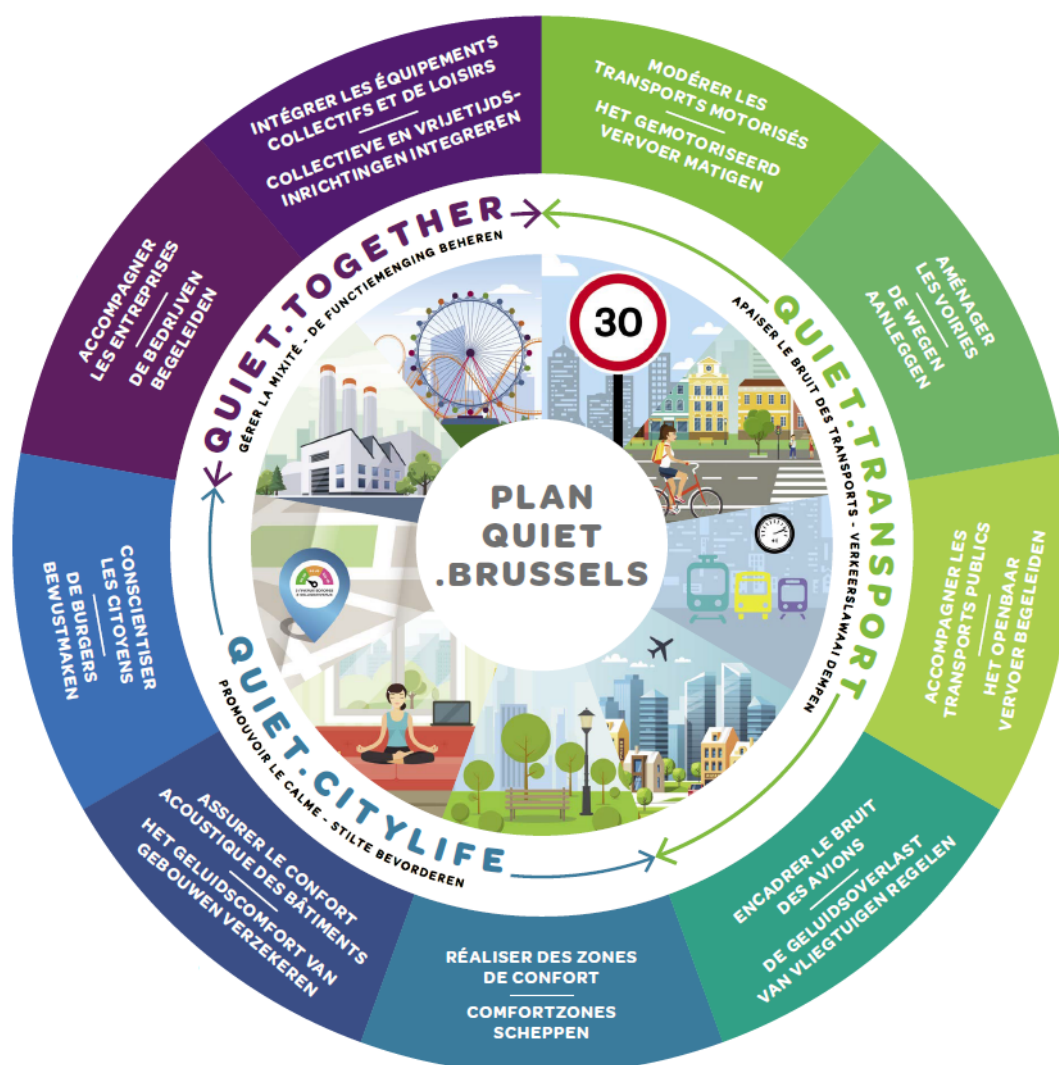
#5: FINANCING INNOVATION

One key UMii success factor is **the ability of the transport planning authority to secure adequate funding by promoting external and collaborative R&D initiatives**, and whether it has access to dedicated innovation funding that allows for experimentation to take place. This can include for example innovations in procurement rules allowing for uncertain outcomes as part of the innovation process. Diversifying the sources of financing also improves resilience.

Notable innovation examples include Singapore which regularly launches research calls and provides funding support for conceptual-stage research and pilot trials of innovative ideas. The City of Helsinki founded a business hub which helps foreign companies to establish their operations and tap into business opportunities in Helsinki by connecting people and businesses with relevant data, investors, public sector and academia. Johannesburg issues Green Bonds to raise funding for environmental and social sustainability projects. Hong Kong established a dedicated Smart Traffic Fund to provide funding support for enterprises or organisations to conduct research and application on vehicle-related innovation and technology. The Delhi government provides a subsidy for the purchase of new electric scooters. In Casablanca, there is a dedicated fund for financing urban mobility initiatives which can reform either inter city or urban transport.

#6: ADDRESSING BARRIERS FOR INNOVATION

There is a fundamental issue with governmental planning authorities to be fine-tuned for efficient operations and control of the transport system, but not be geared for innovation in general (Oslo interview). The innovation process can face many internal and external barriers: **the UMii framework evaluates whether the city is actively identifying regulatory barriers to innovation and developed channels with policy-makers to advocate for changes in the legal environment that are blocking innovation.**

Los Angeles and its Slow Streets program which is a good example of a bottom-up approach of addressing legislative barriers. In the early days of Covid-19 pandemic, the program started as a citizen and NGO initiative. After the city worked out underlying

barriers, the initiative was approved and implemented. Furthermore, the city pushed for legislative changes which would allow to make the slow streets permanent. These efforts resulted in a new state-wide law recently signed by the governor of California which went into effect on January 1, 2022[17].

Amsterdam's Innovation team 'watchtower' which closely monitors the policy needs of innovative mobility services, anticipates possible innovation barriers and translates them to their policymakers. Bogota has a systematic approach to overcoming impediments to innovation, which are mostly found in the procurement of new technologies. In recent years the city has witnessed progress as new regulations encouraging the procurement of innovation and promotion of entrepreneurship have been introduced, for instance, by enabling the creation of regulatory sandboxes that makes it simpler to innovate.

[17] https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB773

#7: ENABLING SAFE JOURNEYS FOR WOMEN AND GIRLS

Mobility for all is a common theme, driven by the fundamental idea that if the transport system is designed for the more vulnerable users, it benefits everyone (Hamburg interview). Yet only a few cities are taking systematic steps to accommodate the needs of female travellers. Some opt for segregation, providing dedicated public transport sections or taxi services available to women only (Dubai). Others argue that segregation is not a scalable solution, that the key is ensuring safety for all users and enforcing a culture of zero tolerance towards different forms of harassment (London).

But providing an adequate transport system for women and girls often goes beyond dealing with issues of unwanted attention and isolated routes. It first is about making sure women do not disappear in the transport planning process: understanding that female travellers have different needs, travel patterns and experiences requires gender-disaggregated data and gender sensitive data standards (Bogota). Similar logic applies to accommodating the needs and improving the experience for female transport vehicle operators. Balancing the share of women working in the transport / innovation department can support taking female perspectives into consideration for the full innovation life-cycle (one of the UMii quantitative indicators), although the need is not just for more women in planning, but more gender experts in planning. At the procedural level, it also includes producing systematic Equity impact assessments, such as those produced by London and Manchester for their mobility interventions.

Notable innovation examples include Montevideo which runs successful initiatives to prevent sexual harassment in the transport network including a harassment reporting system embedded in Montevideo's official travel app. Dubai addresses the safety and comfort of female travellers by dedicated carriages for women and children in Dubai metro as well as by pink-coloured taxi service with female drivers. Transport for NSW, Sydney's transport authority, runs the Safety after Dark initiative which aims to increase women safety through a number of actions including innovation challenge and Greater Sydney Women's Safety Charter which outlines a set of principles that can be followed to make Sydney safer for women. In Istanbul, female passengers using buses after 10 pm can stop a bus at any point along its route irrespective of the bus stop location, with the aim to minimise the walking distance to their destination.

#8: DESIGN FOR PROXIMITY AND ACTIVE/HEALTHY MOBILITY

Urban densification is one of the emerging trends highlighted at the beginning of this report. Underlying this trend is the realisation that land use planning and transport planning are intrinsically linked: "the best transportation plan is a good land use plan" (Vancouver interview). Together with this comes the trend for integrating micromobility solutions for first- and last mile, particularly with providing shared services and safe riding and parking infrastructures for electric scooters and electric bicycles, which are considerably more affordable and energy-friendly than electric cars, and can help people travel great distances when combined with the existing public transport.

This approach comes with multiple names: the 15-min city aims to design urban life for proximity, where most daily services can be reached by active modes and longer distances by public transport; transit-oriented development develops new living and working locations around public transport nodes (Montreal, Hong-Kong); Complete Streets guidelines aim to make streets amenable and safe to all types of transport users, including for walking (Jacksonville, Los Angeles); and the Healthy Street approach puts health and the personal city experience at the core of planning (London).

Other notable innovation examples include Copenhagen which highlights in its Green Mobility strategy that green mobility must be incorporated into urban planning. The city prioritises green mobility solutions when developing municipal planning. Singapore in its Land Transport Master Plan envisions a 45-Minute City with 20-Minute Towns where all door-to-door journeys to the nearest neighbourhood centre using Walk-Cycle-Ride modes are completed within 20 minutes and 9 in 10 peak-period door-to-door journeys using Walk-Cycle-Ride modes are completed in less than 45 minutes. This is to be achieved both by increasing the efficiency of the transport system as well as by decreasing the travel distances. Seoul has developed "S-Map", a three-dimensional replica of the city of Seoul in cyberspace which will be used for more efficient and integrated urban planning and traffic impact assessment based on objective and scientific deliberation. New York, committed to improve accessibility to open spaces and cultural resources by harnessing place-based community planning.

Future urban vision based on scenarios of isobenefit urbanism (D'Acci L.S.), an urban design approach based on a 15-minute walking city where one can reach both natural areas and shops, social services and workplaces within 1km, and where the resulting walkable urban islands are connected by fast public skytrain links. Source.

#9: AUTOMATED, ELECTRIC AND SHARED VEHICLES

The wider trend for diversification of the transport offering is also enabled by the electrification, inter-connection and automation of vehicles (CAVs). CAVs are expected to bring tremendous advantages over conventional vehicles, for example, in terms of reducing risks of collisions, tackling traffic congestion, opening the possibility to put parking space to other uses, allowing travellers to use their travel time for work or leisure activities, lowering overall transport costs and increasing the accessibility of difficult-to-reach places to more diverse users, including the elderly and disabled[18]. Yet research also warns that an unconditional, technology-driven deployment of CAVs without policy supporting a significant switch to the sharing economy and relinquishing of private car ownership could, on the contrary, exacerbate congestion and undermine the social and sustainability benefits listed above[12]. Therefore, the type of service CAVs will be providing is also being given careful consideration by cities.

A common innovation in this context that is being trialled in many locations is the deployment of CAVs for first-/ last-mile connections, providing access to remote or less populated areas, or as fixed lines to transport hubs such as airports.

Notable innovation examples include Oslo, which is trialling CAVs as an integrated part of the region's public transport services, aiming to provide users with first-hand travelling experience and exploring the possibilities of self-driving vehicles in its public transportation system. Vienna deployed two autonomous e-busses in its Aspern Seestadt urban lab, where they served a two-kilometre circular route.

More cities are planning to deploy shared autonomous mobility services on their streets. Dubai willlaunch its commercial shared robo-taxis service pilot soon. Singapore is preparing a trial of autonomous buses and autonomous on-demand shuttles in Punggol, Tengah and the Jurong Innovation District to complement the existing public transport system.

In Nairobi, Mazi now offers a fleet of bodabodas as a basic MaaS option and its recently-launched fleet consists of motorbikes which are totally electric.

[18] Thomopoulos, N., & Givoni, M. (2015). The autonomous car—a blessing or a curse for the future of low carbon mobility? An exploration of likely vs. desirable outcomes. European Journal of Futures Research, 3(1). https://doi.org/10.1007/s40309-015-0071-z

Innovations relating to the deployment of data-enabled transport systems represent a large and varied share of city initiatives, to a similar level than planning processes and tools (29%). Digitalisation is the third wider trend affecting transport identified at the beginning of this report, and this trend was largely confirmed by the range of innovations reported by cities. This tenth topic covers together novel practices in terms of data collection, data sharing culture, and using data for innovative applications.

#10: DATA EVERYTHING

Notable innovation examples include Sydney, which actively promotes the use of their open data to be used for innovative digital solutions. Transport for NSW - Sydney's transport authority regularly organises a number of events, innovation challenges and maintains a developer portal for external innovators. Hamburg developed an ITS strategy to promote the use of ICT and innovative technologies in the transport sector in a structured way and to stimulate a digital transformation in a profitable manner. Abu Dhabi develops a modelling framework called STEAM + to make better use of data for urban mobility and transportation needs with Meso, Micro Models and near Real-Time Simulation, allowing assessment of schemes ranging from specific intersections to large infrastructure studies, transit corridors and policy tests. In Nairobi, there are multiple examples of collaborative projects aiming to develop mobility solutions by using data in innovative ways e.g. using IoT devices and machine learning to optimise the flow of traffic through traffic lights.

São Paulo makes available different types of transport data via mobilab+ and organises events, hackathons (Radarton) and competitions (MOBILIZA+SP Radar Data) to address challenges such as how to organise and make use of the data obtained through electronic traffic inspection equipment in the city. Seoul is planning to complete the establishment of a citywide public IoT network by 2023 making it one of the world's first hyper-connected cities. The network will allow a rapid transmission of collected data, development of connected services and utilisation of big data processing and convergence technologies. Athens Urban Transport Organisation (OASA) has been involved in many European projects aiming to use data to enhance mobility services. OASA is now a project partner in European project FRONTIER aiming to develop and test autonomous management systems that will constantly evolve using data generated from real-time monitoring of the transportation system and input from operators, decision makers and simulation models.

ITS & data

New BRT line on a dedicated track

Amman

'We want to increase the contribution of women in economic growth.' 'Keeping our workforce stimulated and working towards a better future for themselves and for the city they are living in, is part of the innovation.'

**GEOGRAPHICAL SCOPE OF STRATEGY**
MUNICIPALITY

POPULATION	**AREA**
4,600,000	800 KM²

| 🚶 26% | 🚌 14% | 🚗 42% | 💬 18% | ♀ 40% | 🌳 0% | PM2.5 NA | 🚗💥 5.4 |

CITY BACKGROUND

The Greater Amman Municipality (GAM) is headed by the Mayor of Amman and is the civil juridical institution for Amman Governorate, the capital of the Hashemite Kingdom of Jordan. Its mission is to provide high quality municipal services of excellence focused on the environmental, health, organisational, and infrastructure dimensions. Amman's urban mobility system is dominated by cars and the road network which is one of the main challenges the city has to deal with. GAM partnered with CDM Smith to adopt a comprehensive Smart City strategy that harnesses the latest in artificial intelligence and big data innovation to solve the city's urban planning needs. The Amman Smart City vision is 'to improve the quality of life for Amman's citizens with the use of practical technology'. Smart Mobility is one of the 5 strategic directions of the Smart City roadmap. The strategy was prepared in February 2021 and will be soon adopted by GAM.
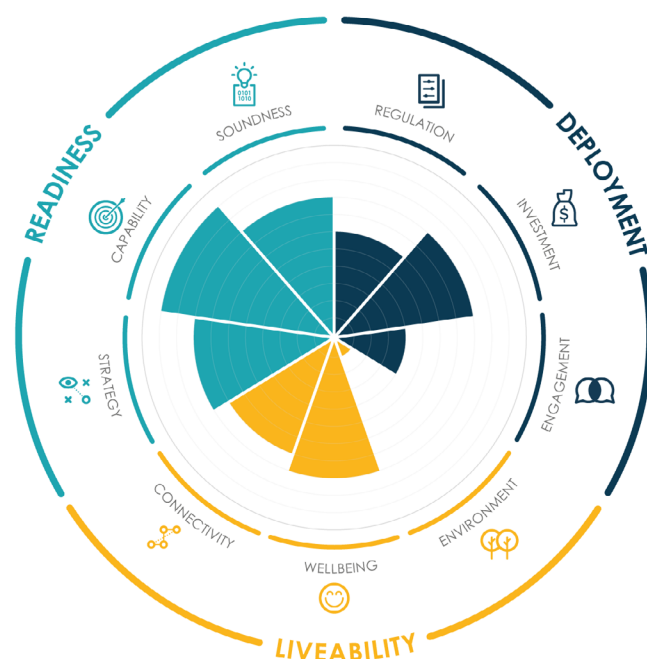
UMII PERFORMANCE
READINESS

💡 **Strategy (Comprehensiveness of strategy)** – The Smart City strategy of Amman draws on the Amman Resilience Strategy and Green City Action Plan. The Sustainable Development Goals are also referenced within the plan and linked to the national level. The goals of the strategy are informed by a comprehensive diagnostics exercise including among others ICT infrastructure assessment, international benchmarking reports and Covid-19 impacts, demonstrating a structured process to identify the challenges and role for

innovation in urban mobility. Inputs from interviews with representatives from various GAM departments, as well as external stakeholders in both the public and private sectors were also taken into account.

💡 **Soundness (Data accessibility)** – Data is not open to the public in Amman and there is no evidence of an integrated data platform which would enable access to the data by internal and external stakeholders. An open data policy, strategy or similar could encourage open data practices across city stakeholders.

DEPLOYMENT

💡 **Regulation (Market barriers to innovation)** – CDM Smith who were appointed to develop the Smart City strategy, assessed regulations to identify any potential gaps and barriers that might hinder the development of GAM's ambitious smart city plans. It was concluded that GAM should begin dealing with regulation changes needed to facilitate projects, particularly those that currently inhibit or prohibit mobility project enhancements such as ride sharing or compatible EV charging systems.

💡 **Regulation (Enabling new business models)** – There is little evidence that new urban mobility business models are created in Amman as a result of efforts to eliminate market barriers in the regulatory environment. Innovative mobility services or solutions are not a common practice in Amman.

LIVEABILITY

💡 **Environmental (Air quality) –** The adoption of hybrid and electric vehicles has increased noticeably in Amman. The value proposition for owning electric vehicles has become attractive for individuals, especially after tax and customs exemptions that the government granted for these vehicles. Both the government and GAM have also replaced a portion of their own car fleets with electric vehicles.

💡 **Wellbeing (Fairness) –** Amman's transport system is lacking facilities for accommodating the needs of vulnerable people or those with restricted mobility. Furthermore, the poor condition of terminal hubs, the long waiting times between services, the lack of real-time information on schedules and long walking times to reach bus stops, exposes women to higher safety risks. Services, initiatives or tools can be introduced for users with disabilities and for female users to use Amman's transport network easier and in a safe manner.

UPCOMING / LIVE PROJECTS
TRAFFIC MONITORING PLATFORM

The Traffic Monitoring Platform aims to assist with managing the traffic in Amman and to augment the capabilities of GAM and its Traffic Management Centre (TMC). The platform will integrate all systems that collect traffic data, will store the data, process it, and translate it into usable traffic information. The planned project will bring Amman traffic to life by visualising real-time data on large displays and make the information available for smart mobility applications and to users.

The open source platform will enable better mobility decisions, reduced congestion spots, and better management for emergency response vehicles and the routes they follow.

🔗 SOURCE

THE SMART CITY PLATFORM

CDM Smith's digital solutions experts are helping Amman to develop an integrated data platform that will allow GAM to manage its programs and services. The Smart City Platform (SCP) aims to develop a computer and communications system that integrates data from current and future Smart City projects. The SCP will provide data exchange and analytic standards and will build on and integrate with the Traffic Monitoring Platform and its traffic data as well as with other non-traffic data produced. The SCP will also include an open data portal for common and public access to these project results, acting as a technology enabler. The SCP can lead to better service delivery to residents, businesses, and communities in GAM enabling Amman to support smart planning and decision-making.

🔗 SOURCE

AUTOMATIC FARE COLLECTION SYSTEM

GAM has recently released a tender for a comprehensive ITS solution for public transport, including a bus management system and automated fare collection system. This tender was issued by a GAM-owned company that owns a fleet of buses that will soon come into operation.

INNOVATIVE SOLUTIONS
BUS RAPID TRANSIT

Bus Rapid Transit (BRT) phase one operation is now completed in Amman, the first national mass transit system in Jordan. The first route was launched at the end of July 2021 and it was widely accepted by the public. Users of the BRT network need to purchase a prepaid card and charge it with the desired amount. When fully operating, the BRT network will be extended on 3 routes along 32km, with large-capacity buses on dedicated tracks to provide a high level of serviceability. The buses will run at intervals of no longer than 3 minutes to and from modern and fully integrated terminals, connecting Amman with the surrounding district. With the Amman Bus mobile application BRT users can plan their trip and have access to real time information on bus schedules and expected arrival times, as well as information on the location of stations and routes.

🔗 SOURCE

An example of an eHub - on-street location that brings together e-bikes, e-cargo bikes, e-scooters and e-cars to dissuade citizens from owning private cars.

Amsterdam

'We do small innovative projects where we learn our lessons and then scale up.'

GEOGRAPHICAL SCOPE OF STRATEGY
MUNICIPALITY

POPULATION	**AREA**
821,752	219 KM²

🚶 5% | 🚴 19% | 🚌 19% | 🚗 42% | ⚫⚫⚫ 4% | ♀ 65% | 🌳 11% | PM2.5 10.3MG/M³ | 🚗💥 NA

CITY BACKGROUND

The municipal organisation of the City of Amsterdam consists of four clusters, the services support teams and seven district organisations, responsible for executive tasks. The City of Amsterdam has appointed an Innovation team which collaborates with all municipality departments to foster innovation in the city. The Innovation team is responsible for development of the Smart Mobility Amsterdam 2019-2025 (PSMA) Program, which aims to establish Amsterdam as the "smart mobility city number 1, while contributing to an ambitious car-free and 2025 climate neutral agenda. The mobility innovation in the city stems from two program lines of PSMA: Data and digitisation and Innovative mobility solutions.
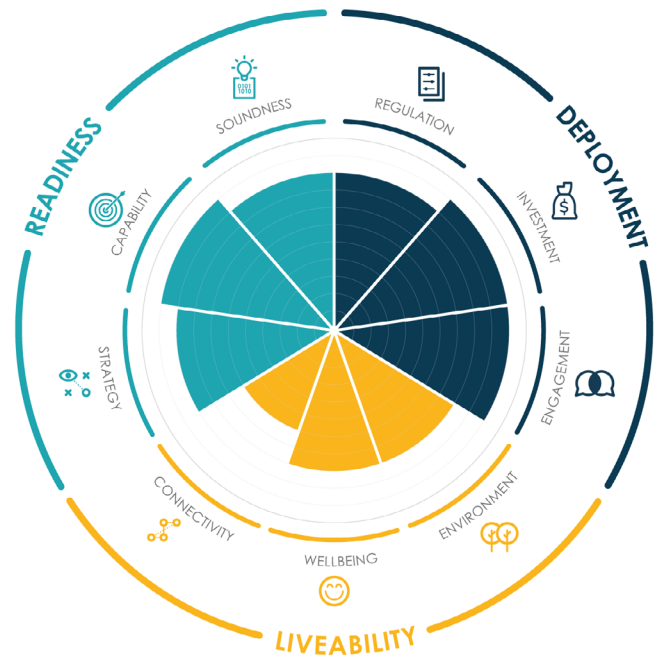
UMII PERFORMANCE
READINESS

💡 **Capability (Internal capacity)** – The City of Amsterdam has a dedicated innovation team responsible for fostering innovation in urban mobility. In addition, there are more innovation teams established to pursue innovation in other areas such as energy and climate. Moreover, Amsterdam has established the 'Amsterdam Institute for Advanced Metropolitan Solutions' – a research and education institute committed to deliver interdisciplinary solutions to urban challenges.

💡 **Strategy (Comprehensiveness of strategy)** - The scope of the PSMA is far-reaching. It covers the challenges which innovation can be applied to with a focus on moving away from private vehicle use towards smarter, active and sustainable transport. The strategy clearly identifies the expected outcomes and intended

benefitors. PSMA also recognises links to other areas by approaching urban mobility as one of the multiple domains of the city. However, the strategic targets are not quantified and measurable. The document does not consider emergency scenarios and crisis management of the envisaged projects.

DEPLOYMENT

💡 **Investment (Own investment)** – the Amsterdam municipality has a dedicated budget to foster innovation activities, as well as for staff training and capacity building. When it comes to supporting innovations, the city can take advantage of various sources of funding including international/multilateral institutions, national, regional and municipal budgets as well as external funding. The city has achieved this thanks to its extensive involvement in international research projects and through numerous partnerships on regional, national, and international level.

LIVEABILITY

💡 **Environmental (Air quality) –** There are numerous examples of successful services, projects or initiatives deployed in Amsterdam to increase the levels of active transport and low emission vehicles. Those examples include, among others, building eHUBS throughout the city where a user can easily rent electric vehicles (bikes, cargo-bikes, scooters, cars) via an app, city's multimodal MaaS application, and experimenting with innovative travel expense schemes that promote travelling without a private car.

💡 **Wellbeing (Fairness) –** At the time of writing this report, there are no specific services deployed to increase the safety of female travellers. However, the city started to tackle this area as well. As a first step, a campaign was launched to spread awareness about how unsafe women feel outside when they have to face whistling or intimidation.

UPCOMING / LIVE PROJECTS
INNOVATIVE TRAVEL EXPENSES SCHEMES

The city works in collaboration with employers to introduce novel travel expenses schemes that promote travelling without a private car. The city encourages and trains HR personnel to give travel advice when recruiting new employees.

NEW MOBILITY SOLUTIONS FOR COMMUTING TEACHERS AND NURSES

The city in collaboration with teachers, childcare providers, and nurses is testing which mobility options offer a good alternative to commuting by car. In consultation with a shuttle panel of teachers, the city organises pilots for carpooling, improved sharing services and electric bicycle offers. From there, the city works on new travel expense schemes and offerings, such as lease offers for an electric bike.

eHUBS

The City of Amsterdam is a lead partner in eHUBS project. eHUBS are on-street locations that bring together e-bikes, e-cargo bikes, e-scooters and e-cars. By providing the users with a range of shared electric mobility services, the city aims to dissuade citizens from owning private cars. Within the eHUBS project, Amsterdam and five other cities will deploy eHUBS while developing knowledge, best practices and a blueprint that would lead to replication of the experiences in other cities and regions.

↗ Source

INNOVATIVE SOLUTIONS
CODE THE STREETS

Together with its partners (TomTom and Mercedes-Benz), Amsterdam is developing an open API that includes the city's rules for the preferred use of public space. Through this API, navigation apps have access to data about school zones, vulnerable city infrastructure, congestion and pollution on a street level. This information is communicated to the drivers, stimulating them to choose safer, more 'social' routes.

↗ Source

AUTOMATED PARKING ENFORCEMENT AND INFRASTRUCTURE CHECKS

The city operates vehicles equipped with cameras to detect the conformance to parking regulations. These vehicles are equipped with cameras and use AI-based object recognition software for licence plate reading and background checks. The vehicles are also used to monitor the status of city-owned infrastructure and buildings. If the vehicle detects any damaged property, maintenance teams are sent to the site to rapidly repair the damaged object.

↗ Source

AMAZE – AMSTERDAM'S MAAS APPLICATION

The city recently launched its own MaaS application called Amaze. The app allows the users to plan and pay for trips using public transport and shared mobility services. The users can take advantage of different shared mobility solutions with a single account, combining different modes of public transport and shared services. Furthermore, the app makes it easy to manage and share travel expenses. The OV-Chipkaart (integrated ticketing card) is no longer necessary for public transport. All payments can be made through the Amaze app.

↗ Source

PUBLIC EYE: AN OPEN-SOURCE CROWD MONITORING SOLUTION

Amsterdam introduced a pilot called 'Public Eye Amsterdam', an open-source extension to its crowd monitoring system, which enables residents and visitors of the city to check the crowdedness in a number of popular places in Amsterdam. Cameras and sensors in these locations detect the number of people in the area. The camera images are instantly anonymised and converted to numbers so no one, not even the city employees, can access personal information, preserving the privacy of individuals. Residents and visitors of the city can view the information about the crowdedness on digital information boards and online. The system allows users to plan their visit at a less busy time or use alternative routes so they can maintain social distancing.

↗ Source
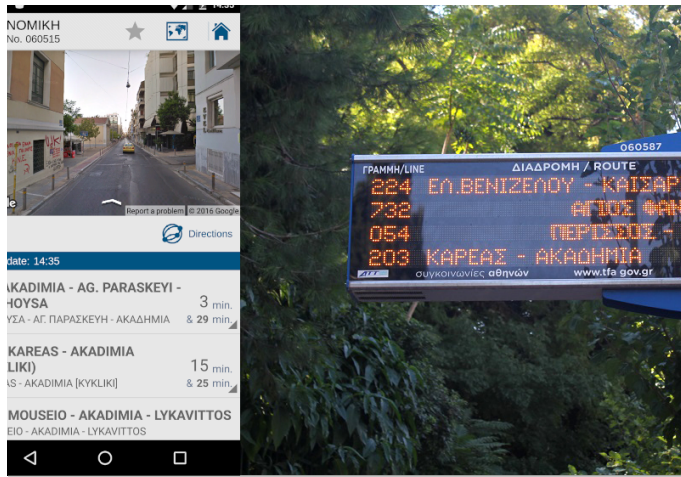
Athens

'Our vision for Athens - a modern city, green and vibrant, a capital model, with fewer cars and with more space for cycling and walking.' [SVAK]

GEOGRAPHICAL SCOPE OF STRATEGY
REGION

POPULATION	**AREA**
3,828,000	3,808 KM²

🚶 3% | 🚴 28% | 🚌 47% | 🚗 9% | 💬 13% | ♀ 80% | 🌳 0.7% | PM2.5 20MG/M³ | 🚗 4.5

CITY BACKGROUND

Athens Urban Transport Organization (OASA) is a public utility company operating the public transport system in the region of Attica, including its two largest cities - Athens and Piraeus. OASA's key mission is to provide passenger transport services by all means of public transport in the area, with particular attention to passenger service and the quality of life in the area of its responsibility. Through its subordinate companies, OASA oversees the operation of bus, trolley, tram, metro and part of the suburban railway lines. Innovation in urban mobility in Athens is guided by the recently developed metropolitan Sustainable Urban Mobility Development Plan (SVAK), prepared by the Municipality of Athens.
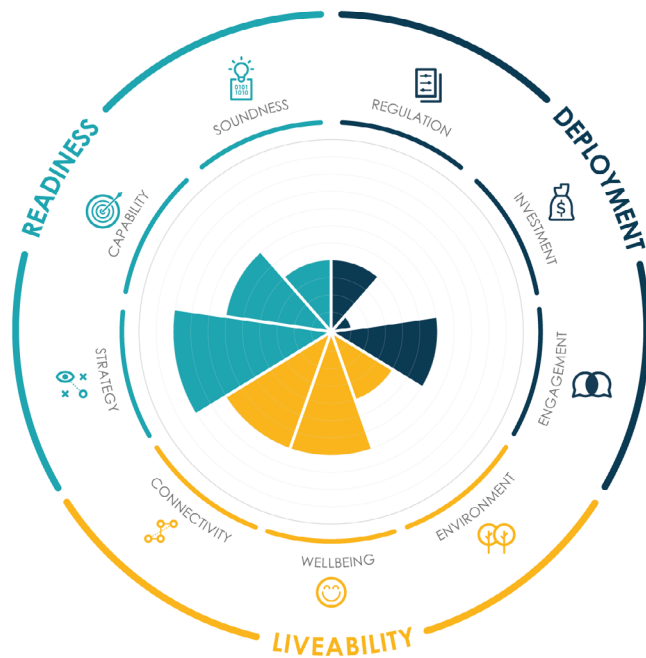
UMII PERFORMANCE
READINESS

💡 **Strategy (Comprehensiveness of strategy) -** The scope of the SVAK is very far-reaching. It covers the challenges which innovation can be applied to with a focus on moving away from private vehicle use towards shared and active mobility options. The SVAK accounts for the outcomes and intended benefitors of innovation in the city. Strategic targets are quantified and measurable and they are used to set further goals.

💡 **Soundness (Data accessibility) –** While OASA has access to an integrated data platform containing relevant real-time and static datasets, dynamic data are not publicly available due to the related policy barriers. Unless those barriers are resolved there cannot be any significant efforts to open data or to promote an open data culture across city stakeholders.

DEPLOYMENT

💡 **Community Engagement (Information provision)** – Users have access to OASA Telematics App which provides real-time information for buses and trolleys. The app contains line search and timetables, list of routes and stops, real-time bus location and announcements. There's also a network of 1000 bus-stops (which will be extended in the near future) equipped with VMS signs that provide real-time bus arrival times.

💡 **Investment (Own investment) –** Currently, there is no specific budget allocated to innovation in urban mobility in Athens. Innovation activities are mainly funded through national or international grants. OASA is very active in implementation of EU-funded R&D projects. Hence, the funds are unlocked on a per-project basis which leaves limited room for experimentation.

LIVEABILITY

💡 **Connectivity (Seamlessness) –** There is evidence of measures to promote integration between different modes of transport in Athens. Major interchange facilities in the city include OASA Transit Stations and ATTIKO Metro Transit Stations, which integrate metro, connection to the airport, multiple bus lines, taxis and, where applicable, also suburban railway. Major modes of transport available in the city are covered by a single ticketing system - Ath.ena ticket or card.

💡 **Environmental (Natural areas) -** Currently, the share of natural and semi natural areas in the city of Athens is among lowest in Europe. The municipality is trying to fight this issue by unveiling "pocket parks" that aim to turn abandoned areas into lively green spots.

UPCOMING / LIVE PROJECTS
NEW DATA MANAGEMENT SYSTEM

The development of a new data management system using geographic information systems (GIS) in Athens is currently in progress. The development of the system aims at the transition to the projection and analysis of the basic transport data exported from the OASA Telematics System (lines and stops) as well as their combination with additional data exported from other sources. For this purpose, a New Transport Database was created in 2021, a data update system was introduced, and the first applications were developed for both internal management and presentation to the passenger public.

FRONTIER PROJECT

OASA recently started implementation of another EU-funded project – FRONTIER. In FRONTIER, the consortium will develop, apply, and test autonomous management systems that will constantly evolve using data generated from real-time monitoring of the transportation system, knowledge generated by operators and decision makers, and simulation models providing optimal solutions accounting for new mobility services and technologies. Athens will be one of the pilot sites of the project. The Athens pilot will fature the deployment of the FRONTIER platform along a motorway corridor of Attiki Odos and key interchange points with links to urban multimodal infrastructure.

☑ Source

INNOVATIVE SOLUTIONS
OASA Telematics System

OASA has equipped its buses and trolleybuses with telematics devices to collect real-time vehicle information. These data are used both to ensure timely and accurate information for passengers on mass transit routes and, at the same time, to assist in improved fleet management and supervision of the transportation system. Passengers can access the information either via mobile app, or 1,000 variable message signs at public transport stops throughout the city.

☑ Source

πNEUMA

πNEUMA is a first-of-its-kind experiment which resulted in creation of the most complete urban dataset to study traffic congestion. A swarm of 10 drones hovered over the central business district of Athens over multiple days in 2018 and recorded traffic streams in a congested area of a 1.3 km2 with more than 100 km of road lanes, around 100 busy intersections (signalised and non-signalised), many bus stops and close to half a million trajectories.

☑ Source

AUTOMATED PARKING ENFORCEMENT AND INFRASTRUCTURE CHECKS

The city operates vehicles equipped with cameras to detect the conformance to parking regulations. These vehicles are equipped with cameras and use AI-based object recognition software for licence plate reading and background checks. The vehicles are also used to monitor the status of city-owned infrastructure and buildings. If the vehicle detects any damaged property, maintenance teams are sent to the site to rapidly repair the damaged object.

☑ Source

HoPE PROJECT

OASA was a partner in the EU project Holistic Personal public Eco-mobility (HoPE). Its main objective was to ease the use of public transport by developing an open platform assisting the user with all the phases involved in typical public transport use: from access to schedule information to real-time operational information, from planning multi-modal trips to bookings, ticket purchases and validation, while maintaining interoperability across different transportation modes and ICT systems. Athens was one of the project's three pilot locations. There were three pilots conducted in Athens:
1) Athens Journey Planner – App for Android 2) Tourist Tour Planner- App for Android - providing optimum time/cost tours around the city, on foot or using public transport, or a combination of both, according to personalised preferences (points of interest: archaeological sites, theatres, hotels etc.) 3) Electronic ticket purchase & validation - App for Android- The action was performed by 30 volunteering Athens International Airport employees.

☑ Source

Barcelona

'Disabled people should be as autonomous as possible – we don't provide some kind of assistance; we implement measures to make them autonomous.'

GEOGRAPHICAL SCOPE OF STRATEGY
Metropolitan area

POPULATION	**AREA**
1,664,182	102 km²

🚶 42% | 🚲 2% | 🚌 17% | 🚗 39% | ♀ 49% | 🌳 27% | PM2.5 13mg/m³ | 🚗💥 4.3

CITY BACKGROUND

The operation and coordination of public transport in Barcelona s Metropolitan region fall under the competence of the Metropolitan Transport Authority (ATM). This inter-administrative consortium set-up in 1997 has since developed an integrated fare system and is currently managing a network of 50 different operators across 346 municipalities. The ATM is likewise responsible for strategic planning of infrastructure and mobility in Barcelona s Metropolitan region.

Its most recent 2020-2025 Mobility Master Plan sets out a clear objective of promoting healthy and sustainable mobility, which is also efficient and productive, safe and reliable, inclusive and equitable, and smart and digital. The Mobility Master Plan has been built upon a robust diagnostic exercise accompanied by a city stakeholder consultation process. The plan connects to other plans affecting mobility either on European, national or Catalan level.
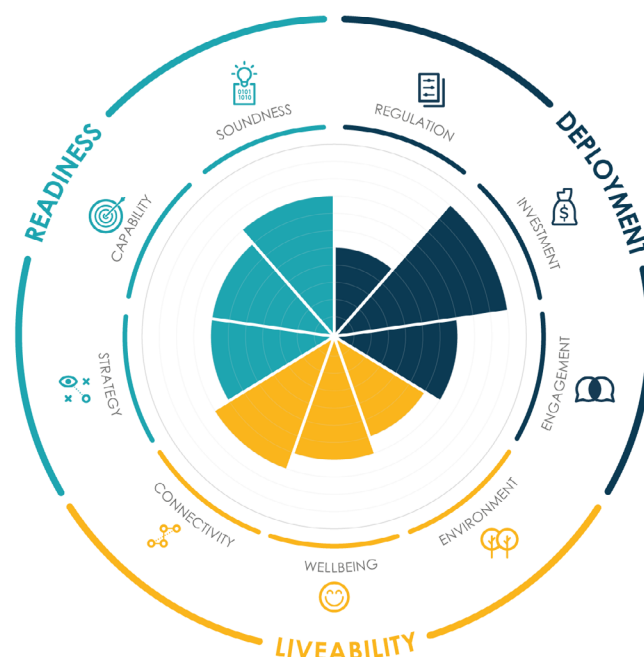
UMII PERFORMANCE
READINESS

💡 **Strategy (Readily available innovation strategy) -** One of the strongest points of Barcelona's Metropolitan Area is its strategic planning. The ATM Mobility Master Plan consists of 86 measures, detailing the scope and benefits of each action, providing, in a tangible way, the timeframe of implementation, responsible actors, and estimated budget. On top of that, the plan covers for the first time the entire Barcelona Integrated Metropolitan Mobility System (SIMMB), covering 25% of Catalonia, in which 75% of the population of Catalonia resides. The plan goes beyond the planning of mobility and entails the social perspective, environmental efficiency, innovation and digitalisation, the gender perspective, and the

effects of transport on health. ATM regards digitisation as the future's key pillar of innovation, hence the current mobility master plan focuses on building mechanisms that will allow the innovation process to be integrated into mobility planning.

💡 **Capability (Internal capacity to support innovation) -** The work on the innovations within ATM is a bit transversal and involves cooperation between various roles, while the systems department is responsible for the implementation of a few digital innovation projects. While ATM have a dedicated team established for dealing with Covid-19 (cooperating with a consultation company), other departments work on Covid-19 related challenges on a rather ad-hoc basis. ATM might consider

further consolidation of the internal capacity with the remit of fostering innovation in urban mobility in the future.

DEPLOYMENT

💡 **Investment (Own Investment) -** As a part of its mobility master plan, ATM has allocated half a million euros to urban mobility innovation towards 2025. This will encompass projects such as preparation for the arrival of autonomous mobility, internationalisation and research as key elements for mobility as well as new tools at the services: robotics, sensorisation and virtual reality.

💡 **Regulation (enabling new business models) -** The city has identified several barriers to innovation in urban mobility, such as the absence of a common framework/agreement determining governance in urban mobility innovation among the different agents involved or a clear model to share data whilst aligning to legal frameworks. Although ATM is aware of these barriers and actively works on their elimination, they have not been resolved to this point.

LIVEABILITY

💡 **Environmental (Noise) -** Thanks to a network of more than 150 noise monitoring stations and noise covering the whole city, it has an accurate picture of noise levels. The city is now working on the Noise Pollution Program 2021-2030, which will adopt measures to reduce traffic and noise from nightlife and construction. The City Council also conducts public awareness campaigns and has formed the 'Noise and Health in Barcelona' working group to address noise in the city and its direct impact on citizens' health, and to contribute to the resolution of problems identified.

💡 **Connectivity (Connectivity) -** The analysis of quantitative data suggests that Barcelona is underperforming concerning the multimodal connection of the interchange points within an urban transport network.

UPCOMING / LIVE PROJECTS
CITYFLOWS PROJECT

A new pilot project Cityflows is jointly funded by EIT Urban Mobility in cooperation with The International University of Catalonia (UIB) and the Barcelona city council. The project implements a crowd monitoring service at Parc Guell in Barcelona, collecting real-time crowd data with on-site sensors and wireless tags, visualising and analysing the collected data to provide decision support for crowd management.

The objective of CityFlows is twofold, firstly to improve liveability in urban environments by deploying a crowd monitoring decision support system (CM-DSS) on a city-scale and secondly to make a CM-DSS ready for the international market. The main goal is to improve the liveability of crowded pedestrian spaces through the provision of decision-support for the management of pedestrian flows. The Cityflows pilots are likewise ongoing in Milan and Amsterdam.

🔗 SOURCE

ATM INDOOR AND OUTDOOR GUIDANCE SYSTEM

ATM is currently working together with academic partners on a pilot project using augmented reality and NaviLens technology. The objective is to provide guidance and orientation at public transport stations to people with various disabilities. The project is still a work in process for ATM.

ATM BARCELONA

INNOVATIVE SOLUTIONS
THE GREEN T-CARD

The ATM has devised an interesting incentive - a 'green T-card' ticket, which allows the owner to use public transportation for free for three years. Citizens living in the metropolitan area of Barcelona who decided to decommission a vehicle without an environmental certificate and have pledged not to buy a new one for the next three years are eligible for the ticket. The card can be used on all public transport services within Barcelona's municipal area.

🔗 SOURCE

Bogotá

'We also ask people how much they feel the transport system is actually accessible for them, because we know by experience that some of the underrepresented communities are not visible in conventional tools measuring accessibility.'

**GEOGRAPHICAL SCOPE OF STRATEGY**
CITY

POPULATION	**AREA**
7,834,167	1,775 KM²

🚶 24% | 🚴 7% | 🚌 37% | 🚗 20% | ⚫⚫⚫ 12% | ♀ 49% | 🌳 NA | PM2.5 13.8MG/M³ | 🚗💥 5.9

CITY BACKGROUND

The Secretariat of Mobility of Bogotá develops policies and implements multimodal, inclusive, and sustainable mobility strategies that promote equity and improve citizens' quality of life while also increasing productivity, competitiveness, and regional integration. By 2030, Bogotá aims to be a model for multimodal, inclusive, clean and sustainable mobility.

The city's latest transport strategy 'Plan Maestro de Movilidad' (Mobility Master Plan) is from 2006, with a succeeding Sustainable and Safe Mobility Plan currently in the advanced stage of development led by the Secretariat of Mobility. The plan will set out the programs, projects, actions and strategies to guarantee mobility involving modes and actors equitably, according to their needs and aligned with the territory. Within the framework of global sustainability and safety policies, the plan integrates objectives that have an impact not only on the reduction and optimization of travel times but also seeks to promote cleaner mobility using modes of transport with low or zero emissions, mitigating the negative effects of transport on the environment and

the inhabitants of the city. Together with the City Master Plan, which is the city's land-use plan that includes the major infrastructure projects, the two make up Bogotá's whole mobility structure and planning.
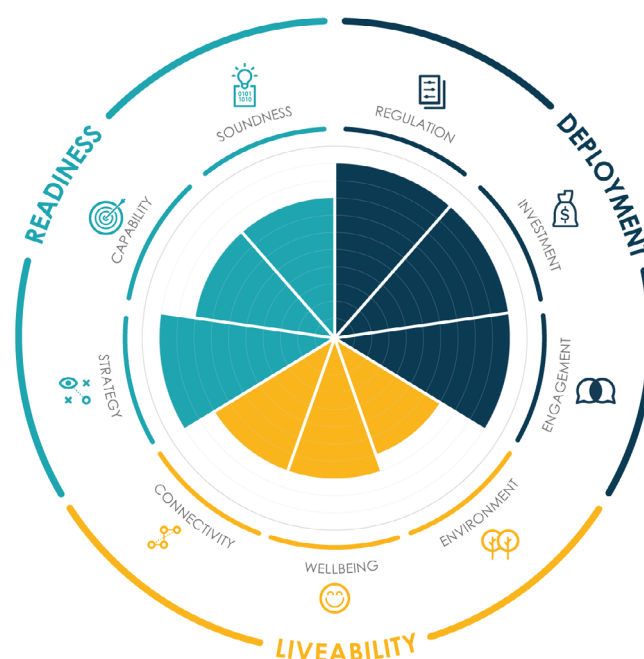
UMII PERFORMANCE
READINESS

💡 **Strategy (Means to execute and monitor strategy)** – The city is now drafting a monitoring framework to guarantee effective follow-up on the Sustainable and Safe Mobility Plan's actions. Apart from meticulously tracking established KPIs, the city acknowledges the necessity to reach out to the least visible users of the transportation network and solicit input to adequately analyse the plan's social implications. Furthermore, due to the significant degree of variety across Bogotá's

neighbourhoods, the city is investigating the idea of linking KPIs to specific geographic areas.

💡 **Soundness (Data Accessibility)** – One of the ways the Secretariat of Mobility is trying to foster innovation is by providing data and being transparent about its processes and transport models. The Secretariat is currently working on providing a considerable amount of information on its two portals - Observatorio de Movilidad and the Open Data portal while other data sources are present, too (e.g. Transmilenio's Open

Data portal). Despite the availability of data, a lack of consolidation and absence of one integrated data platform may confuse and obstruct external users' usage of the data. As a result, it is suggested that the city concentrates on improving this aspect in the future.

DEPLOYMENT

💡 **Community engagement (User engagement) –** The strategy owner deploys comprehensive, varied schemes and robust engagement strategies, both during the creation of the new mobility strategy and for the deployment of solutions. It's worth mentioning that any project, policy, or regulation developed by the Secretariat of Mobility includes social scientists who have in-depth knowledge of various communities as well as close interaction with them. This allows them to deliver significant insights for the creation of various initiatives. Besides that, there is evidence of successful implementation of digital tools and technologies in the engagement process, which was further encouraged by the pandemic.

💡 **Regulation (Market barriers to innovation) –** Secretariat of Mobility identified a rigid procurement process to be a hindrance to innovation in urban mobility in the city. Acquisition of new technologies requires public tenders and the need to demonstrate tangible results, which creates barriers to experimentation - an essential prerequisite for innovation. However, the city has seen a positive shift in this area lately with the enactment of laws and regulations facilitating the introduction of innovation in the city (e.g. through the development of regulatory sandboxes). The Secretary of Mobility is therefore encouraged to exploit the opportunities provided by such law and adapt its internal processes accordingly.

LIVEABILITY

💡 **Wellbeing (Fairness) –** Bogotá is taking the safety issues of women's mobility seriously and implemented a series of initiatives led by the Secretariat for Women and Gender Equality, the Secretariat of Mobility and TransMilenio to improve the quality of life, safety, and mobility experience for women. An example of specific solutions is an extensive campaign named 'I move safely' attempting to prevent, attend to and punish the harassment suffered by women in public space and transport. The initiative was accompanied by the reinforcement of the security system with 50 police motorbikes patrolled by women and a mobile application for real-time reporting.

💡 **Wellbeing (Quality of life - Health, Safety, Affordability) –** Assessment of several quantitative indicators suggests that Bogotá's transport system is not optimised in terms of access to public transport and its affordability. The city has recognized the need to improve this aspect of public transport and has set it as one of the objectives of its new strategic plan.

UPCOMING / LIVE PROJECTS
GREEN CORRIDOR (CORREDOR VERDE) AVENIDA SÉPTIMA

The Green Corridor in Bogotá's most important Street (Avenida Séptima) was conceived as the physical demonstration of what should be done in infrastructure design to achieve climate adaptation. Bogotá develops this project around three pillars: sustainable mobility, ecological integration, and sense of place and public space. For instance, although Bogotá excels in heavy BRT infrastructure design, the administration believes that this paradigm needs a bold shift in two senses: no more carbon-based technologies for public transit, and prioritisation of walkability, bike riding and electric mobility. After this project is inaugurated, the administration expects 90% of all trips made in the corridor to be 100% zero-emission (walking, biking and public transit). The project incorporates other ecological and spatial objectives, as well.

🔗 SOURCE

BIKE SHARING SYSTEM

The Bike Sharing System of Bogotá will be a sui-generis system with a unique inclusiveness vision due to the diversity of bikes and services offered to its citizens. It will deploy 1500 mechanical bikes, 1500 electric bikes, 150 hand bikes (as an accessory for any wheel-share giving independence to the final user), 150 cargo bikes and 150 of the bikes will have child seats. In addition, the system will provide a 20% discount to low-income citizens and provide 300 public bike repair stands available for free for all citizens. Hence, besides being one of the largest systems in Latin America, it will provide a sustainable mobility alternative to all the citizens regardless of their gender, disability, or economic background. The city already signed a contract with the Brazilian company Tembici and will start operations in the second semester of 2022.

🔗 SOURCE

RESILIENT CYCLE HIGHWAY

Colombia's first large-scale cycle avenue, the "Ciclo Alameda Medio Milenio", will go across the city from south to north. This 25 km-long cycling corridor shall

connect citizens from low, middle and high-income neighbourhoods with jobs, schools and recreational opportunities. It will be the first rapid cycleway in the country and marks a starting point for the next generation of cycling avenues. In addition, the project has been gender-responsive from its inception seeking to respond to the needs of female cyclists.

↗ SOURCE

DISTANCE-BASED CONGESTION PRICING AND MANAGEMENT PILOT (MÍDELE LA CONGESTIÓN A BOGOTÁ)

As part of its road pricing strategy, Bogotá has launched the call 'Mídele la congestión a Bogotá', which aims to identify and test technologies for the implementation of an infrastructure-light smart road pricing program. Technologies to be tested should allow the Secretariat of Mobility to define the length, hour, and location of a trip, as well as the occupancy of the vehicles, to determine the fees associated with such trips. In addition, the systems should facilitate the enforcement of the policy.

↗ SOURCE

INNOVATIVE SOLUTIONS
PICO Y PLACA SOLIDARIO - BOGOTÁ'S ROAD PRICING PROGRAM

As part of its transition from Pico y Placa (a policy that restricts car usage based on licence plate numbers) to a congestion charge program, Bogotá implemented Pico y Placa Solidario in 2020. This initiative allows car owners who want to use their vehicles during the restriction to compensate society for associated negative externalities. Currently, daily, monthly and biannual permits are available, and differentiated fees are charged based on key characteristics of the vehicles: estimated emissions, car value and city of registration. Similarly, high occupancy vehicles (3+) and electric/hybrid vehicles are exempted from the restriction. 100% of the collected revenue is earmarked for transit, thus seeking to improve the experience and opportunities of citizens who depend on public transport.

↗ SOURCE

ROAD SAFETY LAB

Road Safety Lab is an international call for technological solutions to improve Road Safety with the Vision Zero approach, building the main meeting place for developers (supply) and implementers (demand). The objective of this initiative is to identify and make visible the most significant, innovative and disruptive technology solutions that can contribute to mitigating the main risk factors of road crashes and/or their severity. In a second

phase, the Secretariat of Mobility will promote trials to test some technological developments selected from the call, to register experiences and to dialogue broadly about the role of technology in road safety.

↗ SOURCE

TRAINING OF WOMEN FOR MOBILITY-RELATED UNCONVENTIONAL JOBS

Bogotá is training 450 women in eco-driving so that they can work as drivers for the recently created public transport operator. The project's main objectives are to contribute to closing gender gaps in the city by reducing and eliminating occupational segregation in public transport, fostering women's economic autonomy and tackling the problem of the feminisation of poverty.

↗ SOURCE

Brussels

'If you see your mobility policy as part of a bigger picture, then it becomes part of the solution.'

GEOGRAPHICAL SCOPE OF STRATEGY
BRUSSELS-CAPITAL REGION, COMPRISING 19 MUNICIPALITIES, INCLUDING THE CITY OF BRUSSELS

POPULATION	AREA
1,209,000	162 KM²

🚶 15%	🚲 3%	🚌 31%	🚗 48%	••• 3%	♀ 11%	🌳 1.5%	PM2.5 11.7MG/M³	🚗💥 1.7

CITY BACKGROUND

Bruxelles Mobilité is the administration of the Brussels-Capital Region responsible for equipment and infrastructure, and to address the growing need for innovative mobility solutions. It oversees the definition of mobility strategies and projects to develop, the renewal and maintenance of public spaces and roads, as well as public transport infrastructure and taxis of the Region. In doing so, it fulfils the essential tasks to protect and enhance the quality of life and the sustainable development of the Brussels-Capital region in partnership with other relevant bodies. The public transport in the Brussels Capital Region is operated by STIB-MIVB, a public corporation.

The current Brussels strategy, named Good Move, was approved in 2020 and runs through to 2030. The Good Move plan aims to anticipate innovation and to transform Brussels into a city that is "more human, greener and friendlier, and with quality public spaces for its residents" based on a vision of a green, affordable, pleasant, healthy, efficient and safe mobility for all. The plan consists of 50 actions, with the general goals to influence demand and travel habits by creating a city for people, where walking and cycling are encouraged, to reduce the need for a personal car, to widen the range

of mobility services, and to align parking and pricing policies at the regional level. The plan aims to reduce mobility-related greenhouse gases by 35% compared to 2005 by 2030, and Brussels's itself aims to become climate-neutral by 2050.

UMII PERFORMANCE
READINESS

💡 **Strategy (Comprehensiveness)** – As stated above, the strategy is based on clear regional goals and follows a state-of-the-art structure based on six strategic programmes of actions: 1) good neighbourhood, actions to improve local quality of life 2) good service, to provide a wide range of mobility options 3) good

partner, to engage all actors 4) good network, to improve transport efficiency 5) good choice, to plan urban space to nudge sustainable mobility choices 6) good knowledge, to foster innovation and open mobility data collection. 50 measures are described, each with their concrete interventions, KPIs and 5-year goals, who is in charge, who is supposed to be involved, and the needed

resources. The government is expected to submit a report every 30 months, following up on individual measures on a yearly basis, and impacts like mode share on a longer term.

💡 **Capability (Internal capacity) -** Brussels Mobility does not have an integrated unit with the specific goal of fostering innovation in urban mobility. Although the strategic plan is comprehensive in covering many best practices, it does not provide a specific innovation strategy and lacks financing earmarked specifically to innovation and experimentation (Investment indicator). Brussels has however started a reflection as to what types of innovation hubs or living labs could best help achieve their various mobility goals.

DEPLOYMENT
💡 **Community engagement (User engagement) –** The strategy is the product of a large-scale participatory process that included all Brussels stakeholders, including mobility and institutional partners, municipalities, the business and social sphere, and residents. The participatory process took place over a period of four years and took the form of a citizen panel: 40 citizens came to work for three consecutive weekends and produced a resolution, followed by a public enquiry with 8000 responses, and the parliament eventually adopted it. For citizens to report on daily problems, the app FixMyStreet allows users to upload pictures to signal dysfunctions, which come almost directly in the working programs of the operational team.

💡 **Regulation (Barriers to innovation) –** The Brussels region is notoriously complex in terms of governance, partly due to Brussels being an 'island' within Flanders, but also due to the many levels of government responsible for various social services (municipal, regional federal). This governance complexity can make experimentation with novel solutions difficult, particularly if they span across wider geographical areas. Another barrier to innovation in widening acceptance towards more diverse and sustainable mobility habits is the hidden subsidies for the car in terms of tax reductions at the federal and regional level, particularly for company cars.

LIVEABILITY
💡 **Environment (Noise) -** Brussels has recognised noise as an important contributor to urban quality of life as well as health of its citizens. It adopted QUIET. BRUSSELS plan in 2019, which sets 9 strategies and

45 measures to improve the acoustic environment quality, including limiting speeds to 30kmh, measuring and communicating noise and vibration levels in public spaces, creating noise-free zones, and finding synergies with air and climate plans.

💡 **Wellbeing (Healthy mobility) -** Brussels won the 8th SUMP (Sustainable Urban Mobility Plan) award in 2020 for safe walking and cycling, in recognition of its willingness to improve the quality of life of its residents and visitors. Lock-down measures related to Covid-19 saw an additional 40km of bicycle lanes almost overnight. Yet, mode share for cycling remains low due to cyclists too often being confronted with heavy motorised traffic, the lack of continuity of protected lanes, and insufficient secured parking. However, Brussels has experienced very strong growth in the number of cyclists in recent years, and the Region intends on maintaining the trend: with 60% of daily trips being less than 5km, the city recognises the high potential for shifting mobility habits to 15 or 20% of cycling.

UPCOMING PROJECTS
DEVELOPING REGULATORY FRAMEWORK FOR MaaS (BRUSSELS MOBILITÉ)
Developing shared mobility integrated with public transport is a major part of the Good Move strategy. This project supports the development of Mobility as a Service (MaaS) for the Brussels-Capital region, more particularly in terms of establishing a regulatory framework for MaaS. The project is assessing the state of readiness of the Brussels-Capital Region for implementing MaaS, developing guidance for data governance frameworks, and consulting with all relevant stakeholders e.g. public transport authorities and operators, MaaS platform operators and shared mobility operators. This project is carried out with funding by the European Union via the Structural Reform Support Programme and in cooperation with the European Commission.

MUNSTROOM PCP (STIB)
The Muntstroom project is the first Pre-Commercial Procurement (PCP) for pedestrian flow analysis and is intended to make the Brussels-Capital Region more attractive to pedestrians. Measuring and analysing people flows provides insight in how people use the city, and to determine the shortest, safest, or most convenient routes from point A to point B. PCP is a special type of procurement for local authorities who seek to develop products or services not yet commercially available.

🔗 Source

INNOVATIVE SOLUTIONS
AUTONOMOUS SHUTTLE SERVICE BRUSSELS HEALTH CAMPUS

STIB-MIVB has been running tests with autonomous shuttles for a few years, gradually increasing difficulty in phases. The main objective is to understand advantages and drawbacks of such vehicles, and how they might support new mobility services in the coming years (first- and last-mile, etc.). The first series of tests took place in a park, which offered a car-free environment and a pleasant place to discover a new way of mobility. In this first phase, shuttles carried more than 5,293 customers and travelled 1,902 km. The second test phase is taking place in the business campus of Solvay, where the shuttles are mixed with cars, speed is increased, and an on-demand application gives the possibility to anyone working in that area to order a shuttle. The third site is still under investigation and will probably be a hospital area with a bigger mobility relevance, passing through public streets and joining a metro station.

There is no driver on board, but a shuttle attendant is always present in the shuttle. His role is to guide the public through this experience, answer their questions, supervise the movement of the shuttle and carry safety checks.

☑ Source

BRUXELLES EN VACANCES (BRUSSELS ON HOLIDAYS, SUMMER 2020)

Temporary installations were placed in public spaces during summer in the Brussels region. The health crisis highlights the need to better share public space and to reserve a significant part of it for active modes and other experimental uses in order to guarantee safety and sufficient physical distance at the same time as providing safe outdoor cultural activities, green spaces, terraces or on-street playgrounds for kids. With summer holidays, the Brussels Government decided to support initiatives in all neighbourhoods, expanding the range of outdoor options for all Brussels residents.

☑ Source

TRAFFIC COUNTERS (STIB)

STIB uses traffic counters on about 40% of its vehicles, counting people entering and getting off vehicles with a combination of two cameras at each door. This helps to know, in real time, the average load of vehicles on a specific line, which can then be communicated to users via Brussels datastore web site and open APIs.

☑ Source

MEDIATOR IN COMMUNICATION WITH CITIZENS (STIB)

The Brussels-Capital Region has created a mediation service with STIB. The mediator, appointed by the Government, is a neutral actor who can formulate non-binding opinions vis- -vis STIB. She is also a member of the Users Advisory Committee. This independent mediator provides another channel to improve the means by which users can provide feedback and formulate complaints about their experience of the public transport system in Brussels.

☑ Source

SUSTAINABLE DEPOT (STIB)

A new tram depot has been built, including 22 sets of tram tracks, in anticipation of an order for 175 new vehicles from STIB. It also includes an office building housing 170 workers in the STIB technical operation department, 625 solar panels on its roof, and a rainwater-recovery device which is able to store up to 700 m^3 of water. The solar panels supply the administrative offices with up to 120 megawatts of electricity every year, while the rainwater storage facility aims to meet 80 % of the depot's water needs, both for cleaning vehicles and to supply the sanitary facilities for workers.

☑ Source

NOISE, INSTALLING ANTI-VIBRATION SURFACES (STIB)

STIB is tackling noise on the tram tracks. Trams (especially when turning) are sources of noise and vibrations. The company has its own specialised team working continuously on reducing noise levels from trams. Solutions consist of e.g. installing special rubber mats that serve as a high performing vibration attenuation system.

☑ Source and source

Budapest

'We would like to better understand the motives behind transport mode choices, to understand how to get people out of their cars and to try to get them to use more sustainable mobility options.'

GEOGRAPHICAL SCOPE OF STRATEGY
CITY

POPULATION	**AREA**
1,752,286	525 KM²

🚶 9% | 🚲 1% | 🚌 48% | 🚗 42% | ♀ 31% | 🌳 2% | PM2.5 🏠 14.9 MG/M³ | 🚗💥 2.4

CITY BACKGROUND

The BKK Centre for Budapest Transport is a public service provider owned by the Municipality of Budapest. It is responsible for the operation and development of Budapest public transport services, including buses, trolleybuses, trams, trains, metro, boats, and bikesharing services. Budapest's main strategy in urban mobility is laid out in the 'Budapest Mobility Plan 2014-2030'. The plan sets the city's overarching goal which is to 'improve the competitiveness of Budapest and its metropolitan area and to contribute to the realisation of a sustainable, liveable, attractive and healthy urban environment'. The three transport-specific strategic objectives of Budapest are focused on 1) a liveable urban environment, 2) a safe, reliable and integrated transport and on 3) cooperative regional relations.
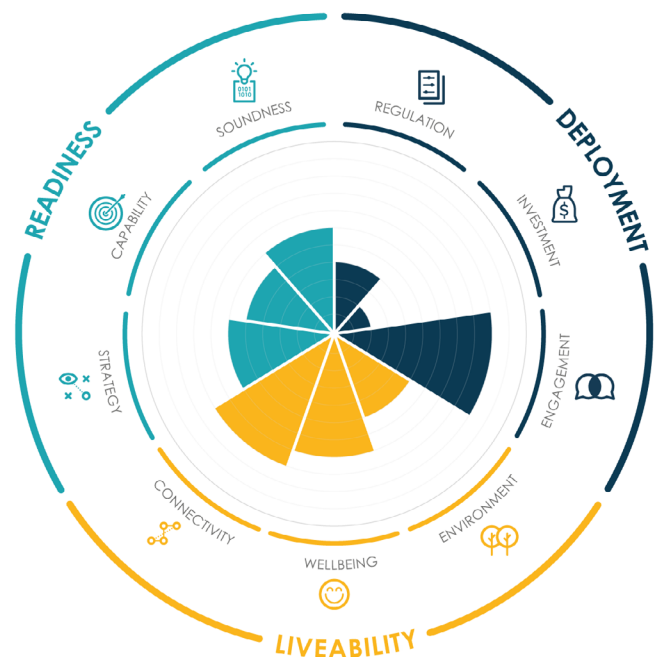
UMII PERFORMANCE
READINESS

💡 **Soundness (Data usability)** – BKK adopts a data-based decision-making process to improve mobility, where not only innovation projects are backed with data but other projects as well. For example, modal split is used to monitor transport shares with additional surveys to understand mobility behaviour. A micromobility service project was introduced and expanded based on local data gathering and the involvement of experts and users. Another example is in the event of a traffic accident or passenger incident, when "Waiting for an ambulance" message is displayed on bus vehicles and information boards to better guide paramedics to the scene of the emergency.

💡 **Soundness (Data accessibility)** – The city of

Budapest does not have an integrated data platform for public access. However, the city recognises the significance of open data and is working towards implementing an open data platform. A small pilot is ongoing with a public dashboard for bicycle traffic counts which is available online.

DEPLOYMENT

💡 **Community engagement (Information use)** – The public consultation conducted for Budapest's SUMP was evaluated and incorporated into the strategic plan. BKK also runs household surveys in relation to mobility, journeys and customer satisfaction on a regular basis. They would like to better understand the motives behind transport mode choices. User insights gathered for the micromobility and bikesharing services in Budapest resulted in major improvements to both services.

💡 **Regulation (Enabling new business models) –** Budapest has some innovative services/solutions expanding in the city, however they continue to face a number of significant legislative, regulatory or policy barriers. There is also no evidence of innovative mobility projects or services being deployed as a result of an emergency situation such as Covid-19.

LIVEABILITY

💡 **Wellbeing (Fairness / Disabled users) –** Assistance to vulnerable and disabled people is provided at transport hubs and stations, and some progress regarding the use of technology to provide further services has been made i.e. the route planner application is able to provide audible passenger information services to assist those visually impaired.

💡 **Wellbeing (Fairness / Women) –** Although there is some reference in the mobility plan for vehicle safety and convenience, Budapest city lacks tailored services, initiatives and tools to support female users to safely use the cities transport network.

UPCOMING / LIVE PROJECTS
OPEN DATA ON CYCLE TRAFFIC
At the moment, the city does not have an open data platform with transport-related data. However, they have a trial for cycling traffic. Data from sensors measuring cycling traffic are publicly available online. They plan to create a subpage on their website and share transport data for various purposes in the future.

INNOVATIVE SOLUTIONS
SURVEYS ON TRAVELLERS' EXPERIENCE
Budapest conducts surveys focusing on modal split and travel satisfaction. The customer satisfaction survey aims to better understand the motives behind transport mode choices, transport behaviour of different social groups and user satisfaction with the services provided in terms of prices, safety, comfort levels, information provision etc. The travel satisfaction surveys are mainly focused on public transport, but the city would like to expand their scope covering all transport modes with the aim to get people out of cars.

MICROMOBILITY POINTS
Budapest has installed several pilot micromobility points where citizens can park their bikes, scooters, or other micromobility modes. Shared bicycles and e-scooters can also be accessed. These points are located close to public transport stations, marked with road surface signs and pictograms for the different modes. The points are also accessible in mobility sharing applications where

users can book and use the shared service. This solution aims to encourage the use of sustainable transport modes in the city by providing accessible and organised parking facilities for micromobility modes.

🔗 SOURCE

SENSORS FOR TRAFFIC AND IN-VEHICLE DATA COLLECTION
30% of buses and trolleybuses and 10% of trams in Budapest are equipped with sensors that count the number of people getting on and off. Based on this data, BKK adjusts the operation of buses, trolleybuses, and trams. For example, this data revealed that the bus service to the airport was reaching capacity in the mornings, so they were able to react quickly and strengthen the connection within a few days. In addition, detectors at certain points in the city are able to measure car (500 points) and cycling (7 points) traffic.

🔗 SOURCE

USER ENGAGEMENT IN DATA USAGE
The city uses the data collected from user engagement activities to improve transport services and expand them. Extension of bikesharing in the city was performed based on data collected from the bikesharing application including occupancy rates at stations. Moreover, the expansion of micromobility points was based on the results of user surveys. In addition, based on the users feedback and ideas on micromobility and bikesharing services, major improvements were implemented on both systems in Budapest.

🔗 SOURCE

ACTIVE CITIZEN PARTICIPATION AND CO-CREATION IN DECISION-MAKING
Within the scope of the Cities-4-People project, Budapest has brought together its local community to rethink and transform the mobility landscape of the city, creating the Mobility Point Network in collaboration with seven mobility providers. The communities and neighbourhoods around the riverbanks of the Danube River and the adjacent public spaces have been invited to collaborate and co-create urban solutions to contribute to a more liveable urban environment. Furthermore, Zugló-Törökőr neighbourhood in Budapest is part of a project which runs a highly participatory co-creation process with their residents and stakeholders to identify local needs, develop new transport solutions, implement and evaluate them. The city also operates a website where citizens can vote for different projects and submit their own ideas. The local government then implements the most popular ideas.

🔗 SOURCE

Cape Town

'Public transport needs to first be working properly for those using it before attracting others to it.'

**GEOGRAPHICAL SCOPE OF STRATEGY**
City/Municipality

POPULATION	AREA
4,488,546	2,461 KM²

🚶 9%	🚌 41%	🚗 50%	♀ 26.5%	🌳 67.4%	PM2.5 8.5MG/M³	🚗💥 17.8

CITY BACKGROUND

The vision of the City of Cape Town is to create a connected city that provides more opportunities, 'with an effective and efficient integrated public transport service, together with a road network that connects communities to opportunities as well as enables business to grow'. The main strategic document for Cape Town on urban mobility is the Comprehensive Integrated Transport Plan (2018-2023) which envisions an integrated, intermodal and interoperable transport system. The City's Energy 2040 Goal (2015) requires an accelerated transition to zero emissions throughout Cape Town, including in the buildings, waste, energy and transport sectors. The overall performance of the transport system and urban development in Cape Town is monitored through the Urban Development Index which is aligned with the City's Integrated Development Plan.
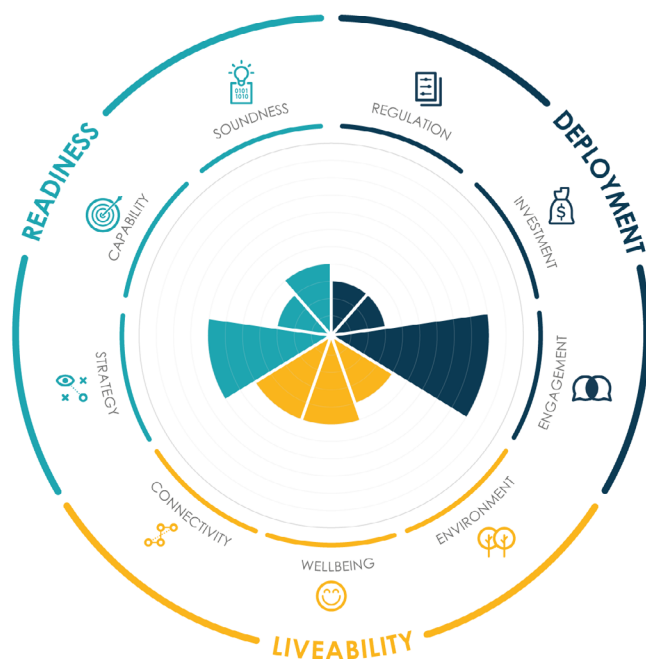
UMII PERFORMANCE
READINESS

💡 **Capability (Internal capacity) -** The Organisational Effectiveness and Innovation department is a dedicated department in Cape Town that leads certain initiatives to foster innovation. This team has been re-purposed to tackle Covid-19 by supporting the identification and deployment of innovations to manage and mitigate the effects of the pandemic.

💡 **Soundness (Data accessibility) –** Although there is an Open Data Portal, it seems that no significant efforts to open data or promote an open data culture across City stakeholders have been made. However, data can be available upon a direct request.

DEPLOYMENT

💡 **Community engagement (User engagement) -** The users of the transport network in Cape Town can actively engage with the City through a mixture of traditional channels and social media platforms and information on how the user can contact the City and transport providers is easily accessible. The users can also engage with the bus rapid transit (BRT) service via the MyCiTi website and mobile application, and annual surveys on levels of satisfaction with different elements of the BRT services.

💡 **Regulation (Market barriers to innovation) -** While regulatory or legislative barriers to innovation are recognised by the City, there are no significant examples

of these barriers being removed to foster innovation in urban mobility. The City of Cape Town finds it challenging to influence things from the local level where it stands, as it does not have the requisite delegated mandates.

LIVEABILITY

💡 **Environmental (Natural areas)** – The proportion of natural or semi-natural areas in Cape Town is as high as 67%, and must remain high as it is home to one of the floral kingdoms of the world: the Cape Floral Kingdom. These areas were identified as those that contain a natural or semi-natural wetland or watercourse, areas with more than 5% indigenous flora species, and areas that support natural coastal processes. The Table Mountain National Park is accounted for within this. Preservation of natural areas within a city enhances the quality of life and makes active modes of transport more attractive.

💡 **Wellbeing (Fairness)** – The disabled or vulnerable users of the transport network in Cape Town are served by initiatives such as the Dial-A-Ride public transportation services and the MyCiTi buses equipped with at-grade boarding platforms. However, the city lacks tailored services, initiatives and tools to support female users to safely use the city's transport network.

UPCOMING / LIVE PROJECTS
INNOVATION FORUM

The City of Cape Town has established an innovation forum to enable an environment where different stakeholders contribute, collaborate, disseminate, share information and improve the coordination in working towards sustainable mobility solutions. The Forum is composed of representatives from all directorates in the administration.

🔗 Source

MODELLING PLANNING TOOL

The provincial government is building a Land Use Transport Interactive model (LUTI), a tool to assist municipalities to understand operations in the land use and transport system. Cape Town has access to this tool for scenario-building. It covers all modes of transport including walking and cycling, facilitating a more informed, evidenced based decision-making process for the design, planning and operation of the network.

INNOVATIVE SOLUTIONS
RESILIENCE PLANS

The City of Cape Town has developed plans to address crises in response to both climate change, and the Covid-19 pandemic. The 'Covid-19 Transport Response Plan' (2020) outlines risks and mitigation measures to ensure that transport business continuity is managed and adjusted to take into account the pandemic and its impact. The Travel Demand Management Strategy (2017) suggests proposed interventions to maintain 'a positive travel behaviour and congestion reduction post lockdown'. Furthermore, the 'Cape Town Resilience Strategy' (2019) provides a roadmap and different mechanisms for the city to be resilient, which together with the 'Climate Change Policy' (2017) aim to achieve the goal for a 'Connected, climate-adaptive city'.

URBAN DEVELOPMENT INDEX

The overall performance of the transport system and urban development in Cape Town is monitored with the Urban Development Index which is an expansion of the initial Transport Development Index first published in 2017. The Urban Development Index examines three key areas related to transport, land use and human settlements which are monitored with 11composite indicators. This tool assists Cape Town to track change and responsiveness to the efforts and goals.

🔗 Source

PUBLIC TRANSPORTATION MANAGEMENT SYSTEM

Adopting a new Advanced Public Transportation Management System in 40 percent of MyCiTi buses since 2017 has improved customer satisfaction in Cape Town. The system enables passengers to track delays and get updated information on departure times.

🔗 Source

Casablanca*

(*Based on desk research)

GEOGRAPHICAL SCOPE OF STRATEGY
CITY/MUNICIPALITY

POPULATION	**AREA**
3,359,818	324 KM²

52%	9%	39%	♀ NA	🌳 NA	PM2.5 9.1MG/M³	10.2%

CITY BACKGROUND

The urbanisation of Casablanca is putting significant strain on the city infrastructures which are near or past its design life, requiring significant upgrades. A major increase in car travel (300,000 vehicles in 2001 vs 1,300,000 vehicles in 2014) has led to high congestion levels at peak hours. As a result, citizens' access to services and their activity has been reduced, and accidents, air pollution and other challenges steadily increasing. The strategy aims to tackle these challenges by launching an ambition for the city to become connected and integrated through several new transport and mobility projects. By 2022 there will be: 1) 4 tram lines and 3 BHNS lines 2) Network equipped with over 550 IoT and security cameras 3) Modern, efficient ticketing system for integrated travel 4) 8 inter-network correspondence light rail stations 5) 10 multimodal exchanges 6) Increased coverage of mobile connectivity and wifi 7) Restructuring, upgrading of the bus network with dedicated corridors.
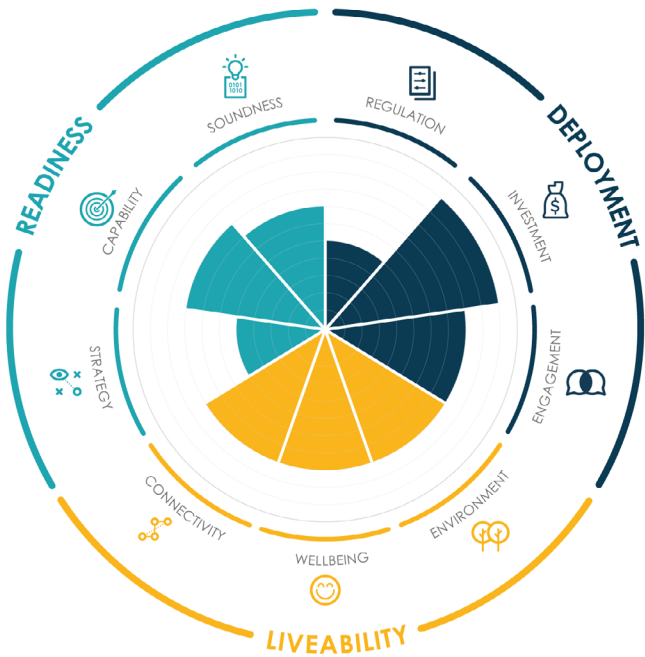
UMII PERFORMANCE
READINESS

💡 **Capability (Internal capacity) -** The city is open to innovation through its first innovation laboratory, Casaroc which enables innovators to conduct field trials or test beds in the city. Despite engaging the users in innovation processes, this is not yet an embedded approach and communities don't necessarily recognise themselves as part of the innovation ecosystem, rather as a consultation party.

💡 **Capability (Internal capacity) -** Innovation in urban mobility is embedded in the work the strategy owner does but the agenda hasn't been assigned to any department/unit/person in particular. The city council could consider creating a department/unit/role within the strategy owner's organisation with the specific remit of fostering innovation in urban mobility.

DEPLOYMENT

💡 **Investment (Attracting investment) -** The council promotes external innovation through the development of innovation awards and other competitions such as Al Amal which is a hackathon for developers to create mobility, energy, urban transportation solutions which can have a positive impact on the city. The challenge: to develop mobile apps responding to challenges outlined in the strategy. There are prizes up to $ 27,000 available.

💡 **Regulation (Market barriers to innovation) -** The city has some innovative new mobility services expanding in the city, however legislative, regulatory and policy

barriers have restricted the growth of shared, on-demand ride hailing apps like Uber. Uber doesn't operate in Morocco anymore. They stopped in February 2018. Uber said that "Unfortunately, since our launch in Morocco, almost 3 years ago, we have not had any clarity about integrating applications like Uber into the existing transport model. That's why we make the difficult decision to suspend our activity in Morocco." There were many taxi drivers in Casablanca protesting against what they call "unfair competition" from Uber.

LIVEABILITY

💡 **Connectivity (Seamlessness) -** Major modes of public transport available in the city are covered by a single ticketing system called Calypso. The fare collection system is automated, based on a physical ticketing system and tickets are validated in each vehicle.

💡 **Wellbeing (Fairness) -** The city does not have visual and audio technologies to help provide information to enable vulnerable people to navigate the network. The potential to use technology to provide further services has not yet been taken advantage of but is stated as an ambition.

UPCOMING / LIVE PROJECTS
SKYTRAIN
The project is assessing the feasibility of a 'skytrain' for Casablanca. The aim of the project is to provide several elevated electric monorail trains which includes a 15-kilometre route suspended on beams.

🔗 SOURCE

AL AMAL HACKATHON COMPETITION
The council is promoting external innovation through the development of innovation awards and other competitions such as Al Amal which is a hackathon for developers to create mobility, energy, urban transportation solutions which can have a positive impact on the city. The challenge: to develop mobile apps responding to challenges outlined in the strategy. There are prizes up to $ 27,000 available.

🔗 SOURCE

INTEGRATED PUBLIC TRANSPORTATION SYSTEM
By 2022, the City of Casablanca is aiming to develop 10 multi-modal transport interchanges in the city to create a more integrated network. The local government are developing a new integrated pricing and ticketing scheme covering many urban trips.

🔗 SOURCE

INNOVATIVE SOLUTIONS
INTEGRATING BRAIN FOR DATA ANALYSIS
Minsait, an Indra company, has won a contract to develop the urban data management platform of Casablanca, one of the cornerstone projects of this city's digital transformation program. The contract has been signed with Casablanca Prestations, a local development company of the Casablanca City Council, and it aims to become a model for urban modernisation in Morocco. The "integrating brain" combines the Internet of Things, Big Data and Artificial Intelligence technologies to cross-reference and analyse the information of the various vertical services such as waste collection, energy, water and traffic in order to make decisions and respond to events in real time as well as simulating possible scenarios to define the best public policies and generate increasingly sustainable public services.

🔗 SOURCE

EXTERNAL PARTNERSHIPS
Through the cities innovation lab, a network of external stakeholders has been engaged through partnerships and collaboration agreements to support the development of aims which can help Casablanca become more sustainable through innovation. The following stakeholder groups have been engaged:

- 8 reputable partners, committed to innovation, who have mobilised resources, and supported mobility innovation projects (EMINES UM6P, Foundation Ecole Centrale Casablanca, Emlyon Campus Casablanca, R seau Entreprendre Maroc, Numa Casablanca, Le Wagon, Technopark Maroc, Kluster CFCIM)
- 400 students have collaborated on innovation projects at various points in the prototyping cycle
- 50 RATP Dev employees, from all subsidiaries combined, who took part in an internal call for projects to identify innovation opportunities
- 6 RATP Dev networks that tested/approved at least one Casaroc project

ITS FOR FREIGHT PRIORITISATION
The city has developed a network of ITS sensors and devices to capture traffic and public transport data, in some cases real-time. This data and the technology have been used to deliver several transport and mobility projects, including one which made it possible for HGVs to bypass the downtown of Casablanca by prioritising them at strategic junctions through traffic signals. This has delivered a significant gain in terms of business competitiveness and a substantial positive impact on the quality of life of citizens and the urban environment.

Copenhagen*

(*Based on desk research)

GEOGRAPHICAL SCOPE OF STRATEGY
City

POPULATION	**AREA**
799,033	180 km²

🚶 10% | 🚲 47% | 🚌 16% | 🚗 27% | ♀ 17% | 🌳 23,7% | PM2.5 9.3mg/m³ | 🚗 0.9

CITY BACKGROUND

In 2012, the The City Council of Copenhagen adopted the CPH 2025 Climate Plan with the goal that Copenhagen must become carbon neutral by 2025 – a goal meaning that the city aims to become the first carbon neutral capital in the world. Politically, the city strives to demonstrate how it is possible for big cities to create green growth and development, while reducing carbon emissions at the same time. One of the key aspects also considered in the Climate Plan is the reduction of emissions from the city's transport system. Therefore, Copenhagen adopted an action plan for Green Mobility which aims to address the issues of growing demand for mobility in the city, while meeting the Climate Plan's ambitious environmental goals.
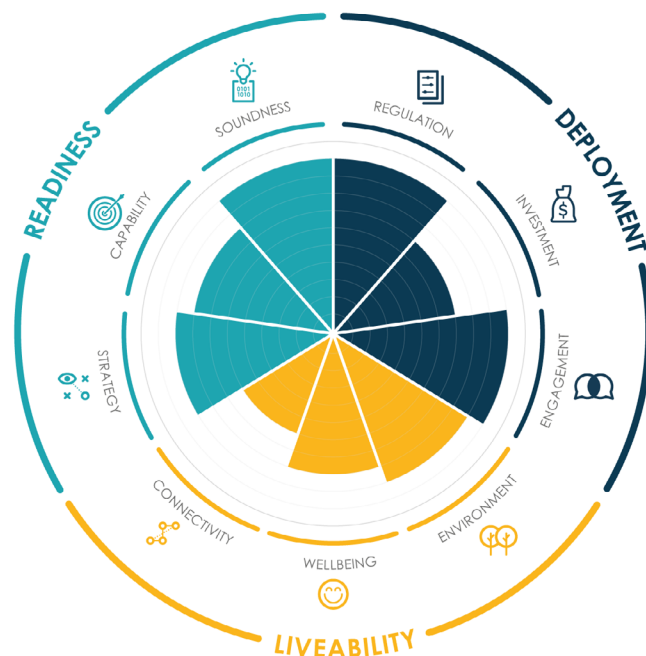
UMII PERFORMANCE

READINESS

💡 **Strategy (Readily available innovation strategy)** – The municipality of Copenhagen prepared several very comprehensive strategic documents which aim to guide the city towards materialisation of its mobility innovation vision. Key documents include the Action plan for Green Mobility, Car sharing strategy and CPH 2025 Climate Plan. The strategy for urban mobility innovation sits as a part of broader policy context which recognises other city domains as well. The strategic documents are regularly updated to reflect the changing citizens' needs and keep up with the recent developments in urban mobility.

💡 **Capability (Leveraging skills and capabilities)** - The share of women working in the municipality's transport department is 17%. Balancing the employment of genders within the department, thus giving women a more proportional role in decision-making processes could enable a wider range of factors to be considered in support of more inclusive mobility.

DEPLOYMENT

💡 **Regulation (Market barriers to innovation)** – The city is very well aware of the policy, regulatory and legislation barriers to urban mobility innovation and takes a proactive stance towards addressing them. For each

intervention envisaged in its strategy, the city provides an analysis of key legislative barriers to innovation and assigns itself a task to push for legislative improvements by lobbying the government for specific interventions to remove the barriers to innovation.

LIVEABILITY

💡 **Connectivity (Seamlessness) –** There is evidence of significant measures taken by the city to increase the seamlessness of transport for the users. City's key transportation hubs are rebuilt with a focus on better access arrangements and more bicycle parking spaces. Moreover, there are numerous journey planners available that allow the users to select mode combination pre-trip, e.g. Citymapper, Cogo, Rejseplanen, DOT. Users of Copenhagen's transport system benefit from integrated ticketing and can use various means of payments, including cash, electronic card or a dedicated mobile app.

💡 **Environmental (Air quality) –** The concentration of PM2.5 in some localities during peak hours remains a slight challenge, however, it is worth noting that the air quality in the city increased significantly over the past years. This was achieved also thanks to the city's extensive measures to increase the air quality, including the continuing support for transition towards active modes of transport.

INNOVATIVE SOLUTIONS
GREEN WAVE, GREEN LANES

New initiatives in the city seek to maintain and improve the use of bicycles. Green lanes have been established for the exclusive use of cyclists, creating an ecological environment for the city. The main routes have been established to "green waves" to synchronise the flow of bicycles with traffic lights so that the cyclists maintain an average speed of 20 km per hour.

"RAPID" (RAPID PROTOTYPING IN 3D)

The City of Copenhagen's Smart City incubator, Copenhagen Solutions Lab has been involved as a project partner in recently finished pan-European project "RAPID" (Rapid Prototyping In 3D). The project aimed to develop digital tools that can support the authorities' decisions on introducing measures against Covid-19 in the public space. Within the project a 3D-model of Copenhagen Central Station was created that planners can use for digital testing of what effect potential measures in the city's public space may have.

↗ SOURCE

FIND THE CLOSEST AVAILABLE PARKING SPACE

In 2016, the Citizens' Representation decided to release the construction funds for the establishment of a smart parking solution which will make it easier for drivers in Copenhagen to find a free parking space. The research and case studies of similar solutions showed that hardware-based solutions are costly, demanding in terms of maintenance and inefficient. Instead of installing expensive sensor infrastructure, Copenhagen Municipality provides high quality data which suppliers of digital parking payment and navigation systems are free to incorporate into existing and new applications to create purely software-based parking solutions. One of the key expected effects of the solution is less congestion on the roads and decreased air pollution caused by search traffic.

↗ SOURCE

SUPERKILEN PARK

The Superkilen is a public park which was built as part of an urban improvement project in Copenhagen's Nørrebro district. It was planned through a public participation process and is intended to promote tolerance and unity by bringing together diverse ethnic communities. The multifunctional urban space integrates green corridors into the urban centre of Copenhagen and is stretching along a cycle path. Therefore, it combines an urban park and a cycling gateway filled with objects and designs from all around the world.

↗ SOURCE

STUDY OF AIR POLLUTION AT SIGNALISED INTERSECTIONS

When the traffic lights turn yellow, many motorists try to rush over the intersection by increasing their speed. This extra acceleration releases additional exhaust products which might have a negative impact on the health of pedestrians, cyclists and residents close to the intersection.

Copenhagen Solutions Lab have, in collaboration with Leapcraft and DTU amongst others, completed an investigative project of the linkage between traffic and air pollution at signalised intersections. While further studies are needed to prove whether it is possible to affect local air pollution by changing the signal times in consecutive intersections along a traffic corridor, this study is a first important step to better understand the phenomenon.

↗ SOURCE

Delhi*

(*Based on desk research)

GEOGRAPHICAL SCOPE OF STRATEGY
City/Municipality

POPULATION	**AREA**
16,787,941	1,484 km²

🚶 35% | 🚴 4% | 🚌 31% | 🚗 9% | 💬 21% | ♀ NA | 🌳 NA | PM2.5 98.7mg/m³ | 🚗💥 4.8

CITY BACKGROUND

Delhi is a globally competitive, thriving urban centre as well as a historic world city with unparalleled cultural wealth. Delhi is quite prominent and one of the fastest growing megacities in the world, and according to international studies, it is the second highest performer and the fastest growing economy in Asia-Pacific.

Being one of the leading start-up ecosystems in the world. It is one of the most important trade centres in India and Asia and the biggest and busiest logistics and trade hub in North India. Delhi needs to build on this potential and address issues such as pollution, degraded built environment, congestion, lack of safety and disparate living conditions, which are a threat to its market potential and global attractiveness (Delhi Master Plan 2041). By 2041, the Plan envisages Delhi to achieve a modal split of 80:20 in favour of public and shared transport.

The Master Plan for Delhi is one of the key instruments that facilitates Delhi's development by assessing the present condition and guiding how to achieve the desired development. The anchor agency for the master plan is the Delhi Development Authority. Implementation of the Plan is the collective responsibility of all agencies involved in the development of Delhi, including the Central Government, concerned departments of the Government of the NCT of Delhi, service providers, landowning agencies, regulators, and local bodies among others. In order to address the city's sustainable mobility related issues, the government has launched a variety of policy initiatives in the last decade, including TOD Policy & Regulation (2014), Delhi Parking Policy (2017), and Electric Vehicle Policy (2020).
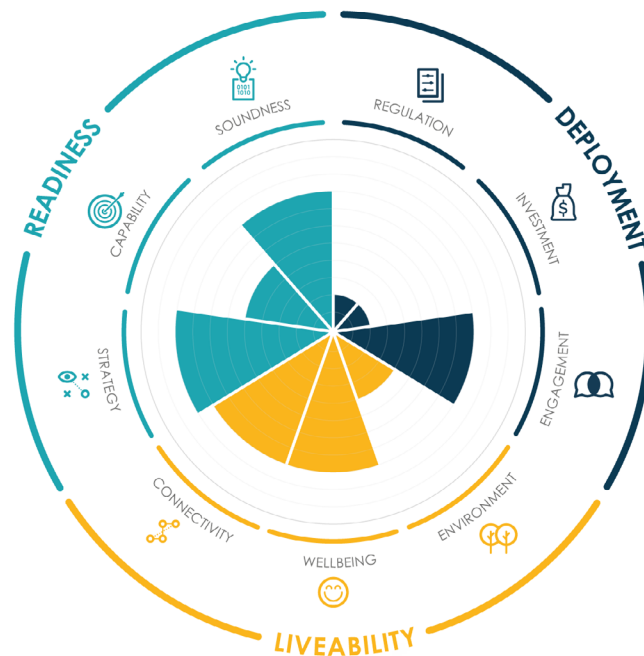
UMII PERFORMANCE
READINESS

💡 **Strategy (Stakeholder engagement)** - To support the development of the Master Plan, a comprehensive stakeholder engagement programme was completed. The opinions, views and aspirations of the people of Delhi were captured through continuous engagement during the preparation of the Plan. Stakeholders came from a variety of backgrounds; local governments, public bodies, industry, citizens, young generation, persons with disabilities, professionals, NGOs working on gender issues, people living in unauthorised colonies and slums,

traders, industry representatives. An online, citywide wide outreach was launched with events and focussed group discussions through a dedicated online web portal and social media. In one exercise, over 5000 vision statements were received from members of the public.

💡 **Capability (Internal capacity) -** Delhi does not have a 'Living Lab' program to support the development of innovative smart city solutions in a safe, controlled environment. Regulatory barriers make testing innovation difficult; the organisations required to collaboratively establish a Living Lab are often siloed from one another.

DEPLOYMENT
💡 **Community engagement (Information use) -** Engagement data collected from consultation of the Master Plan was used to complete an analysis of trends and strengths, weaknesses, opportunities and threats (SWOT) which brought to the fore key concerns regarding the city. These were corroborated by views received from citizens, stakeholders and experts who participated in public consultations and focussed group discussions held during plan preparation.

💡 **Investment (Attracting investment) -** There is little or no evidence that the strategy owner promotes third-party innovation through open calls to innovation (incl. hackathons), challenge/outcomes-based procurement processes including procurement of innovation mechanisms such as Pre-Commercial Procurement and Public Procurement of Innovative Solutions, particularly in the field of urban mobility. In a recent initiative the Government in collaboration with the Indian Institute of Technology Delhi (ITT) is setting up a Centre of Excellence with fund support of Rs. 60.1 million from Delhi Knowledge Development Foundation, to promote sustainable mobility and encourage start ups to undertake research in smart mobility systems.

LIVEABILITY
💡 **Connectivity (Seamlessness) -** The Delhi Common Mobility Card, launched in January 2018, can be used to pay for the Delhi Metro as well as the buses run by the Delhi Transport Corporation (DTC) and cluster bus operators. There are plans to expand this to other transportation modes, such as bikesharing, but not commuter rail.

💡 **Wellbeing (Fairness)** - There is little evidence of support provided for vulnerable and disabled people on the transport network and dedicated mobility services in Delhi. Attempts are being made by the government to carry out disability audits at the existing road systems in the city. The city also encounters inequity issues in the delivery of public transport services particularly in non central areas. In order to promote gender equity and fairness, the government provided free travel for women in buses.

UPCOMING PROJECTS
SMART TICKETING
A unified ticketing system or smart mobility card shall be implemented covering major modes like railway and bus transport. Other shared modes like Intermediate Public Transport, on-demand cabs, etc. may also be considered for integration. A common fare management system may be developed by seeking partnerships amongst the various private service providers and transit agencies. This can facilitate further incentives and fare subsidies to users who move from one mode to another.

SMART PARKING
A number of initiatives have been undertaken in the New Delhi Municipal Council (NDMC) area related to mobility and parking under the Smart City Mission programme which includes EV based last mile connectivity, EV charging facilities, smart bus stops, E surveillance, smart parking management system, Pelican crossing facilities etc.

INNOVATIVE SOLUTIONS
ELECTRIC VEHICLES
Public charging infrastructure for Electric Vehicles shall be made available throughout the city at various public places, on-street parking areas and public parking sites. This may be enhanced incrementally based on trends in market share of e-vehicles and based on the estimated traffic in a grid block. In the absence of design standardisation of charging equipment, kiosks with multiple charger models shall be made available at all public charging stations.

- Fuel stations, metro station parking, railway parking areas, authorised on-street parking or other government-owned parking shall be retrofitted with EV charging infrastructure. All new fuel stations allocations shall have mandatory space allocated to electric charging infrastructure.
- Provisions for an environmentally safe and efficient battery recycling eco-system shall be made by the concerned agencies.
- Land required for setting up separate/exclusive battery recycling centres shall be provided by the concerned agencies in their respective areas.
- Live air quality monitoring covers the entire city and data of air quality are mapped. According to the Ministry of Earth Sciences, Delhi's air quality index (AQI) is 121, which is described as poor.
- Smart sensors for Ambient Air Quality Index (AQI) measurement can be set up at traffic signals to provide real-time air quality information to citizens.

Dubai

'Engaging citizens, academia and industry experts is very important because these people can give you a perspective, which is often very different from ourselves as a government entity.'

GEOGRAPHICAL SCOPE OF STRATEGY
Urban area

POPULATION	**AREA**
3,411,200	1,491 km²

14%	14%	47%	25%	♀ 34%	🌳 5.2%	PM2.5 36.8mg/m³	🚗 2.2

CITY BACKGROUND

Roads and Transport Authority (RTA) is responsible for planning and organisation of transportation, infrastructure and traffic in Dubai, between Dubai and other Emirates of the UAE as well as the neighbouring countries. With a vision of becoming "The world leader in seamless and sustainable mobility", RTA aims to develop and manage integrated and sustainable roads and transportation systems at a world-class level, providing pioneering services to all its customers. RTA aspires to support Dubai's vision through developing efficient policies and legislation, adopting new technologies and best practices while leading its own innovation processes to shape the future of mobility.
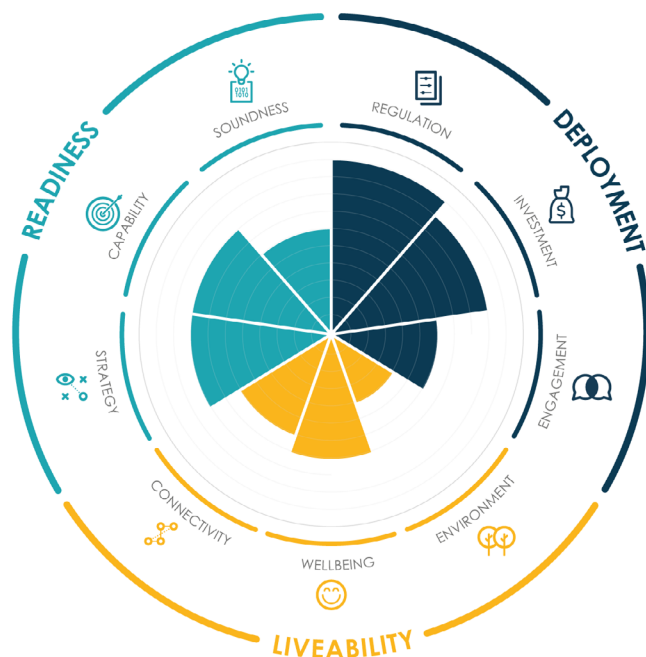
UMII PERFORMANCE
READINESS

💡 **Capability (Internal capacity to support innovation) –** In 2016, RTA established the "Knowledge and Innovation Department" (KID) - a central unit to manage innovation. The Department manages innovation activities, fosters a culture of innovation, develops innovative tools and employs them in line with the needs and expectations of stakeholders. At the onset of Covid-19, RTA formed the Covid-19 Crisis Management Committee, including the KID director as a key member of the team.

💡 **Soundness (Data accessibility) –** RTA collects a lot of static and real-time data to inform its strategic and operational decision-making. Some of the datasets are available through Dubai Pulse – an integrated data platform for Dubai. In the Transport section, RTA currently provides static datasets relative to the main motorised transportation modes, including road, rail and marine vehicles. Providing access to real-time datasets and collecting qualitative data on the experience and satisfaction of active mode users—pedestrians and cyclists - could be considered as it would be beneficial for external innovators and to bring even more innovative transport solutions to the city.

DEPLOYMENT

💡 **Investment (Own investment) –** RTA has a specific budget allocated for urban innovation activities including research collaboration. The investments cover a wide range of projects from improving the efficiency of street lighting to futuristic solutions to enhance the utilisation of its network such as the Dubai Intelligent Traffic Systems Centre. As well as clear programs with clear allocated funds for the coming 10 years, examples are

Dubai Autonomous Strategy and Dubai Zero emission plan. The risk of investing in innovation projects is mitigated by a risk management plan, actions include collaboration, research, and piloting/testing.

💡 **Community Engagement (User engagement) -** RTA actively engages with users using tools and methods such as social media, face-to-face consultations, focus groups and customer satisfaction surveys, as well as data from the Nol travelcard. There is potential to employ more innovative digital participation platforms to make the most of the user engagement to inform decision processes and contribute to the development of solutions as well as providing feedback on existing services, especially for active modes.

LIVEABILITY

💡 **Wellbeing (Fairness) –** Public transport infrastructure in Dubai is built according to the Dubai Universal Design Code (DUDC), which assures accessibility for people with disabilities. Facilities constructed before the adoption of DUDC are being upgraded to comply with the code. Furthermore, RTA provides a variety of services for people with disabilities including subsidised parking and public transport pass, communication channels with visual and hearing aids, and docking stations for charging electric wheelchairs at bus stations. Female travellers can take advantage of dedicated women and children carriages in each metro train, and dedicated seats for women in other modes of transport. There is also a dedicated taxi service with female drivers distinguishable by pink-coloured cabs.

💡 **Environmental (Air quality) –** RTA is running initiatives to enable the transition from petrol/diesel to electric vehicles both in public transport and in private ownership vehicles. From the evidence available, it seems that there is potential for active mobility modes to play a more significant role in the transition towards sustainable mobility in Dubai. Although the city has a goal to become a leading city in cycling, its current targets for active mobility share remain modest, and ways to reach this goal still need to be better defined.

UPCOMING PROJECTS
ROBO-TAXIS

RTA and Cruise, an autonomous vehicle company backed by General Motors, SoftBank and Honda, signed an agreement to operate robo-taxi service in Dubai. This agreement, which is the first of its kind worldwide between a government entity and a leading autonomous vehicles company, is a major step towards realising

Dubai's Self-Driving Transport Strategy of converting 25% of total trips in Dubai into self-driving transport trips by 2030. This new service will start with a limited number of vehicles shortly, with plans to scale up to 4,000 vehicles by year 2030. Dubai will be the first non-US city where the Cruise Origin, the first purpose-built all-electric, self-driving vehicle, will be launched. Under the agreement, Cruise will establish a new local Dubai-based company which will be fully responsible for the deployment, operation and maintenance of the fleet.

🔗 SOURCE

AIRTAXIS

RTA has signed a memorandum of understanding with Dubai Air Navigation Services (DANS) and another with Dubai Civil Aviation Authority (DCAA) to exchange expertise and support the launch of aerial vehicle service in Dubai. RTA is also working with the General Civil Aviation Authority (GCAA) on multiple tracks including legislation, benchmarking and review of technologies, and future partners assessment. In terms of the needed infrastructure, RTA is also collaborating with Dubai Airport Engineering Projects (DAEP). RTA with stakeholders are discussing legislation, air routes, take-off and landing sites as well as safety and security related to urban air mobility. In this context, several benchmarking efforts, site visits, technical and business studies have been conducted, also advanced tests have already been carried out in collaboration with eVTOL providers including Volocopter and EHang.

🔗 SOURCE

INNOVATIVE SOLUTIONS
DATA PIONEERS PROGRAM

RTA introduced a special training program called Data Pioneers Program, which aims to equip its employees with the basic data science and analytics knowledge. This will enable them to utilise the newly gained expertise for optimising their day-to-day activities and achieving RTA's business goals through a data driven approach. As of date, the program has trained over 150 employees.

DATA FIRST, THE CITY'S DATA CHALLENGE

Dubai has launched "Data First, The City's Data Challenge", a six-month-long challenge that brings together Smart Dubai's government and semi-government partners to accelerate data collection, enabling the city to deliver insightful use cases that will support its leaders, government sector entities and private sector businesses in making more informed and data-backed decisions. To encourage sharing of

data, Dubai awarded partners that have made the most contributions in terms of providing their respective data to the Dubai Pulse – Dubai's open data platform. Winning entities of the challenge included among others RTA and Dubai's Knowledge Human Development Authority.

⤴ Source

INTEGRATED TICKETING CARD WITH REWARDS (NOL)

RTA introduced Nol as a unified ticketing solution in 2009. Nol can be used across all modes of public transportation in Dubai including Dubai metro, tram, bus, marine transportation and taxis. What is different from other integrated cards is that Nol can also be used for payments at retail stores or for other uses stipulated by RTA as well as to access public parks and museums in Dubai. Moreover, RTA provides Nol Plus, a loyalty and rewards program that enables users to earn points by using RTA services, including public transport. The Nol Plus points can be spent in various retail outlets as well as on RTA services, which encourages public transport use.

⤴ Source

RTA TAXIS DELIVERY SERVICE

During the Covid-19 pandemic, RTA developed a new business model for Taxis struggling with decreased demand. An analysis highlighted that food/grocery supply chains were facing significant challenges to process and deliver the huge increase in orders during lockdowns. To help solve both of those issues, vacant taxi vehicles have been used for delivering groceries to customers.

⤴ Source

VIRTUAL WORKING PROGRAMME

Dubai introduced the Virtual Working Programme and remote work visa, an innovative and unique measure to attract qualified workers to work in Dubai remotely. Although this is not a transportation innovation in itself, this regulatory innovation may contribute to reducing travel demand as well as to paving the way for a paradigm change, curbing the need to travel to work, even from outside national borders.

⤴ Source
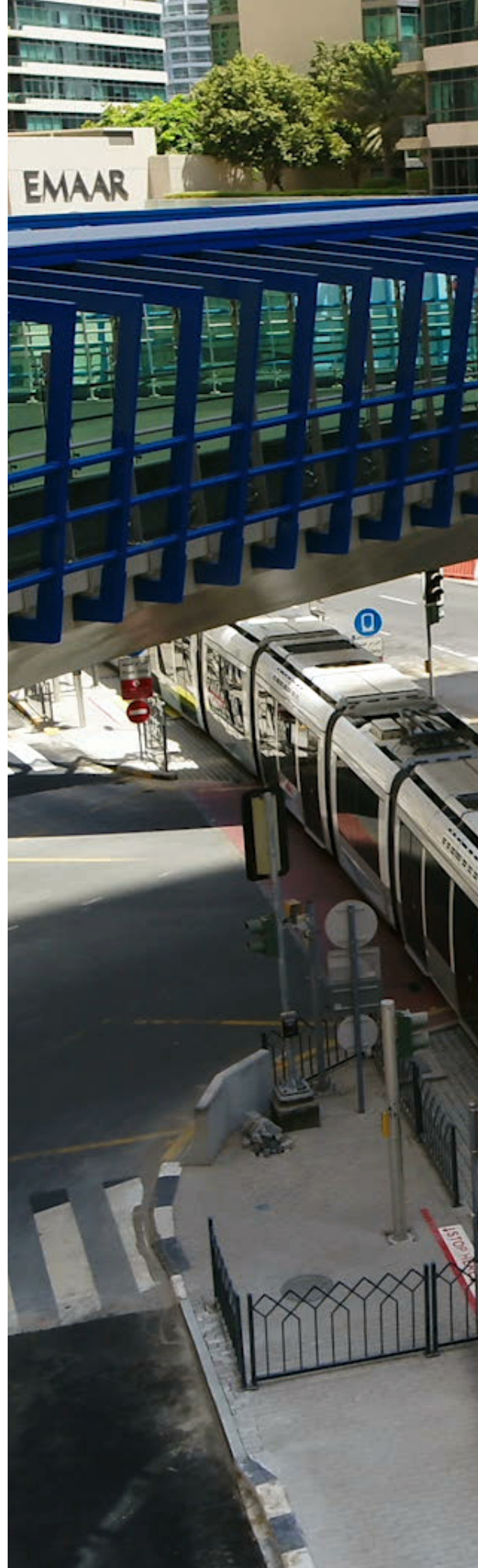
جسر المشاة مفتوح الآن لعبور آمن
The pedestrian bridge is now open
for you to safely cross

RTA

Hamburg

'Targeting people with reduced mobility serves everyone.'

GEOGRAPHICAL SCOPE OF STRATEGY
CITY

POPULATION	**AREA**
1,845,229	755 KM²

🚶 27% 🚲 15% 🚌 21% 🚗 36% 💬 1% ♀ 48% 🌳 24.7% PM2.5 10.8MG/M³ 🚗💥 1.5

CITY BACKGROUND

The city of Hamburg 'takes action to become an emission-free, sustainable and user-friendly mobility capital of the future.'Hamburger Hochbahn AG (HOCHBAHN) is involved in the co-creation of the city's strategy for mobility. HOCHBAHN is a city-owned public company operating the metro and part of the bus services as well as the MaaS solution in the city of Hamburg. The core strategic documents in terms of urban mobility innovation include Hamburg Climate Plan and ITS Strategy for Hamburg. Hamburg has a vision to become "a modern city of the future in which climate mitigation and climate adaptation are fundamental components of our shared society". Hamburg will become a "Climate Smart City" and a zero-carbon city by 2050. The city aims to use the "opportunities offered by technological progress to improve Hamburg's quality of life and economic attractiveness". For public transport the city is aiming to offer passengers an adequate public transport service within 5 minutes by 2030 and at the same time achieve electrification of vehicle fleets by 2030 using 100% green electricity.
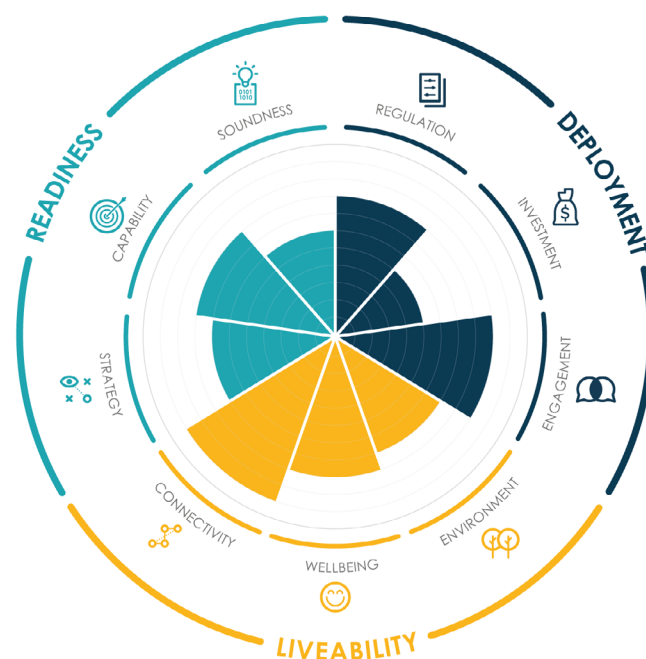
UMII PERFORMANCE
READINESS

💡 **Soundness (Data accessibility)** – Transparenzportal Hamburg provides open access to a wide range of data, including mobility datasets, maps and documentation on meetings etc. Data is recent, updated regularly and available in various formats for use by internal and external stakeholders. Hamburg has developed an open data policy and encourages open data practices and use for commercial and non-commercial purposes. All public companies related to the city have to publish a big share of their data on this portal.

💡 **Soundness (Data collection)** – Although Hamburg has an established data collection mechanism, data is not automatically validated or standardised which could enable an integrated access to mobility data for multiple stakeholders in real-time. Towards this direction, innovative data collection mechanisms such as crowdsourcing, IoT and sensing could be used. The city is planning to establish a platform for the comprehensive digital documentation, analysis and planning of new mobility services in urban areas.

DEPLOYMENT

💡 **Community engagement (User engagement) –** Citizen participation is a core element for Hamburg especially for new projects. The city interacts with different socio-economic groups (e.g. people with hearing impairment, nature advocates etc.) via various platforms as well as digital tools which are available for community involvement. 'Hamburger Stadtwerkstatt' is a platform launched in 2012 for planning together with citizens. Citizens have multiple ways to engage with the city such as online and offline participation, analogue collection of ideas and the DIPAS which is a digital system for citizen participation.

💡 **Investment (Own investment) –** Although Hamburger Hochbahn AG invests in urban mobility innovation, there is not a specific budget allocated to innovation activities in urban mobility. Investment to such activities is assessed and mobilised on an ad-hoc basis, following a justification of the activity's innovative role.

LIVEABILITY

💡 **Environmental (Air quality) –** In 2021, Hamburg started operating a fully electric bus fleet. Bikesharing and e-scooter services are widely adopted, and the city promotes their use. Hamburg has one of the densest charging infrastructure networks among European metropolitan regions. The green hydrogen produced by the Hamburg Green Hydrogen Hub will replace fossil fuels in the transport and logistics sector and the electricity is to be used to charge batteries for e-mobility.

💡 **Wellbeing (Fairness) –** Surveillance cameras, security guards and SOS telephones have been introduced into the public transport services of Hamburg. However, the city lacks tailored services, initiatives and tools to support female users to safely use the city's transport network.

UPCOMING PROJECTS
SMARTPHONE-BASED TICKETING

A pilot project was launched at HOCHBAHN in 2018 working towards the realisation of smartphone-based ticketing with automatic fare calculation for public transport services. When the project is completed, customers will be able to check-in quickly using an app when starting their journey. Any line changes will be automatically recorded, as well as the check-out point.

↗ SOURCE

MOBILITY PLATFORM

'Hvv switch' aims to integrate all mobility options in just one application. Combining classic public transport with other sharing options, the platform offers commuters the ability to switch easily from trains to car-sharing and ride-pooling services.

↗ SOURCE

TEST COURSE FOR AUTOMATIC AND INTERCONNECTED DRIVING

Since 2018, Hamburg has been upgrading traffic lights for infrastructure-to-vehicle (I2V) and vehicle-to-infrastructure (V2I) communication. A test track of several kilometres long for automated and connected driving has been set up in the city, where innovative mobility services, such as automated driving functions or safety assistance systems, can be tested in real traffic on public roads.

↗ SOURCE

PILOTS ON AUTONOMOUS VEHICLES

In April 2019, an autonomous vehicle pilot program was launched in Hamburg, where five Volkswagen e-Golf vehicles are operating on a 2-mile stretch of public roads. The vehicles are testing Level 4 autonomous technology, and have a safety driver on board.

↗ SOURCE

Hamburg Electric Autonomous Transportation (HEAT) is the HOCHBAHN-led research and development project for driverless operation in public transport on a defined route with a vehicle assistant who doesn't drive.

↗ SOURCE

Hamburg TruckPilot was successfully completed in summer 2021 and included the development and practical testing of an autonomous truck in container handling between different logistics hubs.

↗ SOURCE

INNOVATIVE SOLUTIONS
LIVING LABS

The Norddeutsche Reallabor is a project that intends to test the overall transformation of the energy system in order to demonstrate a rapid decarbonisation of all energy consumption sectors in Northern Germany having its main location in Hamburg. The end uses on mobility are to replace fossil fuels in cars, buses, trucks and other.

↗ SOURCE

HomePORT provides space for collaboration and innovation to bring together companies, start-ups, universities and researchers. With fixed sites, parking spaces and a water test area at the Hafen, it offers conditions for testing autonomous robots and vehicles in the port area.

🔗 Source

The City Science Lab of the city-state of Hamburg is the living lab in which urban transformations are being investigated and new solutions are developed all the way up to the level of urban applications. Projects address topics related to MaaS solutions, urban data platforms and citizen participation tools such as DIPAS.

🔗 Source

DIGITAL PARTICIPATION SYSTEM - DIPAS

With the help of digital data tables (touch tables) onsite, combined with an advanced online map-based participation tool, georeferenced citizen contributions to planning projects can be collected. This geodata-based application enables citizens to submit online comments, suggestions, questions and criticism on the city's plans tagged to a location. With the aid of a back-end administrator, the contributions can be evaluated by administrative staff using various statistical methods and soon with AI based tools.

🔗 Source

HAMBURG TRANSPARENCY PORTAL

Hamburg is committed to open data policies with Hamburg Transparency Portal allowing citizens to openly access the city's public documents. All ministries and public companies related to the city have to publish a really big share of their data.

🔗 Source

SMART TRUCK PARKING

The Hamburg Port Authorities developed a smart parking system which optimises the utilisation of the existing capacity based on demand and considering the parking space availability, the road traffic situation and the processes at the port terminals in real-time.

🔗 Source

Autonomous shuttle pilot in Helsinki

Helsinki*

'The city needs to be an enabler. The best way to do this is to open its processes, data sets, information systems and policies. Forum Virium speeds up innovation and enhances Helsinki's Smart City image around the world.' [Director, Economic Development] (*based on desk research)

GEOGRAPHICAL SCOPE OF STRATEGY
CITY/MUNICIPALITY

POPULATION	AREA
656,250	716 KM²

🚶 36%	🚲 11%	🚌 33%	🚗 20%	♀ NA	🌳 13%	PM2.5 6.1 MG/M³	🚗💥 3.2

CITY BACKGROUND

Mobility in Helsinki is very advanced thanks to the city's equal commitment to innovation, collaboration and engagement. The public transport system and new, shared and active modes of transport are highly safe, reliable and accessible. Helsinki is leading the way with innovative approaches to Mobility as a Service (MaaS). The city is also making strides to develop connected vehicle technology; they recently launched an autonomous, public bus service.

Forum Virium is the City of Helsinki innovation company. It co-creates urban futures with companies, universities, other public sector organisations and Helsinki residents. Forum Virium overarching mission is to make Helsinki the most functional smart city in the world whilst creating new business opportunities for companies.
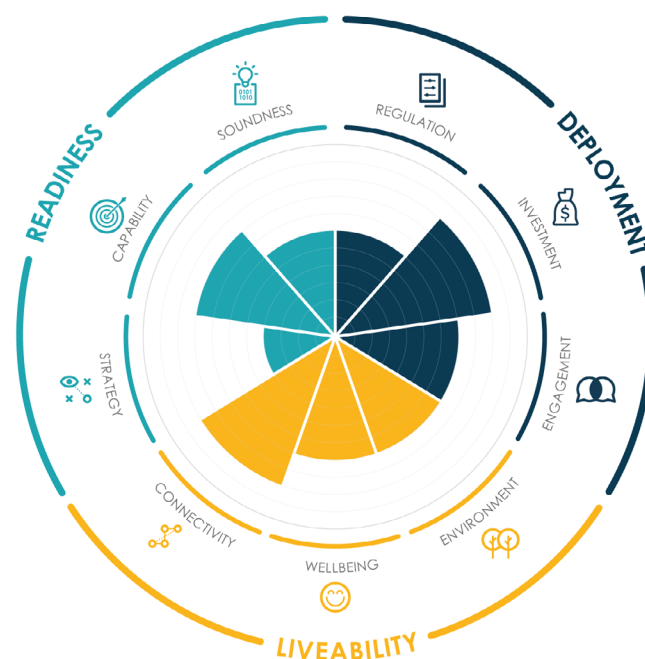
UMII PERFORMANCE
READINESS

💡 **Capability (Internal capacity) -** Forum Virium published 'The project book for Agile Piloting' to provide support and increase co-operation between the city, startups, residents and other stakeholders when developing and testing innovation. Agile piloting provides a model for quick experimentation of new services in a real-world environment.

The Pocket Book for Agile Piloting works as a guide for urban developers interested in applying experimental approaches and shares insight on how to get the most out of agile piloting. The Pocket Book sheds light on how to engage the key stakeholders, facilitate co-creation with residents or city partners. The book gives practical tips and presents concrete case examples from urban living labs in Helsinki.

💡 **Strategy (Innovation strategy) -** In Helsinki there is no published mobility innovation strategy. Not having a strategy has clearly not restricted innovation in the city and whilst the absence of a published strategy provides stakeholders with a higher level of flexibility, it is difficult to understand what the common vision, aims and objectives are going into the future.

DEPLOYMENT

💡 Community engagement (User engagement) - Forum Virium and Helsinki Regional Transport actively engage with different stakeholder groups, going beyond traditional consultation to incorporate co-creation practices into their engagement works. They use a citizen innovator pool, a community based model to engage residents with the public and private sector to co-create, develop and test urban solutions. It allows the citizens interested in the urban lab topics and activities

to be informed, interact and participate in service design processes or other innovation activities of their choice. Engagement activity is ongoing.

💡 **Regulation (Market barriers to innovation) -** There are no specific laws to support carsharing services and the term has yet to be defined. It is currently covered by the same laws as for private vehicles. Recommendations have been made to the government for a clearer framework for carsharing.

LIVEABILITY

💡 **Connectivity (Seamlessness) -** Integration between different modes of mobility is high in the city thanks to the MaaS platform which allows seamless integration between services which include shared bikes, e-scooters, on demand taxis and traditional modes of transport.

💡 **Wellbeing (Fairness) -** There are some examples of tools available to help disabled people use the transport network, however the city recognises gaps in technology which can aid in this respect. Audio cues and crossing signals are not yet widely used in Helsinki. People with hearing impairments can find information easily on displays at stations and inside vehicles, but induction loops are not available.

UPCOMING PROJECTS
AUTONOMOUS BUS TRIALS

The first on-road autonomous buses pilot was launched in April 2020 in Helsinki. The fleet of three vehicles drive along a circular route, starting from the busy Pasila Railway Station, at speeds of up to 40 km/h. Most of the route is in mixed traffic and includes several crossroads with traffic lights, right turns, street-side parking and a roundabout. There are three bus stops on the route and on-demand rides are available via a mobile app.
The project aims to accelerate the introduction of new types of automated last-mile solutions in Europe. It focuses on the management of autonomous fleets as part of public transportation systems. The FABULOS project has received funding from the European Union's Horizon 2020 research and innovation programme.

↗ SOURCE

FUTURE DIGITAL MOBILITY MANAGEMENT PROJECT

The project aims to investigate how drivers can be helped to avoid congested areas or areas the urban environment and other public/active transport users should be protected from congestion. The project pilots ways to nudge and influence drivers to choose

alternative socially responsible routes. A traffic control tool is being developed which uses data from a network of sensors and IoT devices. The tool will support the directing of traffic to more socially responsible routes and promote Helsinki's low pollution, carbon neutrality goal and traffic safety in the city. The project is funded by EIT Digital, and the Helsinki subproject is supported by the City of Helsinki.

↗ SOURCE

INNOVATIVE SOLUTIONS
HELSINKI BUSINESS HUB

Helps foreign companies to establish their operations and tap into business opportunities in Helsinki by connecting people and businesses with relevant data, investors, public sector and academia. They are funded by the Helsinki region and provide services free of charge.

↗ SOURCE

CITIZEN INNOVATOR POOL

A citizen innovator pool is a community-based model to engage residents in working together with the public and private sector to co-create, develop and test urban solutions. It allows the citizens interested in the urban lab topics and activities to volunteer, be informed, interact and participate in service design processes or actively participate on different levels of the innovation process, both as contributors and users.

MOBILITY AS A SERVICE SOLUTIONS

The city has successfully implemented a MaaS platform to integrate different modes of transport across the city. The customer pays for one trip fee or a monthly subscription and is able to access different modes of transport (public and private) with different levels of service options depending on their needs. All of this is seamlessly enabled via a smartphone and other digital services and can be used multiple modes of transport: bus, tram, metro, and commuter rail, and excellent coverage and connectivity throughout the entire metropolitan area.
The integrated ticketing system covers all public transport modes available in the city. In some cases, it is a free flow system with no physical barriers, based on an fully integrated fare model or location-based fare collection system (e.g. through geofencing or validation beacons). MaaS Global Ltd is working with the city to develop the concept of MaaS.

↗ SOURCE

Hong Kong*

'We owe it to our next generation to rise to this challenge and maintain Hong Kong as Asia's premier international city.' [Hong Kong Moving Ahead: A transport strategy for the future] (* based on desk research)

GEOGRAPHICAL SCOPE OF STRATEGY
CITY

POPULATION	**AREA**
7,474,200	1,106 KM^2

🚶 3%	🚲 2%	🚌 88%	🚗 7%	♀ NA	🌳 NA	PM2.5 18.6MG/M^3	🚗💥 1.6

CITY BACKGROUND

As one of the world's most densely populated cities, Hong Kong faces unique challenges in providing a safe, efficient and reliable transport system to meet the economic, social and recreational needs of the community in an environmentally acceptable manner. Limited land and financial resources, higher population forecasts, rapidly increasing cross-boundary traffic and greater concern about the environment all need to be taken into account in devising any medium to long-range transport strategy for Hong Kong. Transport Policy concentrates on the continued development of Hong Kong's transport system under a three-pronged approach:

•   Improving transport infrastructure
•   Expanding and improving public transport
•   Managing road use

The challenge now for the Government and the community is to ensure that the same safe, efficient and reliable transport system is not only maintained in the years ahead but improved significantly.
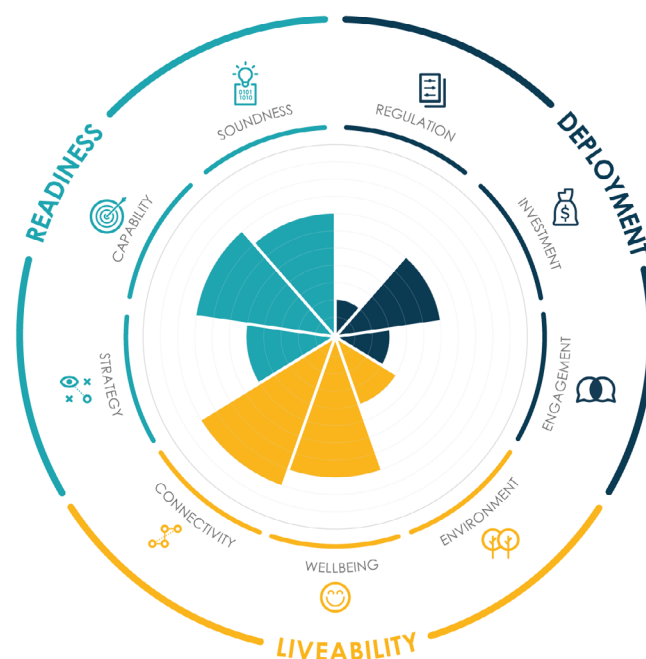
UMII PERFORMANCE
READINESS

💡 **Strategy (Innovation strategy) -** The Government of the Hong Kong Special Administrative Region has an established process to look at innovation in urban mobility. In 2020, they published the Smart City Blueprint. It sets out initiatives under six areas: "Smart Mobility", "Smart Living", "Smart Environment", "Smart People", "Smart Government" and "Smart Economy". The strategy's vision: Embrace innovation and technology to build a world-famous Smart Hong Kong characterised by a strong economy and high quality of living.

💡 **Strategy (Means to monitor the strategy) -** Whilst the city has an established plan to deliver innovation in urban mobility, it does not publish who will be responsible for specific objectives and timescales for delivery. The city could consider developing an action plan to monitor and evaluate the success of the strategy.

DEPLOYMENT

💡 Investment (Own investment) - The Financial Secretary (FS) announced in this financial year's Budget that the Innovation and Technology Bureau would (who publish the Smart City Blueprint for Hong Kong 2.0) has been allocated earmarked about $1 billion for the Smart

Traffic Fund (the Fund) to provide funding support for enterprises or organisations to conduct research and application on vehicle-related innovation and technology.

💡 **Regulation (Market barriers to innovation) -** Regulatory frameworks in the city have not been conducive for ride-hailing and shared bike service. This therefore limits new, innovative business models emerging from the city as a direct result of regulatory, legislative or policy barriers.

LIVEABILITY

💡 **Connectivity (Seamlessness) -** The city has a highly integrated cross-modal electronic payment system which covers all public transport modes available in the city called the Octopus Card. It is a contactless card payment system which can be used on buses, coaches, ferries, tram, light rail, buses, railways, taxis, tramways. Octopus cards have a wide range of other uses including for payments in retail stores and for parking metres. Users can even redeem octopus card points at certain dedicated retail outlets.

💡 **Environmental (Air quality) -** There are examples of some successful services, projects or initiatives to increase the levels of active transport and low emission vehicles, however coverage and representation across the city is low. Furthermore, the annual mean of PM2.5 concentration over the last 3 years is relatively high.

UPCOMING PROJECTS
A SMART MOBILITY CONSORTIUM

A consortium has formed to develop a comprehensive city wide network of IoT devices and cellular-vehicle-to-everything (C-V2X) technologies with the aim of creating an environment to trial connected mobility services and ITS. The partners include Hong Kong Applied Science and Technology Research Institute (ASTRI), HKT, Huawei Technologies and Qualcomm Technologies.

Ten million-plus journeys are made on the city's public and private transport system every day, while its robust telecommunications infrastructure and high digital technology adoption rate provides a foundation for the potential of smart mobility.

The consortium aims to use C-V2X to introduce a series of intelligent transport systems (ITS) in Hong Kong including a warning mechanism for collision and control, assistance for cruise control and parking and alert systems for speed and lane violations. In addition, it will help drivers and traffic administrators to identify potential loopholes and risks at intersections, pedestrian crossings and traffic queues.

This project is being completed alongside a trial to use a 5G vehicle communications system on a 14 kilometre public road in the city, one of the longest testing routes in the world. It started early 2021 and is planned to last for nine months. The partners include Hong Kong Applied Science and Technology Research Institute (ASTRI) and HKT (one of Hong Kong's largest telecommunications providers) and Scania.

Smart sensors will empower vehicles to communicate with other vehicles, pedestrians, cyclists, parking spaces, infrastructures and buildings to enable effective, faster and more accurate exchange of data. The aim is to significantly improve road safety and traffic efficiency and explore the possibilities vehicles have to communicate with their surroundings.

🔗 Source

USE OF IT IN COMBATING COVID-19

The city has developed a comprehensive list of some innovative measures to reduce the impacts and limit the spread of Covid-19:

- Develop health codes to facilitate orderly resumption of travel between Hong Kong and other places
- Encourage wider application of anti-microbial technology in public transport
- Deploy the exposure notification system and mobile app "LeaveHomeSafe" for different trades and premises
- Adopt technologies in public markets to enhance environmental hygiene
- Continue to promote use of contactless payments in public markets
- Use of robots and advanced technologies for airport terminal patrol, cleansing, disinfection and environmental monitoring
- Introduce new or streamlined e-forms to further digitise health declaration processes
- Continue to expand the functions of Hospital Authority's "HA Go" mobile app to provide remote consultation using video conferencing technology and to prescribe clinical information for specific groups of patients, in addition to online booking of clinic appointments and payment
- Established the LawTech Fund of $40 million to encourage and support the legal sector to adopt technologies which can limit the spread of Covid-19.

🔗 Source

INNOVATIVE SOLUTIONS
HONG KONG eTRANSPORT APP.

Three mobile navigation and journey planning applications ("Hong Kong eTransport", "Hong Kong eRouting" and "eTraffic News") were launched to provide public transport information, driving route information and real time traffic alerts and news. In July 2018, the Transport Department integrated them into an all-in-one mobile application "HKeMobility", with new features including the estimated time of arrival (ETA) for buses and trams, the real-time parking vacancy information, and the walking route search function.

↗ SOURCE

THE SMART LAB

The Smart LAB supports government departments to conduct proof-of-concept and technology testing on innovative solutions for better understanding of their effectiveness and limitations, thus facilitating relevant departments to formulate effective procurement and implementation arrangements.

Established by the Office of the Government Chief Information Officer in April 2019, it aims to promote a Smart City by providing a place to pilot innovation, in doing so facilitating the development and adoption of innovative information technology solutions in government departments.

↗ SOURCE

Metrobus - Istanbul's BRT service carries around 700,000 passengers daily.
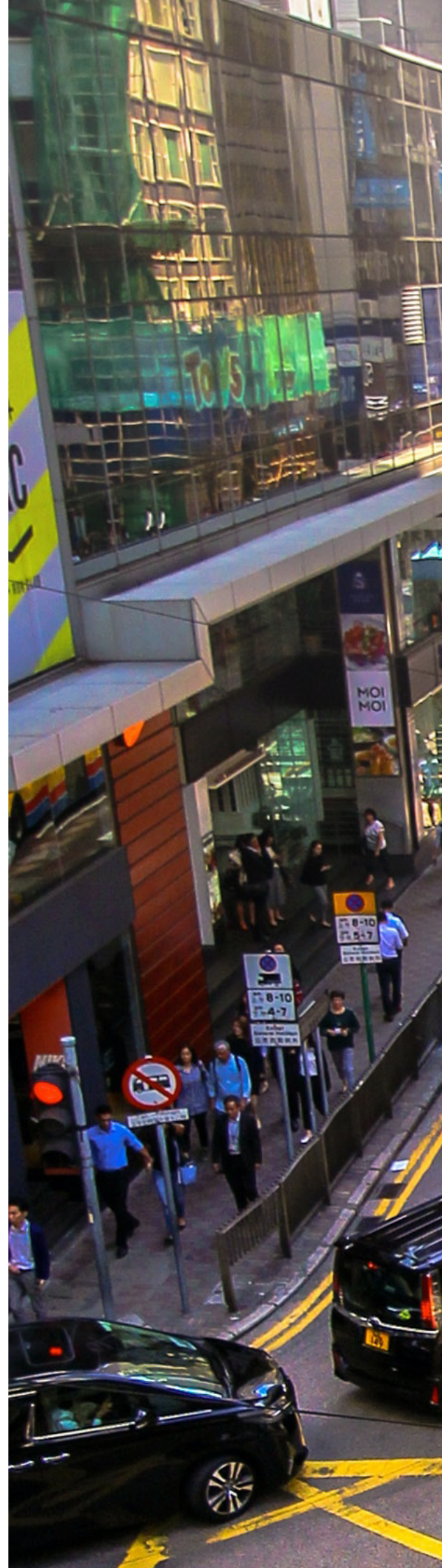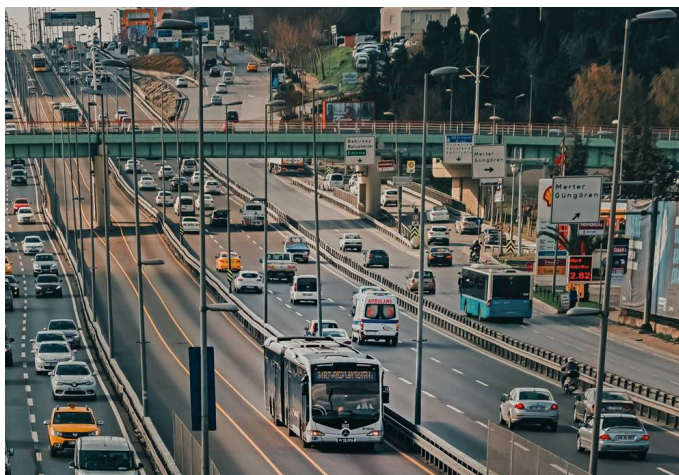
Istanbul

'Before implementing a project, we try to tell citizens what the advantage for them is.'

GEOGRAPHICAL SCOPE OF STRATEGY
CITY/MUNICIPALITY

POPULATION	**AREA**
15,462,452	5,343 KM²

🚶 45% 🚴 1% 🚌 25% 🚗 23% ⬤ 6% ♀ 7.2% 🌳 2.2% PM2.5 19.7MG/M³ 🚗 2.5

CITY BACKGROUND

Istanbul's massive public transport network, which serves more than 15 million citizens, includes buses, metrobuses, trams, metros, funiculars, cable cars, ferries, sea buses, and Marmaray (train system under the sea). Authority responsible for mobility strategy in Istanbul is Istanbul Metropolitan Municipality. The current strategic plan was developed for the period 2020-2024, and its vision is a fair, green, and creative city with happy residents. A theme-oriented approach was adopted in the development of the strategic plan which focuses on eight themes: accessible, eco-friendly, productive, living Istanbul, unique heritage, Istanbul as a sharing community, financial sustainability, and participative and innovative management. At present, Istanbul Metropolitan Municipality is working on the first SUMP in Turkey, which aims at a transportation system promoting sustainable, inclusive, innovative, environmentally friendly, affordable, and integrated mobility solutions for Istanbul citizens.
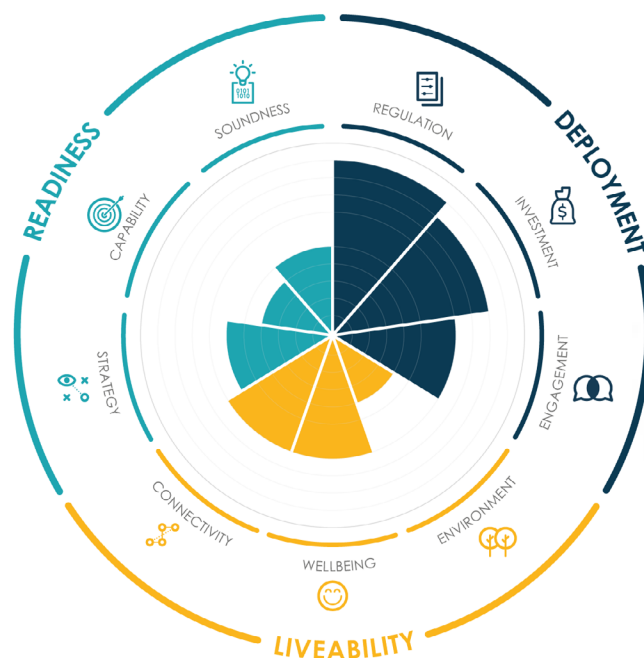
UMII PERFORMANCE
READINESS

💡 **Strategy (Readily available innovation strategy to internal and external stakeholders)** – The strategic plan for Istanbul was prepared with a participatory approach. The city started the initiative "Istanbul is yours" to include different kinds of stakeholders in the strategy development process. It has cooperated with universities, private bus companies, non-governmental organisations, other third parties, and specific groups of citizens, such as people with disabilities and cyclists. The city representatives and citizens have had monthly meetings to discuss citizens' needs and satisfaction with implemented solutions.

💡 **Soundness (Data accessibility)** – The city of Istanbul has an open data platform that provides opportunities for researchers and companies to explore the data and develop new innovative solutions. However, there are no significant efforts to promote open data culture across city stakeholders.

DEPLOYMENT

💡 **Community engagement (User engagement)** – Istanbul communicates with its citizens and other stakeholders regularly using different communication channels such as social networks, websites, and mobile applications. An IBB application provides access to all smart city services in Istanbul Metropolitan Municipality. It allows citizens to obtain information about city traffic

in real-time, give complaints and suggestions about transport infrastructure, environment, health and find other important information. In addition, Istanbul Electric Tramway and Tunneling Facilities (IETT) also conducts a customer satisfaction survey every year.

💡 **Investment (Attracting investment) –** Istanbul has a specific budget allocated to urban innovation research, smart transportation and development. The city uses funds from the Municipal Budget and available international possibilities to finance innovative solutions and projects. A budget of approximately 200 million Turkish lira has been allocated within the scope of Smart Transportation Studies. In this context, improvement of traffic signalling, observation and measurement systems. The diffusion of Wi-Fi systems in urban transportation. There are infrastructure investments such as improving the control and supervision of traffic mobility. Mechanisms to provide financial incentives to third party innovators have not been fully employed yet.

LIVEABILITY

💡 **Wellbeing (Fairness/Women) –** IETT provides support to female users to feel safe during their travel in buses. After 10 pm, they can stop a bus at any point on its route to minimise their walking distance. In addition, buses have a red button that can be used to contact the control manager if a passenger does not feel comfortable.

💡 **Environmental (Air quality) –** The city has made an initiative towards using technology and innovation to improve air quality, such as replacing vehicle fleet with electric and hybrid vehicles and increasing charging points in car parks. However, the average annual mean of PM2.5 concentration in the last three years still reaches high values (average of last three years: 19.7µg/m3).

INNOVATIVE SOLUTIONS
MARMARAY

In 2004, the city started one of the largest transportation infrastructure projects in the world. 'Marmarays project goal was to connect Europe with Asia with a modern and high-capacity commuter rail system to reduce pollution from car traffic and decrease individual transport. The world's deepest undersea immersed tube tunnel was built to achieve this goal. After finishing the second stage in 2019, Marmaray has a length of 76.6 km with 43 stations and is connected to several metro, metrobus, ferry and tram stations.

↗ SOURCE

SAFETY OF FEMALE PASSENGERS

Female passengers using buses after 10 pm in Istanbul can stop a bus at any point along its route irrespective of the bus stop location. The aim is to minimise the walking distance to the destination and help female passengers to feel safe when travelling in late hours.

↗ SOURCE

MONITORING PASSENGER DEMAND

IETT monitors the number of passengers in buses which help them to manage the situation during the Covid-19 pandemic. If there are more passengers on specific lines, they can send another bus to increase social distance and decrease the Covid-19 deployment risk.

VIRUS TRACKER ID PAIRED WITH ISTANBUL CARD

At the beginning of 2021, the city introduced a solution for reducing the possibility of infection by Covid-19 in public transport. Passengers' travel cards in Istanbul were paired with HES code, a personal code implemented by the Turkish Ministry of Health, determining a person's likelihood of having caught the Covid-19.

↗ SOURCE

Jacksonville

'As a result of the pandemic, peoples' work patterns have changed. The long-distance trip is no longer the valuable point of transportation.'

GEOGRAPHICAL SCOPE OF STRATEGY
County

POPULATION	**AREA**
949,611	2,265 km²

🚶 1%	🚌 2%	🚗 88%	♀ NA	🌳 NA	PM2.5 7.1 mg/m³	🚗 15.4

CITY BACKGROUND

The Jacksonville Transportation Authority (JTA) is responsible for design and construction of road infrastructure and providing mass transit services in Duval County, Florida, including the city of Jacksonville – the largest city in the continental U.S. in terms of landmass. The services operated by JTA include express and regular bus, a downtown Skyway monorail, the St. Johns River Ferry, the Gameday Xpress for various sporting events, Paratransit for the disabled and elderly, and Ride Request on-demand services. JTA strongly focuses on the needs of their "core customers" and seeks to "deliver innovative transportation choices providing accessible mobility throughout the community".
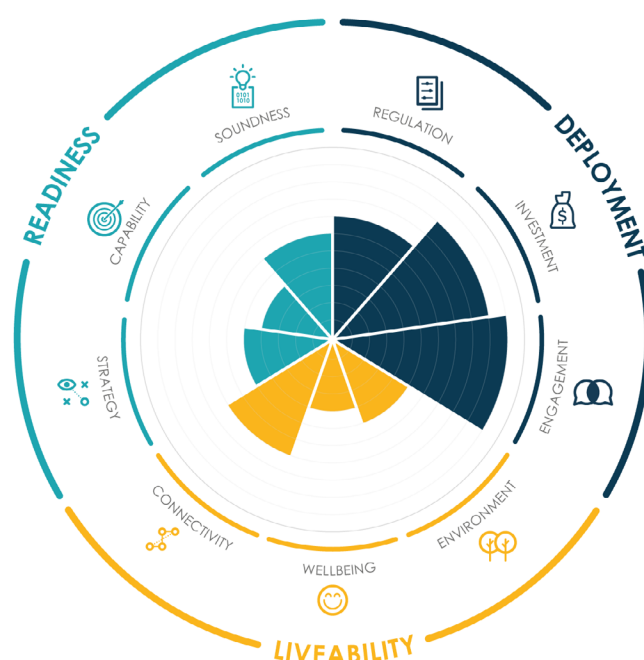
UMII PERFORMANCE
READINESS

💡 **Capability (Leveraging skills and capabilities) –** When developing its strategy, JTA consulted a wide array of experts with different backgrounds ranging from traditional mobility-related fields to business, and healthcare. Also, JTA has established a partnership with a local college to enable regular collaboration on automation-related projects. The college has access to the JTA's testing facility where the two institutions jointly work on many trials. This partnership resulted in the development of a new curriculum to train the next generation of automation experts.

💡 **Strategy (Comprehensiveness of strategy) –** The focus of the strategy covers challenges across different modes of transport. The strategy aims to encourage the shift from private vehicles to public transport,

however the active modes are seen as rather minor, complementary options. The focus of the strategy is on shifting to buses and motorised micromobility services. JTA recognised the importance of equity in providing access to jobs, healthcare, and other essential services and indicates interventions, where the equity should be a "critical lens" through which to look when approaching those interventions. The envisaged outcomes of the interventions are not quantified and measurable.

DEPLOYMENT

💡 **Community Engagement (User engagement) -** JTA regularly organises public outreach activities to collect feedback. Even during the pandemic, they continued to organise virtual meetings to maintain the interactive experience of the outreach events. User insights are used to inform decision making on a regular basis. A recent example is a project testing autonomous shuttles the

city. JTA used customer insights to finetune routes and frequency of the service.

💡 **Investment (Attracting investment) -** There is evidence that JTA has promoted external innovation by in-kind contribution of services on multiple occasions. For example, the authority supports the Jacksonville Chamber of Commerce by providing them with premises for establishing the city's innovation hub. JTA also seeks to leverage investment by fostering collaborative, state- or federal-funded projects with other public agencies, such as the City of Jacksonville. Additional leverage that could be considered is to provide funding to kickstart the innovation ecosystem and work with third-party innovators to multiply the funds available.

LIVEABILITY

💡 **Connectivity (Seamlessness) -** The Jacksonville Regional Transportation Centre (JRTC) at LaVilla, opened in 2020, connects customers to Downtown Jacksonville from all areas of the city and the Northeast Florida region. JRTC brings together JTA bus routes, the First Coast Flyer premium BRT service, the Skyway monorail, regional shuttles, rideshare, paratransit and other shared modes in a modern and environmentally friendly facility. Furthermore, JTA is now running two new projects for multimodal integration. First, an introduction of a 31-mile-long multiuse path trail system around Downtown to connect to mobility hubs. Second, JTA is conducting studies to assess the impacts of bringing a commuter rail to the Downtown area of the city.

💡 **Environmental (Noise) –** Currently, an environmental assessment, including noise levels, is conducted as a one-off activity when deploying major infrastructure construction projects. Noise generated by operation of the transport system is an important aspect directly impacting the quality of life in neighbourhoods. Therefore, its assessment and communication of the results on a regular basis could also be considered.

UPCOMING PROJECTS
JACKSONVILLE ULTIMATE URBAN CIRCULATOR (U2C)

The 'U2C' project is a program aiming to modernise and expand 'Skyway' – an existing monorail transit service and introduce AVs into JTA's transportation system. The project aims to convert the monorail service into an automated vehicle service that can operate both above ground and at street level. The project is expected to result in extending the JTA's services to new areas as well as to increase the offer of on-demand transportation

options.

🔗 Source

INNOVATIVE SOLUTIONS
SUPPLYING HOSPITAL BY AUTOMATED VEHICLES

Female passengers using buses after 10 pm in Istanbul can stop a bus at any point along its route irrespective of the bus stop location. The aim is to minimise the walking distance to the destination and help female passengers to feel safe when travelling in late hours.

🔗 Source

WELLNESS ON WHEELS -VACCINE DISTRIBUTION

The JTA has partnered with Agape Family Health to bring Wellness on Wheels — mobile vaccinations for the Jacksonville community. Here, three JTA-owned vehicles have been converted to mobile vaccination units. The vehicles tour the City, targeting areas with gaps in health equity.

🔗 Source

EMBRACING TACTICAL URBANISM

As a form of "pop-up" planning, Tactical urbanism refers to a citizen-led approach to neighbourhood building by deploying short-term, low-cost, scalable interventions to catalyse long-term change. Projects are designed to draw attention to perceived shortcomings, widen public understanding, test innovative solutions, and inspire action to support desired infrastructural changes. JTA adopted the concept of Tactical urbanism to introduce innovative solutions in many areas, including testing alternative street configurations with slow lanes, piloting micromobility solutions and introducing a variety of improvements in low-income, transit-dependent neighbourhoods.

READI RIDE – ON-DEMAND TRANSPORTATION

ReadiRide is an on-demand service providing affordable, on-call transportation to customers in 12 Jacksonville communities. Upon phone reservation, the customer chooses the date and pick up time, pick-up and drop-off locations, number of passengers or assistance with wheelchairs. Statistics reveal that the service is very popular especially among women in nighttime, helping to increase the safety of female travellers.

🔗 Source

DOOR-TO-STORE

Door-to-Store is a partnership between the JTA and the City of Jacksonville that provides free rides to grocery stores for residents living in 'food deserts' - areas where access to fruits, vegetables, and meats are not as easily available within a close proximity. Customers can take free rides to and from eight grocery store locations.

🔗 Source

Johannesburg*

'Cities in the 21st century must plan for uncertainty, build resilience and embrace sustainable solutions - at the human, urban and environmental levels.' [City of Johannesburg, Integrated Development Plan 2021-2026] (*based on desk research)

**GEOGRAPHICAL SCOPE OF STRATEGY**
CITY

POPULATION	**AREA**
5,782,747	1,645 KM²

🚶 7%	🚌 15%	🚗 33%	⬤⬤⬤ 45%	♀ NA	🌳 NA	PM2.5 23.8MG/M³	🚗💨 22.4

CITY BACKGROUND

Johannesburg is expecting an increased rate of urbanisation over the coming years. Congestion in the city has increased significantly over time, worsened by the dominance of private vehicles and private mini-bus taxis. The Covid-19 pandemic has created additional challenges on top of this. To address these challenges, the city council has clearly identified the need to become a smart city; "Being a smart city is not a 'nice to have'," says Makhubo. "It is an absolute necessity if Johannesburg is going to retain its status as an economic hub that supports and determines the growth of this country and counters unemployment related to the rapid contraction of the economy."

The city's transport system is central to its economy and its people. After years of underinvestment in public transport infrastructure during the Apartheid period – where separate systems were created for black and white commuters – the domain of transport is poised for a new future in the city. With the introduction of the country's first Bus Rapid Transit (BRT) system (the Rea Vaya BRT) and the Gautrain high-speed rail link (with a Johannesburg-OR Tambo airport route, and a Johannesburg-Tshwane route), transport holds tremendous potential.

The recently published Integrated Development Plan 2021-2026 guides the city's efforts to create a sustainable place, reflected in the outcomes they are seeking to achieve:

- Outcome 1: Improved quality of life and development-driven resilience for all
- Outcome 2: Provide a resilient, liveable, sustainable urban environment – underpinned by infrastructure supportive of a low-carbon economy
- Outcome 3: An inclusive, job-intensive, resilient and competitive economy that harnesses the potential of citizens
- Outcome 4: A high performing metropolitan government that pro-actively contributes to and builds a sustainable, socially inclusive, locally integrated and globally competitive Gauteng City Region.
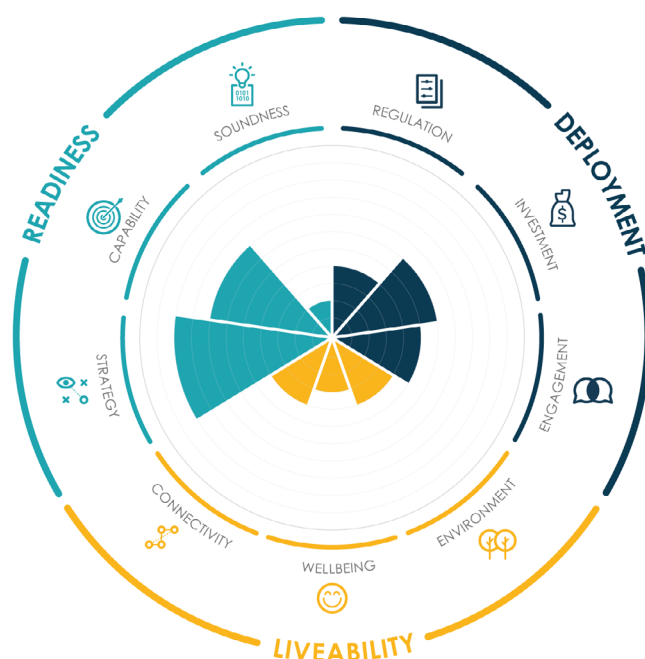
UMII PERFORMANCE
READINESS

💡 **Capability (Internal capacity) -** The mandate of the Smart City Office is to provide strategic and operational leadership of the CoJ'SSmart City Programme, specifically through the execution of the Programme of Action as defined by the Smart City Strategy, providing relevant programme leadership, coordination, programme management, incubation of new initiatives, and programme performance assessment.

💡 **Soundness (Data accessibility) -** The city does not have a dedicated open data platform to share transport, mobility, health, environmental or other types of data which can be used to stimulate innovation and collaboration from stakeholders across the city to solve the various social, environmental and economic challenges. There is a lack of policy support for data owners to open their data.

DEPLOYMENT

💡 **Regulation (Enabling new business models) -** The city municipality launched the Smart City Innovation Challenge is to find and develop digital technology solutions that respond to urban and community challenges as a result of the Covid-19 pandemic, which include a) Smart mobility: with the easing of lockdown, public transportation presents the biggest risk of the spread of infection b) Safety: the city has seen increased incidents of gender-based violence, looting, and property damage under the lockdown. It is feared that this may only increase with the economic challenges that will follow the pandemic.

💡 **Community engagement (Information provision) -** Innovative tools or mechanisms, like a multi-modal journey planning application, are not available to provide static or real-time travel information to commuters before and during journeys. Users have limited channels to access information pre-trip and on-trip. The availability of information is often static and mostly on-trip related.

LIVEABILITY

💡 **Connectivity (Seamlessness) -** The City of Johannesburg Rea Vaya BRT is used by 45,000 commuters daily. During peak hours buses arrive and depart at three minute intervals running along dedicated routes to ensure speed of service. A high-tech control room monitors all bus routes and stations. The control room delivers real-time tracking of bus movements and staff can communicate with individual drivers, ensuring buses run on time and quick solutions are found for any eventuality.

💡 **Connectivity (Seamlessness) -** The city does not have an integrated ticketing system, tickets are not interoperable among different transport operators/modes. It's a physical ticketing system, based on a manual fare collection model where tickets are validated in each vehicle/station with no aid of an automated machine.

UPCOMING PROJECTS
ELECTRIC VEHICLE (EV) READINESS SUPPORT PROGRAMME

The primary goal of this project is to build the capacity of City officials in order to be EV ready. EV-readiness requires a deep understanding of the technical abilities of the City to provide the required infrastructure and set attractive tariffs. Therefore, planning for EV uptake within the city requires careful consideration of the technical components of the grid and the business of selling electricity. It also requires the City to determine the applicability of EV for different vehicles and end-uses. This project is assessing the feasibility of electric minibus taxis (e-taxis) and solar-powered EV charging stations. With an emphasis on gender equality and social inclusion, the project seeks to make the case for EV-related business models that the City can support.

🔗 Source

INNOVATIVE SOLUTIONS
FUNDING INNOVATION

The city has innovative financing mechanisms; Green Bonds are used to fund green infrastructure projects. Johannesburg is one of the first municipalities in South Africa to issue a green bond (ZAR 1.46 billion/USD 110 million) for environmental and social sustainability projects such as the procurement of 150 hybrid-fuel buses.

🔗 Source

Lagos

'One of the key elements of the Lagos state transport sector strategy is the incorporation of all stakeholders in the development process.'

GEOGRAPHICAL SCOPE OF STRATEGY
METROPOLITAN AREA

POPULATION	**AREA**
21,320,000	2,707 KM²

🚶 38% | 🚲 2% | 🚌 48% | 🚗 11% | 💬 1.2% | ♀ 31% | 🌳 40% | 🏭 PM2.5 40MG/M³ | 🚗 NA

CITY BACKGROUND

Lagos metropolitan area is rapidly growing and spreading geographically, now extending beyond the borders of Lagos State into the neighbouring Ogun state in the north. Lagos is facing a number of transportation challenges, which is also the result of rapid urbanisation, inadequate infrastructure and poorly implemented plans of the past.

The planning, implementation, regulation, and franchising of public transport infrastructure and operations are under the competence of Lagos Metropolitan Area Transport Authority (LAMATA). This Lagos State Government agency is tasked with the responsibility of developing an intermodal integrated transport system for Lagos. Since its establishment in 2002, the agency has successfully implemented the first bus rapid transit system (BRT) in Sub-Saharan Africa, launched construction of the first passenger rail scheme and a common ticketing system. To further improve the transport system in Lagos, LAMATA has developed a

Strategic Transport Master Plan (STMP) which details transport infrastructure requirements for Lagos till 2032 and aims to establish a sustainable, integrated, multimodal public transport system.
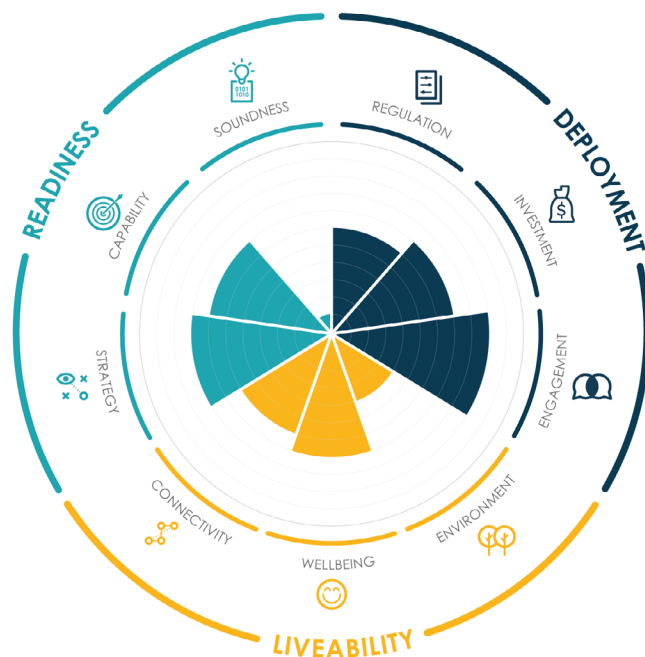
UMII PERFORMANCE

READINESS

💡 **Strategy (Readily available information)** - According to LAMATA, a successful implementation of the project necessitates bringing together all stakeholders and sensitising them to the planned measures. This approach was also adhered to when building its Strategic Transport Plan. LAMATA engaged with stakeholders from the transport sector, ministry of transport, ministry of environment, while citizens were reached through local government area representatives or Community Development Associations. In general, LAMATA is trying to mirror the World Bank standards in its practices.

💡 **Soundness (Data accessibility)** - At the moment, Lagos City has no integrated open data platform that

would provide access to real-time and static data in appropriate formats. Such a portal may be a critical component in urban planning and fostering innovation and development. LAMATA recognises the importance of open data and creation a portal, along with proper mechanisms for data collection, validation, and distribution, shall be addressed in the future.

DEPLOYMENT

💡 **Community engagement (Information provision)** - Users of the BRT system in Lagos can access the trip information through a single point - Lagos BRT App. The app offers multiple features for the customisation of the information, location of the user or the closest available services as well as directly access the real-time data, real-time departure times and updated additional information for all lines of a bus stop. Other planning

tools for individual services are also available.

💡 **Investment (Own investment) -** Although LAMATA is active in securing resources for its development and innovation projects from government, internally generated revenues, international agencies, foundations and PPPs there is little evidence that these allocations would allow room for innovation in CAPEX and R&D activities while also allowing space for failure.

LIVEABILITY

💡 **Wellbeing (Sustainable and healthy mobility) -** Lagos performs remarkably well in terms of the modal split in the city. Up to 38% of journeys are done by walking, public transport represents over 47% of journeys. Cycling is currently at 2% and the city is looking into ways how active travel modes can be further incentivised and the necessary infrastructure provided.

💡 **Connectivity (Seamlessness) -** Prior to the introduction of the Bus Rapid Transit system (BRT) in 2008, Lagos had no organised transport since 1980. Nowadays, informal forms of transportation still have a high prevalence which reflects in low levels of reliability and integration of the mobility services in the city. The efforts for improving the system are in place with LAMATA currently pursuing plans for the BRT extension and introduction of a rail mass transit system (due in 2022) and other transport and infrastructure projects outlined in the STMP.

INNOVATIVE SOLUTIONS
AUTOMATIC FARE COLLECTION – COWRY CARD
In order to ensure revenue security, an electronic ticketing system has been introduced for fare collection in Lagos. Gathering lessons learned from the deployment of electronic ticketing for the Ikorodu-TBS BRT, a more robust and dynamic fare collection approach has been employed. The Lagos Cowry system was launched in August 2021. All regulated bus transport schemes in the city are operational with the use of the COWRY System including the ferry services. Over 1,700,000 Cowry Cards are being used by registered commuters on the bus schemes. Some of the key features of the fare collection system include:

- Multi-Vendor approach: multiple card top-up providers were engaged to facilitate ccity-wide deployment and distribution within the metropolitan area
- Central Integrated Ticketing: a central integrated approach was adopted whereby all systems deployed are integrated and functional using a singular card. This ensure seamless travel across the entire state
- Central Reconciliation and Settlement: the reconciliation and settlement of all transactions is

paramount to the revenue distribution and security. The services of a switching company were employed to carry out the reconciliation and settlement of all PT transactions.
LAMATA

LAGOS SIDEWALK CHALLENGE
As Lagos still faces a significant deficit between the existing versus required walking infrastructure, a project involving LAMATA and other parties with the funding from the German Transformative Urban Mobility Initiative (TUMI) was carried out in 2018.
The project aimed to assess the existing walking conditions and engage local people to define future investment priorities. An app was developed to measure walking infrastructure quality throughout Lagos, followed by its utilisation to gather the data. More than 2,000 public transport users on Lagos Island shared their walking experiences to 19 key walking destinations. In response LAMATA invested in new infrastructure to improve the walkability for school children and those visiting the main hospital in particular.
↗ SOURCE

TRANSTURA
In October 2021, urban mobility and on-demand courier service startup, Transtura, launched its operations in Lagos. Deploying a unique and tech-driven solution, Transtura operates fixed routes for a fixed flat fare at prices up to 75% cheaper than on-demand ride-hailing services. The company through its mobile app allows commuters to reserve a seat on the Transtura bus or to order a delivery van to deliver their products and goods to customers and vendors.
This solution aligns with the Lagos State Government plan of easing pollution and traffic congestion as it strives to improve the urban mobility characteristics and commuters experience across. In just five months the company grew from five buses to over 20buses and more than 40 employees. The company is currently valued at $10 million.
↗ SOURCE

GIRLS BIKE CLUB
Girls bike club is a female empowerment programme under Lagos Urban Development Initiative's (LUDI) Urban Mobility Project. The program took place in early January 2020 with the main purpose of training girls bicycle riding and self-defence.
Currently the project has been halted due to Covid-19, yet plans remain to establish the Girls bike club as long-term initiative on Lagos Island and other communities. The initiative is a collaborative effort of the Heinrich Boll Stiftung, Bikaholics and LUDI with bikes provided by Awabike, Lagos.
↗ SOURCE

Lisbon

'We believe that innovation is embedded in everything we do in urban mobility, so it's not a challenge that we have identified that we need to innovate. It's not a conscious decision to innovate, it's there already.'

GEOGRAPHICAL SCOPE OF STRATEGY
City

POPULATION	AREA
545,923	100 km²

🚶 16% 🚴 2% 🚌 31% 🚗 48% 💬 3% ♀ 60% 🌳 NA 🏭 PM2.5 10.1 MG/M³ 🚗💥 3.8

CITY BACKGROUND

Lisbon City Council takes on the role of a mobility manager in the city, overseeing the development of the city's urban mobility system and intervening at various levels, including road and parking management, surface transportation planning and implementation, and the promotion of shared services and vehicles. The council's public company EMEL is managing public parking and leading the innovative solutions in the city, such as bike and carsharing schemes or alternative means of payments for transport.

Although Lisbon has been gradually implementing sustainable mobility solutions, the city lacked an integrated strategy that would define a clear vision and ensure the coherence of the choices made. In 2020, the city has developed a strategic plan titled MOVE Lisboa – Strategic Vision for Mobility 2030. This vision proposes a transport system that is more integrated, reliable, connected, accessible, and open to new solutions, reclaiming space for people, increasing the community's sense of belonging, maximising the quality of life of the city and Lisbon Metropolitan Area (AML) residents, and

improving the experience of those who use and live in Lisbon. The plan will ultimately serve as an underlying basis for the development of SUMP, which is already in the pipeline.

UMII PERFORMANCE
READINESS

💡 **Capability (Skills and capabilities are leveraged to create / deliver the strategy) -** Lisbon City Council has developed solid mechanisms and partnerships with key stakeholders in the city that can help to supply the skills needed to work towards the objectives outlined in the mobility strategy. At large, the city seeks to include external stakeholders in every project they undertake. Lisbon City council is also actively cooperating with universities, frequently involving master's or PhD

students in the work on various challenges the city is facing. In terms of gender balance at the strategy owner's organisation, it is worth mentioning that the mobility directorate has a 60% share of women.

💡 **Soundness (Data collection) -** At the moment, the city lacks automated data validation or quality control and there is limited real-time data available at Lisbon's open data portal. The city recognises the challenge of providing data in good quality and is currently studying new models of data provision. The city would be also in

favour of gathering data with high societal value and in high quality that might not be necessarily free.

DEPLOYMENT

💡 **Community engagement (User engagement) -** The city is extensively invested in communication with the citizens. The City Council gathers insights on the users' needs using surveys and calls or through on-site participatory sessions. For instance, every year in October, a survey conducted in schools aims to establish which modes are used by children to get to school. On the other hand, projects undertaken by EMEL are based on thorough qualitative or quantitative user research and application of designer thinking approaches or marketing tools in their solutions (e.g. cycle parking).

💡 **Regulation (Enabling new business models) -** Apart from few pop-up solutions in the midst of Covid-19 pandemic such as use of bikesharing services for commercial purposes (food and medication delivery), there is no evidence for projects being deployed as a result of relaxation of the regulatory/legislative environment in emergency situations.

LIVEABILITY

💡 **Environment (Air Quality) -** Lisbon has provided measurable examples of successful initiatives to increase the air quality in the city. For instance, Reduced Emission Zones (ZER) and Zones 30 (speed limit 30 km/h) have been defined to limit gas emissions and the city plans to gradually escalate these measures. The city has embraced micro-mobility as the last-mile solution, introduced Europe's second electric vehicle carsharing scheme (emov) in 2018 and had installed 540 public chargers by the end of December 2019. Lastly, the city marks a steady increase in the share of cycling, currently reaching 2%, which, given the hilly landscape, is a success.

💡 **Connectivity (Intermodal integration) -** Based on the data provided by the city on interchange points and the average level of multimodal connections, Lisbon still has room for improvement in terms of intermodal integration.

UPCOMING PROJECTS
VOXPOP

Voxpop is a European initiative that aims to address non-technical challenges in the mobility sector in Lisbon. The project, which began in 2019, mobilises various agents of the local innovation ecosystem to allow for more efficient planning in the collecting and sharing of public and private data to develop mobility solutions

that fulfil the needs of individuals who live, work, and visit Lisbon. A significant element of the project is the creation of an open call in which the community of innovators will be invited to develop solutions that promote the accessibility and safety of the city's most vulnerable citizens and involve those who will benefit from the solutions. The Voxpop is led by the Lisbon City Council, the EMEL is in charge of the project's overall management, while the consortium includes transport providers and other stakeholders. One of the initiatives done within the VoxPop project was a study of design principles and guidelines of closed parking slots for bikes in Lisbon.

↗ SOURCE

INNOVATIVE SOLUTIONS
MICROMOBILITY REGULATION

Lisbon can serve as an example of innovative micro-mobility company management. The city has taken a flexible regulatory approach while also engaging in active communication with operators. As a result, private operators could freely access the market on the condition that they meet with city officials regularly and report on difficulties relating to vehicle operation. The city prepared a Memorandum of Understanding for micro-mobility operators based on these discussions, outlining fundamental standards for parking, safety, and data gathering, among other things. The city continues to use this model and has not found a need for modification.

↗ SOURCE

SMART OPEN LISBOA

Smart Open Lisboa was a six-month open innovation initiative enabling entrepreneurs to test new mobility solutions in the city of Lisbon. The selected solutions were allowed to get support and direct access to significant corporations, as well as to evaluate their solutions using actual data in a live setting while interacting with potential clients and partners.

↗ SOURCE

London

'Innovation isn't just glossy things or really exciting widgets of technology. Innovation is doing things differently that creates value for a city and an organisation. And that's how we approach it.'

GEOGRAPHICAL SCOPE OF STRATEGY

Metropolitan area / City

POPULATION	**AREA**
9,002,488	1,572 km²

🚶 25% | 🚲 3% | 🚌 35% | 🚗 37% | ♀ 42% | 🌳 5.6% | PM2.5 11mg/m³ | 🚗 1.2

CITY BACKGROUND

Transport For London (TFL) is the integrated and multimodal Greater London transport authority; it is responsible for delivering the Mayor's aims for transport laid out in its 2018 strategy. With two dozen policies and more than a hundred concrete proposals, the 300 pages strategy is a comprehensive assessment and a state-of-the-art plan for the future of the London transport system: it is framed around the Healthy Streets Approach, which makes health and personal experience the priority for planning the city.

The strategic aims include reducing the dependency on cars in favour of active, efficient and sustainable modes (80% of all trips should be made by walking, cycling or public transport in 2041, up from 63% today); ensuring all Londoners do at least 20 min of active travel daily to stay healthy; targeting 'Vision Zero' for deaths and serious injuries from all road collisions; integrating suburban rail services and expanding the step-free network for improved overall accessibility; and ensuring that urban regeneration and new spatial developments incorporate Good Growth principles, which are based on high-density/mixed-use, carbon-free travel, car-free places, and inclusive designs.
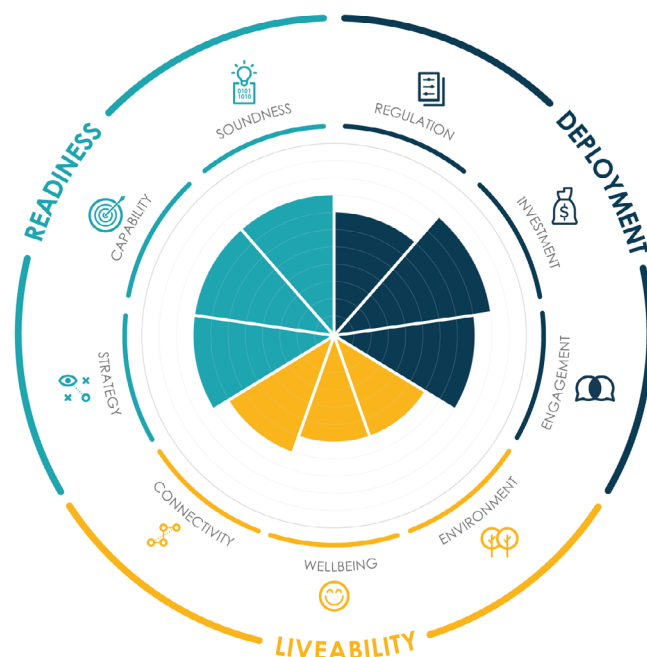
UMII PERFORMANCE
READINESS

💡 **Soundness (Data collection, accessibility and usability) -** TfL has been on a data journey over the last 20 years. As an organisation, it is proactive about data collection, interoperability and sharing (e.g. via a unified API platform https://api.tfl.gov.uk/). Buying the data is built in at the beginning of the procurement process, with a goal of creating data for customer and operational benefits, but also for future-proofing the system e.g. in a context of warming climate, real-time bus temperatures could become relevant. Realtime data is used to ensure travellers can be efficiently redirected to other modes in case of failure on part of the network, via the journey planner application or announcements while travelling. TfL also estimates the volume of car trips that could be made by other modes and assesses the willingness to switch away from cars. Unless there is a legal or technical reason to not make the data open, TfL is an early adopter of open data standards.

💡 **Strategy (Comprehensiveness) -** As part of its Cycling Action Plan, London aims to become the world's best big city for cycling "by creating an environment where everyone who wants to cycle can do so". The plan recognises 'fear and vulnerability' as the top barrier that stops people from cycling. However, the share of

cycling is low and the goal to double cycling trips falls short of the outstanding analysis and ambitions the plan suggests it is aiming for, particularly for children. With flash flooding hitting the city more often, future iterations of the strategy could also develop further concrete measures and innovations to improve the resilience of the transport system.

DEPLOYMENT

💡 **Community engagement (Information use) -** TfL has a large stakeholder engagement team dedicated to truthful and open conversations at the design stage rather than at the launch and scale stage. TfL sees close engagement as key to avoid the risk of unintended consequences. For example, low-traffic neighbourhoods initiative can be divisive; "it's usually the silent majority that don't say anything who actually support them, but if the majority of people are against, you've got to go back to the drawing board." Addressing apprehensions towards innovations and experiments requires to be crystal clear about priorities and the needs of Londoners, and to answer "What's it for? What's the problem?".

💡 **Regulation (Market barriers) -** TfL is proactive in trying to influence relevant decision-makers to overcome or address legislative barriers to innovation. With changes in technology, their approach is to engage early, to develop a route to deliver, and to create the evidence to lobby for change to legislation if the route to deliver requires it. TfL had success with e-scooter and HGV legislation. However, despite the benefit of being a highly integrated organisation, London's 32 boroughs and their highway agencies keep the final say about land use, which can make the task of scaling innovative solutions difficult.

LIVEABILITY

💡 Connectivity (Seamlessness) - London offers a dense and frequent variety of transport options. During the Covid-19 pandemic, TfL pressed forward with low-traffic neighbourhoods to radically increase the amount of space for walking and cycling: "All of a sudden, during the day, from 7:00 until 7:00, there is no through traffic". But because these measures were implemented quickly, making the changes permanent will require more formal consultations with local residents.

💡 **Wellbeing (Environment) -** London is a very compact and populated city, making it difficult to adequately address the needs of disadvantaged groups, or to provide for a safe and comfortable experience in very crowded spaces. London is taking sexual harassment

in transport very seriously and has put in place a host of measures to tackle the issue, including for example body-worn cameras for security staff. However, despite many innovative efforts such as hyperlocal air quality monitoring, environmental indicators such as air pollution, noise and share of natural areas remain relatively low.

UPCOMING PROJECTS
DIGITAL TWIN (VIRTUAL OR AUGMENTED REALITY)
A 'digital twin' is a high-definition street-level simulation for a full 3D digital representation of the environment. This innovative approach allows the London borough of Harrow to improve the efficiency of planning tasks for new mobility schemes, streetscape retrofitting, new cycling lanes or wider pedestrian spaces etc. It is also a better way of engaging with the end-user rather than with traditional methods.

🔗 SOURCE

INNOVATIVE SOLUTIONS
TRANSPORT INNOVATION DIRECTORATE
Since 2016, TfL has its own transport innovation directorate, focused on scanning the horizon for novel solutions, running trials, and generally spreading a culture internally and externally where experimentation is encouraged: "The innovation team's job is to get us ready for the future. We have people that are thinking differently from traditional transport planners. As a result, our job is to challenge the status quo and make sure we leverage best value by working with the best innovators to solve our challenges. With advances in technology, there is a wide ecosystem of innovators out there". The directorate is actively working with start-ups, small and medium sized enterprises, academics or corporates to trial and scale successful technology through Corporate Partnerships and Innovation Challenges, by actively sharing TfL's key challenges and seeking out ideas to test on TfL's network through funded trials. These include focusing on reducing the adverse impact of roadworks, freight, improving road safety and air quality, as well as encouraging more walking in the city.

EMERGING TECHNOLOGY CHARTER
London has developed a set of practical and ethical guidelines for the trialling and deployment of emerging technologies in the public realm. The charter sets four principles: 1) Openness – explaining to the public in plain English what a new technology is and why it is being used 2) Diversity – focussing on the needs of users at every step 3) Security – ensuring data privacy by design

4) Sustainability – new technologies must contribute to net carbon zero goals.

🔗 SOURCE

TACKLING SEXUAL HARASSMENT

Unwanted attention towards women and all forms of sexual harassment is a problem TfL takes seriously, with both technical and citizen education solutions. However, TfL does not support the idea of women-only carriages: it wants everyone to be able to travel on the network in safety and comfort, without the need for segregation. At a higher level, TfL is also systematically writing Equality Impact Assessments (EqIA) for all major transport projects.

🔗 SOURCE AND SOURCE

HYPERLOCAL AIR QUALITY MONITORING

Many UK roads continue to record illegally high levels of air pollution. In response, London has been experimenting with measuring and modelling precise levels of exposure to bad air by installing lower-cost air quality sensors on lamp posts and buildings, and then aggregating the data with other sources in real-time e.g. type and number of vehicles, building heights, the weather etc. This approach gives Londoners the opportunity to see the levels of pollution in their local area and help reduce their exposure.

🔗 SOURCE

SAMDESK AI REAL-TIME ALERT

In addition to the existing 'Have Your Say' platform which allows citizens to share their views, ideas, and experiences directly, London is experimenting with a new tool that scouts social media for sentiment to see what people are thinking about the transport network conditions, but without being asked about it.

🔗 SOURCE AND SOURCE

Los Angeles

'We try to understand people's experiences through surveys. But the underlying idea of transportation happiness is not only are we providing services and projects that improve lives, but do they carry joy? Are they equitable and dignified?'

**GEOGRAPHICAL SCOPE OF STRATEGY**
City

POPULATION	**AREA**
3,898,747	1,214 KM²

🚶 3% | 🚴 1% | 🚌 5% | 🚗 89% | ⚫ 2% | ♀ 32.6% | 🌳 NA | 🏠 PM2.5 13.7MG/M³ | 🚗 6.1

CITY BACKGROUND

Los Angeles Department of Transportation (LADOT) leads transportation planning, project delivery, and operations in the City of Los Angeles. LADOT manages 52 different transportation services in the city including parking management, safety improvements and permits for private mobility operators. Their vision is to ensure that in LA, "all people have access to safe and affordable transportation choices that treat everyone with dignity" and "support vibrant, inclusive communities". LADOT has developed key strategic documents including, LADOT's Strategic Plan 2021-2023 to guide the agency while pursuing this vision. LADOT is also responsible for delivering policies, objectives, and programs of the Mobility Plan 2035 - the City's transportation element of the General Plan - as well as Mayoral executive directives, City Council motions, and state and federal legislation.regeneration and new spatial developments incorporate Good Growth principles, which are based on high-density/mixed-use, carbon-free travel, car-free places, and inclusive designs.
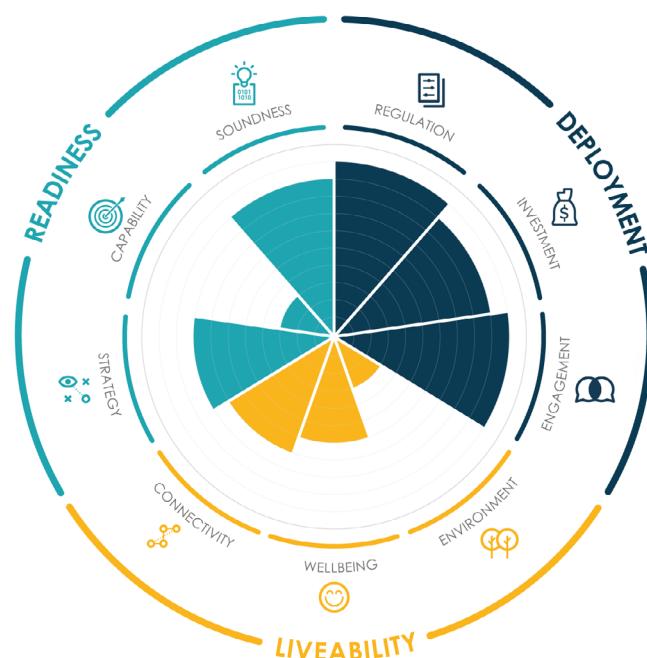
UMII PERFORMANCE
READINESS

💡 **Soundness (Data usability) -** There is clear evidence that LADOT uses data to improve mobility in the city of LA. A notable example is Mobility Data Specifications (MDS) standard used to dynamically manage dockless mobility solutions. MDS is open source to promote its further development and adoption in other cities. LA is one of the founding members of Open Mobility Foundation (see below).

💡 **Capability (Internal capacity) -** Innovation is being pursued by a number of departments within the City of Los Angeles. City of Los Angeles agencies like LADOT

closely collaborate with Urban Movement Labs – a mobility-innovation-focused public-private partnership, to pilot and scale innovative mobility solutions. The City of Los Angeles also has a Chief Innovations Office that has focused on many issues including homelessness, Covid-19, and more. Establishing a dedicated team or a role leading and coordinating mobility innovation within LADOT could be considered to further strengthen LA's vision to become "transportation innovation capital of the world".

DEPLOYMENT

💡 **Regulation (Market barriers to innovation) -** The current city government is dedicated to increasing

LA's role as a leading city in urban mobility innovation. Many of the policy, regulatory, or legislative barriers to innovation are therefore overcome by getting political support or using current legislation creatively. One of the main barriers that has to be worked on is ensuring privacy in a data-driven urban mobility ecosystem.

💡 **Investment (Own investment) –** Besides its own projects, LADOT is also supporting joint projects with other public agencies either by in kind contributions or by match funding. There is no specific budget dedicated to urban mobility innovation. The funds are rather programmed on a per-project basis.

LIVEABILITY
💡 Wellbeing (Fairness) – LADOT's fixed route Commuter Express and DASH services are served by buses equipped with wheelchair lift or ramps. The Cityride Program provides taxi and Dial-A-Ride van services to eligible seniors and disabled people who live in LA and portions of LA County. Moreover, there are several customer service phone lines where travellers with limited mobility can arrange special services and assistance. Currently, there are no dedicated mobility services for women, but LADOT recently released the Changing Lanes report – a gender equity transportation study. The report contains a number of recommendations for pilots that will be implemented in coming months and years.

💡 **Connectivity (Seamlessness) –** Due to different jurisdictions and many service operators, LA County has an extensive public transit system operated by various different entities including LA Metro, LADOT DASH, and numerous other municipal transit providers. Payment for transit and bike share is integrated through Metro's Transit Access Pass (TAP) card in Los Angeles County. However, services such as app-based sharing platforms, are not integrated. Furthermore, all services get branded individually and have their own fare structures, which can get fairly complicated from a user perspective. The region at large already took first steps to improve the integration of its services through interventions including development of Metro's NextGen Bus Plan, LADOT mobility hubs co-location and integrated payment, and inter-agency collaboration to plan and deliver projects.

UPCOMING PROJECTS
UNIVERSAL BASIC MOBILITY PILOT PROGRAM
The South Los Angeles Universal Basic Mobility Pilot Program aims to expand fare payment subsidies, integrate fare payment across existing and new

transportation services, introduce new shared mobility options for residents and workers, and expand electrification to advance Universal Basic Mobility for South LA residents. The project components include:
- mobility wallet and transportation subsidy pilot
- e-bike lending library
- on-demand electric shuttle pilot
- expansion of an electric car sharing into South LA
- new public charging infrastructure
- stakeholder outreach and engagement activities
- quick-build active transportation demonstration projects
- bike and pedestrian improvements on a future Rail-to-Rail active transportation corridor

↗ SOURCE

TRANSPORTATION HAPPINESS
LADOT is exploring ways to measure Transportation Happiness and integrate it as a metric into all LADOT transportation projects. Leveraging existing and future quantitative and qualitative data resources, LADOT will assess and track how the agency is upholding the Principles for Transportation Happiness, which LADOT has defined.

↗ SOURCE

ZERO EMISSIONS DELIVERY ZONES (ZEDZS)
A ZEDZ is a commercial loading zone exclusively for zero emission delivery vehicles, including electric trucks and electric cargo bikes. With more and more deliveries happening, the ZEDZ pilot will provide lessons for how commercial delivery needs can be met while reducing impacts on local pollution.

↗ SOURCE

INNOVATIVE SOLUTIONS
OPEN MOBILITY FOUNDATION
Los Angeles helped found the Open Mobility Foundation (OMF) – a global coalition led by cities committed to support the development of open-source standards and tools that provide scalable mobility solutions for cities. The OMF brings together academic, commercial, advocacy and municipal stakeholders to help cities develop and deploy new digital mobility tools, and provides the governance needed to efficiently manage them. The first project that OMF governs is the Mobility Data Specifications (MDS) – a project which LADOT contributed in full to the OMF. MDS is a digital tool that helps cities to better manage transportation in the public right of way. MDS standardises communication and data-sharing between cities and private mobility providers, such as e-scooter and bike share companies. This allows cities to share and validate policy digitally,

enabling vehicle management and better outcomes for residents. Plus, it provides mobility service providers with a framework they can re-use in new markets, allowing for seamless collaboration that saves time and money. Since its introduction, MDS has been adopted by more than 130 cities and public agencies around the world.

🔗 SOURCE

AL FRESCO

LADOT supports the LA Al Fresco program aiming to help restaurants and bars impacted by COVID-19. Through the LA Al Fresco program, eligible restaurants and bars can apply to expand dining areas into the street parking spaces, sidewalk, and private parking lots adjacent to their premises. The city provides them with free traffic control equipment (planters, barricades, bollards) and umbrellas. Restaurants can therefore serve customers while maintaining social distancing. This is an innovative use of road space which contributes to creating a more vibrant city life.

🔗 SOURCE

SLOW STREETS

Since May 2020, the LADOT has installed over 50 miles of Slow Streets in 30 neighbourhoods throughout the city. The Slow Streets program was set up as a response to the closure of popular recreation places like parks and trails. The goal is to create an opportunity for people to stay physically active while socially distant by reducing speeding on neighbourhood streets.

🔗 SOURCE

Madrid

'A green fleet in public transport is also a means to raise awareness of people to adopt more sustainable mobility options.'

GEOGRAPHICAL SCOPE OF STRATEGY
AUTONOMOUS COMMUNITY

POPULATION	**AREA**
6,642,000	8,030 KM²

🚶 22% | 🚴 0.5% | 🚌 31% | 🚗 44% | 💬 2.5% | ♀ 25.3% | 🌳 44% | PM2.5 9.4 MG/M³ | 🚗💥 1.9

CITY BACKGROUND

The Regional Consortium of Transportation for Madrid (CRTM) is a public body managing and coordinating all modes of public transport, including the different operators in the region of Madrid. CRTM is responsible for the development of the Strategic Plan for Sustainable Mobility of Madrid (2013 - 2025). The plan incorporates the objectives set out in the Air Quality and Climate Change Strategy of the Community of Madrid 2013-2020 (Plan Azul+), as well as the EU 20-20-20 climate targets. In accordance with these guidelines, Madrid aims at reducing air pollutants and GHG emissions, and increasing the share of renewable energy in the overall consumption deriving from the transport system. The strategy has set goals for improving the modal share in the region of Madrid by 2025, having 35% of all trips made by public transport, 35% by walking and 30% by private vehicles, increasing also by 3% the coverage of public transport for the entire population in the region.
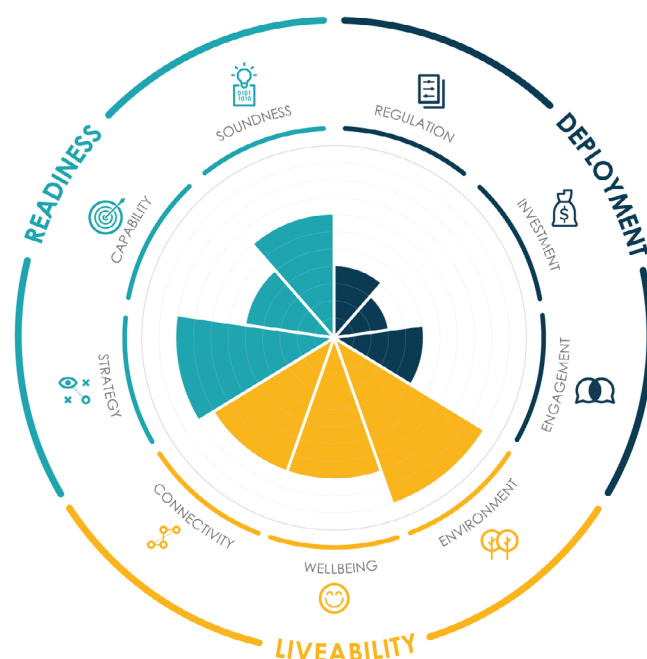
UMII PERFORMANCE
READINESS

💡 **Strategy (Comprehensiveness of strategy)** – A diagnostics exercise was performed to inform the objectives of the Strategic Plan for Sustainable Mobility of Madrid, including territorial and demographic aspects, mobility trends, information on the public transport system, highway network, pedestrians and cyclists, freight movements and logistics, air quality and climate change. The Kyoto protocol and Brundtland report on sustainable development were also considered in the development of the strategy.

💡 **Soundness (Data usability)** – There is little evidence of data being used by internal or external stakeholders, or the strategy owner being particularly encouraging

data usage. The creation of partnerships, hackathons and other open innovation practices could assist in addressing challenges in urban mobility.

DEPLOYMENT

💡 **Community engagement (Information provision)** – Users of the transport network in Madrid can access pre-trip through a single access point and on-trip information on a real-time basis. A variety of complementary channels are available such as variable message signs, static information signs, billboards, CRTM website and alerts.

💡 **Investment (Own investment)** – Although there is some allocated budget for innovation activities in the studies or new projects related to innovation, there is

not a dedicated investment for innovation activities in urban mobility which could allow the implementation of projects that are risky, leaving room for failure and experimentation.

LIVEABILITY

💡 Environmental (Noise) – Madrid has in place mechanisms and plans for monitoring noise pollution. The Acoustic Pollution Monitoring Network of Madrid has in place 31 permanent stations, as well 16 mobile units and 5 instrumented vehicles that travel throughout the city. In addition to publishing real-time data from the permanent network of stations to their public website, Madrid City Council also defines special zones where noise pollution levels are regulated.

💡 **Connectivity (Intermodal Integration) –** Based on the data provided by the city regarding the available modes across the different interchange points on the public transport network, Madrid still has some room for improvement in terms of intermodal integration.

UPCOMING PROJECTS
PILOT ON LAST-MILE LOGISTICS

A new Living Lab has been launched in Madrid, operating as a micro logistics hub which will test an initiative that promotes a more sustainable distribution of goods to the end-consumer. This includes restaurant, supermarket and store home delivery, as well as the transportation of larger goods. The Living Lab will address real freight movement problems deriving from potential traffic restrictions to be enforced, by simulating and demonstrating the use of an urban consolidation centre, along with other mini centres and lockers, to deliver/pick up freight, using electric cargo bikes and vans.

↗ SOURCE

WOMEN AND SAFE TRANSPORT OBSERVATORY

The Municipal Transport Company of Madrid has established the observatory "Women and Safe Transport" whose mission is to study and implement measures to promote the safety of women when travelling with public transport. The aim is to carry out an assessment of the situation of women as users of public transport and identify the situations that may affect their safety more directly. Furthermore, the objective is to also propose concrete and tactical actions to promote public transport as a safe place for women.

↗ SOURCE

INNOVATION AND TRAINING CENTRE

The Innovation and Training Centre will promote research and projects aimed at the development of sustainable mobility jointly undertaken by UITP and CRTM. The centre will serve as a liaison to organise the training programmes the UITP offers its partners worldwide, and it will manage the necessary logistics to provide them to professionals and learners of studies.

↗ SOURCE

INNOVATIVE SOLUTIONS
PUBLIC TRANSPORT MANAGEMENT CENTRE

CITRAM is the Public Transport Innovation and Management Centre that integrates and coordinates in real time information gathered from all 27 public and private operators of the public transport system in the region of Madrid. One of the main priorities of CITRAM is to provide high quality services to all citizens, with better mobility management and support in the decision-making process. The centre enables a collaborative and coordinated work environment in which any stakeholder may identify the best solutions to the challenges of public transport operations.

↗ SOURCE

PUBLIC TRANSPORT STOPS ON DEMAND

The Community of Madrid has introduced on-demand bus stops for women and minors on 40 city Nightline buses. This initiative makes it possible for women and children under 18 years old to request a stop at any point along the route within the urban area, by personally informing the driver.

↗ SOURCE

METRO OPEN-DOOR VALIDATION SYSTEM

After testing the system at a few metro stations, Metro Madrid has now 33 metro stations that are using the open gates fare system. With this approach, the doors remain open at all times and only close in case the traveller does not validate her ticket. In this way, the flow of the travellers can be improved as well as save energy and maintenance costs related to the movement of the gates.

↗ SOURCE

AUTONOMOUS MINIBUS

CRTM together with the General Directorate of Traffic, the Autonomous University of Madrid and the company ALSA signed an agreement for the implementation of a pilot project for the commission of a circular line inside the university campus operated by an autonomous minibus. After months of testing, the autonomous minibus is now operating since October 2020 on a 3.7km circuit with a total of eight fixed stops, starting from the Cantoblanco suburban railway station and with connections to various passing interurban bus lines.

↗ SOURCE

Cargoroo's electric cargo bike rental, a part of the eHUBS project aiming to provide shared and electric mobility alternatives to the private car

Manchester

'When we last consulted on the delivery plan, we did that alongside consultation on the spatial plan. We really tried to bring spatial planning together with transport planning, and showed how the two were developed in a kind of complementary way.'

**GEOGRAPHICAL SCOPE OF STRATEGY**
METROPOLITAN COUNTY

POPULATION	**AREA**
2,822,000	1,276 KM²

🚶 25%	🚲 5%	🚌 18%	🚗 51%	⚫ 1%	♀ 50%	🌳 52.6%	♨ PM2.5 9.8MG/M³	🚗💥 1.9

CITY BACKGROUND

Transport for Greater Manchester (TfGM) is responsible for delivering the city-region's transport strategy and commitments. Its transport vision is to have 'World class connections that support long-term, sustainable economic growth and access to opportunity for all'. It is set out in the Greater Manchester Transport Strategy 2040, which was consulted in 2015, launched in 2017 and refreshed in 2021, and is supported by 5-year delivery plans. The strategy is formulated around the ambitions to enable people to move seamlessly between services; to provide choice and support low-car lifestyles made possible by integrated land use and transport planning; to develop a fully inclusive and affordable system that supports people in leading active, healthy lives; to ensure perceived safety is no longer a barrier to people walking and cycling; and to deliver environmental enhancements whenever possible.

Innovation is an integral part of the plan and TfGM has its own Insight and Innovation team. Innovation is not seen as an end in itself, but as a way to add real value to the strategy implementation and to contribute directly to improving performance and resilience, reducing the need to travel, reducing environmental impacts, improving access to data, and overall improving the customer experience.

As the UK plans to phase out the sale of new petrol and diesel vehicles by 2030, combined with a city-region goal for carbon-neutrality by 2038, the innovation strategy aims to help people make the switch to active and electric transport by creating an integrated, affordable, easy to use and sustainable transport system, covering public transport, cycling and walking, and EVs.
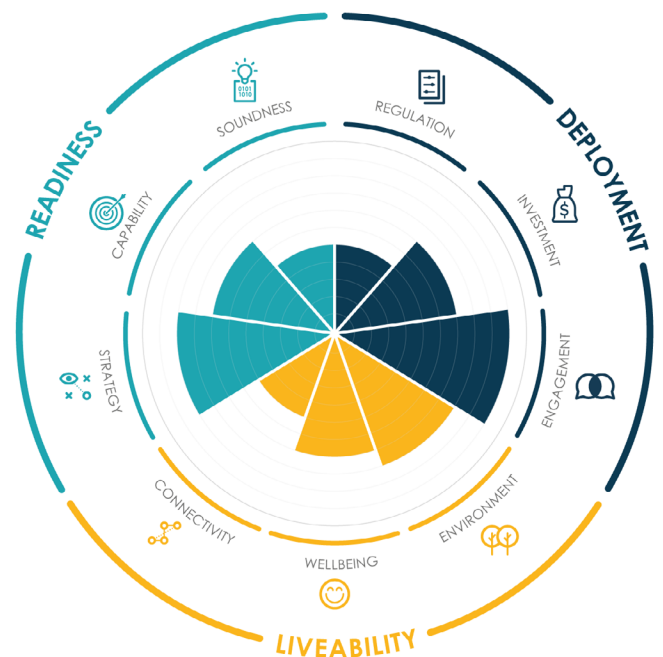
UMII PERFORMANCE
READINESS

💡 **Strategy (Comprehensiveness) -** Data shows that 40% of trips below 2km are undertaken by car in Greater Manchester. The "Right Mix" vision, as set out in the Greater Manchester Transport Strategy 2040, aims to reverse this; with an ambition for 50% of all journeys in Greater Manchester to be made by walking, cycling or public transport by 2040. The strategy is supported

by a Walking and Cycling Investment Plan (see the Bee Network innovation), an Electric Vehicle Charging Infrastructure Strategy, and a Clean Air plan, among others. The strategy sets clear objectives and KPIs, and has been developed taking into account the views of a wide range of stakeholders.

💡 **Soundness (Data collection and usability) -** Due to a historically fragmented transport system, collecting

and sharing real time data from all transport service providers remains a challenge. However, subject to Judicial Review, buses will be brought back under local control and operated via a franchising system. This will provide the opportunity to improve how data is shared for the benefit of customers. In addition, a new real-time data portal was created (https://developer.tfgm.com), new sensors and cameras are being rolled out to support the new Clean Air Plan , and initiatives to capture walking and cycling flows with sensors and cameras to complement existing travel satisfaction surveys are also under way.

DEPLOYMENT

Community engagement - There is a strong tradition for extensive Stakeholder Engagement and Consultation at TfGM, both at strategic level and for discrete projects. For example, in late 2021, the Bee Network Conversation engaged with thousands of people across Greater Manchester who shared their thoughts and opinions around the vision to join buses, trams, cycling and walking into an integrated travel system by 2024. TfGM aims to generate debate, which is inclusive of all Greater Manchester's communities. Focusing around a commonly approved long-term vision also allows to balance between more vocal stakeholders and the 'silent majority'. Finally, TfGM also recognizes the importance of public art to support, promote and engage successfully with local communities on the development of wider public transport network schemes.

SOURCE

Regulation (Barriers to innovation) - Regulatory barriers can significantly slow down the trialling and scaling of innovative mobility solutions. For example, e-scooters are categorised by UK law as Personal Light Electric Vehicles (PLEVs), it is illegal for privately owned e-scooters to be used on streets or public footpaths. Within this context, Greater Manchester has obtained permission to operate 'regulatory sandboxes' for limited trials to understand what role e-scooters can play in the wider transport mix. In a similar vein, TfGM have contributed to the Law Commission's consultations regarding a new regulatory context for connected and autonomous vehicles, which could pave the way for these vehicles being more extensively trialled on UK roads.

LIVEABILITY

Wellbeing (Innovative services or tools for female users) - Together with the School of Social Sciences at the University of Manchester, the Greater Manchester Combined Authority (GMCA) has been developing an ambitious and transformative 10-year Strategy to provide a comprehensive and responsive service to improve the safety of (mainly) women and girls who are victims of gender-based abuse. It also aims to challenge the attitudes and inequalities that promote it and enable those perpetrators who want to change to do so. Concrete actions include public campaigns on what is sometimes called 'low level' harm e.g. wolf-whistling, catcalling, stalking and harassing women in public spaces and verbal abuse on the basis of appearance, dress or sexuality.

Connectivity - With its flagship project, e-Mobility hubs (eHUBS), and several major interchange projects (in Bolton and Stockport for example), TfGM is improving the choice and connectivity of various transport modes. TfGM has also stated its ambition to replace the existing fragmented and siloed ticketing offer with a simple, integrated ticketing system. The ambition is highlighted in the Bus Service Improvement Plan where it states "We want people to be able to travel easily around the City Region, to move from one bus to another, or on to a tram, without having to buy another ticket, just tapping on and tapping off with a daily cap on what it will cost."

INNOVATIVE SOLUTIONS
THE BEE NETWORK

The Bee Network initiative aims to fully integrate cycling and walking with buses, trams, and rail by 2030 in a London-style transport system. Consultation is a key component of the Bee initiative, which was done via traditional surveys, but also with community workshops and a "Bee Network bus", enabling in-person conversations with residents and various communities. A key element of the Bee Network is the delivery of Bee Network Routes. Bee Network Routes are walking and cycling routes which, together, will create the UK's largest cycling and walking network. This initiative aims to connect every area and community in Greater Manchester, making it easy, safe, pleasant and therefore attractive for people to travel on foot or by bike for everyday trips.

SOURCE AND SOURCE

THE eHUBS PROJECT AND eCARGO BIKE RENTAL

Transport for Greater Manchester (TfGM) are a project partner in the Interreg North-West Europe funded eHUBS project. The pilot aims to accelerate the transition to shared and electric mobility services and, as a consequence, encourage people out of private cars and make more sustainable travel choices, ultimately reducing carbon emissions.
For the eHUBS project, TfGM are on track to deliver the

operation of 25 e-cargobikes and 10 Car-Club electric vehicles.

Locations for the eHUBs were selected via a heat-mapping exercise in conjunction with the University of Delft, to identify areas of potential; and by considering several additional factors – such as demographic and socioeconomic data, current cycling levels, presence of existing electric charging infrastructure, interfaces with other transport schemes and opportunities for replication after the trial. As a result, Bury and Manchester were the two districts selected to trial eHUBS.

↗ SOURCE AND SOURCE

SMART JUNCTIONS 5G

Smart Junctions 5G is a project launched in 2020 which joins multimodal IoT sensors with 5G technology to an AI traffic control system to provide better urban traffic control. Using the 5G small cell network decreases infrastructure costs for the connection of sensors at every junction, removing the need to mount hardware onto buildings as well as supporting connected bus projects and other mobility-based public services. The project fosters innovation by using an open architecture that allows for new domestic SMEs to contribute."

↗ SOURCE

ACCESSIBILITY MEASURES AND THE DISABILITY DESIGN REFERENCE GROUP (DDRG)

The DDRG is TfGM's answer to anticipate the requirements of disabled people and to make necessary adjustments to embed accessibility into every aspect of the transport system. The DDRG are consulted at various points throughout the design and implementation of infrastructure and services in order to identify and mitigate any potential accessibility issues. ↗ SOURCE AND SOURCE

Mexico City

'Our biggest objective is to tackle inequality in the access to transport system.'

GEOGRAPHICAL SCOPE OF STRATEGY
City

POPULATION	**AREA**
9,209,944	1,494 km^2

🚶 26%   🚲 1%   🚌 50%   🚗 23%   ♀ 40%   🌳 59%   PM2.5 19.7 mg/m^3 0.3

CITY BACKGROUND

The Mexico City's Mobility Ministry (SEMOVI) is responsible for scheduling, coordinating, controlling, authorising, and, when necessary, modifying the presentation of public, private, and commercial passenger and freight transportation. It strives to promote and stimulate the development of mobility in Mexico City with the universal right to mobility as a reference and the ultimate goal.

The ministry is also in charge of the formulation of the Integral Mobility Program (PIM) for the period 2020-2024 which is due to be published in the last quarter of 2021. The plan aims to address quality of life, health, environmental problems, social inequalities, and accessibility through an integrated and optimised urban mobility system.
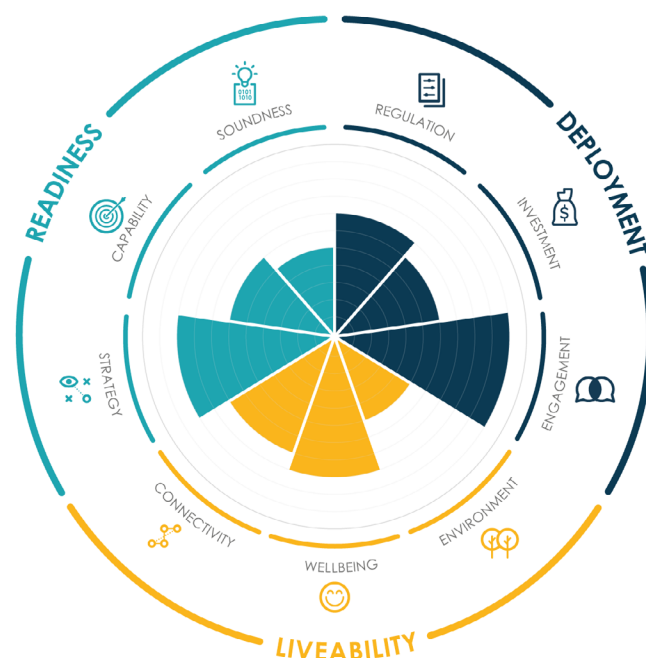
UMII PERFORMANCE
READINESS

💡 **Strategy (Readily available innovation strategy) -** The PIM 2020-2024 provides a structured and consistent approach to mobility innovation in Mexico City along three axes: Integrate, Improve and Protect. The transversal principle of innovation is incorporated across the specific strategies developed in the plan, together with sustainability, equity, gender equality and transparency. The creation of the plan was supported by an extensive citizen and stakeholder participatory process that entailed both face-to-face and virtual activities. In total, 3766 people took part in the process lasting 9 months.

💡 **Capability (Internal capacity to support innovation) -** Within the strategy owner organisation, the responsibility for driving innovation is distributed across many areas and roles, while other governmental organisations and agencies are also accountable for the creation

of some solutions. In the future, SEMOVI may explore strengthening internal skills and processes to systematically pioneer the open innovation ecosystem in the city.

DEPLOYMENT

💡 Community engagement (User engagement) - SEMOVI is putting an emphasis on thorough citizen engagement when developing various initiatives in the city. A project incentivising participation of native communities in proposing ideas for community projects of improvement, rehabilitation and reconstruction is worth highlighting. Proposals that meet the access requirements and are given a favourable evaluation by the committee are eligible for financial assistance.

💡 **Regulation (Enabling new business models) –** Apart from a prompt development of temporary bicycle lanes for safer travel during the Covid-19 health crisis, there is little or no evidence that the crisis enabled the

development of projects or services that were previously constrained by regulation, policies, or legislation.

LIVEABILITY

💡 **Wellbeing (Fairness) -** Mexico City has a record of initiatives and programmes focusing on facilitating women's mobility, access, and safety. In 2019, SEMOVI published The Gender and Mobility Strategy, which defines lines of action and specific goals along 3 axes: a) The sexual violence and assaults towards women in the Integrated Transport System will be reduced; b) The gender equality and institutional culture in the transport sector will be strengthened; c) Attention will be put towards more effective mobility patterns of women. The plan also seeks to guide gender priorities in collaboration with other city stakeholders, civil society, academia, and the private sector.

💡 **Environment (Noise) -** Mexico City is one of the noisiest cities in Latin America, with vehicular traffic being the primary source of the noise. However, no systematic noise monitoring and notifying of citizens by local government agencies is in place, nor is the issue addressed or urban development plans. The need of tackling noise has been already voiced in a participatory workshop and the initiative #NoiseCDMX is pushing a bottom-up approach using open technology to map noise in the city. SEMOVI may investigate steps to reduce traffic noise, such as reducing the speed limit for traffic in particular areas of the city.

UPCOMING PROJECTS
PILOT IN PAYMENT OPTIONS
As part of the modernisation actions, a pilot program has been launched at Chilpancingo metro station (Line 9) and Metrobús and bus corridors to diversify toll payment options. Travellers will be able to use tickets with QR code, CoDi and contactless bank cards, directly in the tourniquet validators or for the purchase or recharge of Integrated Mobility cards in vending machines. With the diversity of payment options, the city wants to promote the integrated mobility card to cut line wait times at the box office, and provide the availability of QR tickets for users who purchase unitary journeys.

↗ SOURCE

ELECTRIC THREE-WHEELER
SEMOVI, in collaboration with the Ministry of Education, Science, Technology & Innovation (SECTEI), launched an innovation challenge in 2019 to develop electric three-wheelers. Two prototypes are currently being built and will be delivered for the stage of development in January.

SEMOVI

PEDICABS REPLACEMENT
Late 2021, SEMOVI issued guidelines for the replacement of obsolete pedicab-type units in the capital's Historic Centre, offering financial assistance of up to 30,000 pesos to those who modify their units. The goal is to ensure the efficiency and safety of user transitions in the first and last stages of their journey.

↗ SOURCE

INNOVATIVE SOLUTIONS
CABLEBUS
In summer 2021, Mexico City inaugurated its newest form of transport, two cable car lines, following a successful testing period. Line 1 is 9.2 kilometres long and runs through a mountainous, working-class neighbourhood. Line 2 is the world's longest public transport cable car line, stretching 10.6 kilometres across the Iztapalapa neighbourhood.
The lines demonstrate primarily a social project that serves densely populated areas, reducing travel times and providing a safe, innovative service to combat social inequality and increase access to opportunities by introducing a modern, and sustainable mode of transportation.

↗ SOURCE

MUÉVETE EN BICI
Muévete en Bici is an initiative of the Ministry of the Environment of the Government, in which streets regularly used by motorised transport are enabled to give way to pedestrians, runners and cyclists. This program allows people to use public spaces for recreation, promotes physical activity, social coexistence, the use of bicycles in the city and offers additional free activities and services. The initiative that started in 2007 now on average attracts more than 60,000 people. The passage has 50 km in total and is made available to people from 8 am to 2 pm every Sunday.

↗ SOURCE

POP-UP BIKE LANES TURNING INTO PERMANENT INFRASTRUCTURE
SEMOVI is currently working on the implementation of the cycling infrastructure on Insurgentes avenue, with a total length of 28.5 km. The project will turn this important avenue into a complete model street, with space for all types of road users. The project further addressed solutions to loading and unloading of goods by installations of 24 bay areas, adaptations to intersections as well as pick-up and drop-off bays of the night bus services.
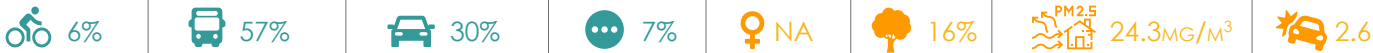
↗ SOURCE
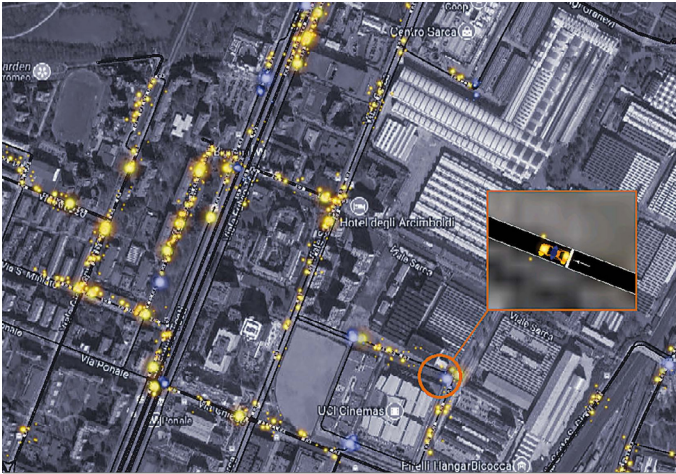
Milan

'The mobility data is the most downloaded set of data in relation to all the open data we have.'

**GEOGRAPHICAL SCOPE OF STRATEGY**
CITY

POPULATION	**AREA**
1,374,582	182 KM²

6%	57%	30%	7%	NA	16%	PM2.5 24.3MG/M³	2.6

CITY BACKGROUND

Since 2000, the Mobility Environment and Territory Agency (AMAT) has been carrying out services to support the municipal functions in the field of urban planning, mobility and public transport, environment, energy and climate on behalf of the Municipality of Milan. All of the agency's actions are executed holistically, with the 17 UN Sustainable Development Goals serving as a point of reference. The major work done by AMAT is aiming at achieving the objectives outlined in Goal 11 'Sustainable cities and communities'. AMAT was heavily involved in the development and drafting of the Sustainable Urban Mobility Plan (SUMP) for the City of Milan, which was approved by the city council in November 2018. The plan is envisaged to address the mobility needs of Milan's population, ensure reduction of atmospheric and noise levels, increase safety and shift the use of private cars to shared systems and public transport. Its four main objectives sum up to 1. Sustainable mobility, 2. Equity, security and social inclusion, 3. Environmental Quality and 4. Innovation and effective economy.
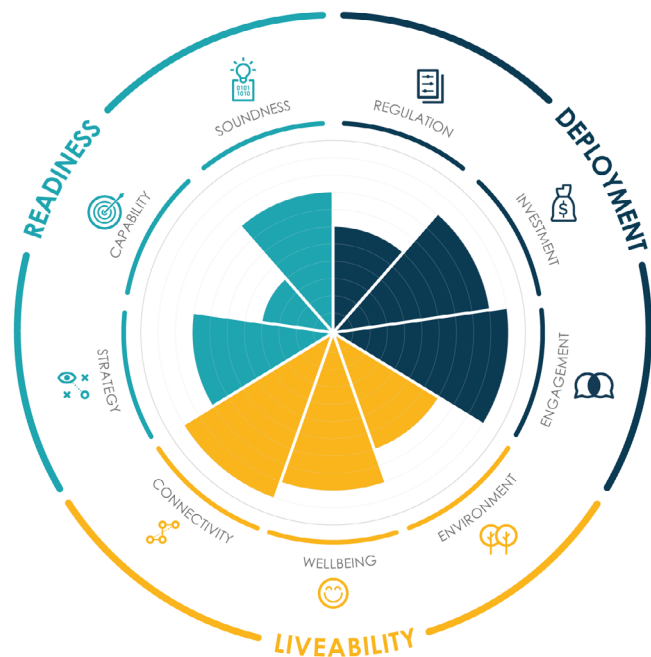
UMII PERFORMANCE
READINESS

💡 **Strategy (Comprehensiveness of the strategy) -** The SUMP for the City of Milan has been built upon extensive diagnostics exercise. The plan has been developed with engagement of stakeholders (citizens, associations or other city representatives) in diverse initiatives and activities. According to AMAT, for each subject or item of the Sustainable Urban Mobility Plan a specific workshop was organised to show their proposal and collect feedback to the specific item. Furthermore, the development of the plan was supported by socio-economic and environmental analysis. The strengths,

weaknesses, opportunities, and threats (SWOT) were also part of the analysis.

💡 **Capability (Internal capacity to support innovation) -** AMAT as the municipal agency responsible for mobility does not have a specific innovation department or team for innovation in urban mobility but rather cooperates with the innovation department of the City of Milan. Although AMAT heavily involves different city stakeholders, universities and external partners in innovative projects, they do not contribute to the expansion of skills and competencies of the strategy

owner. AMAT may explore establishing a dedicated team/role in the future to drive urban mobility innovation in a more centralised manner.

DEPLOYMENT

💡 **Community engagement (User engagement)** - In addition to conventional engagement approaches, the city of Milan has a specialised function of a counsellor who is responsible for exchanging information with residents and gathering their feedback. The city has few portals that actively solicit public participation and suggestions that can be related to, but not limited to mobility.

💡 **Regulation (Market barriers to regulation) -** When launching a new pilot or initiative, the city of Milan must adhere to the current street code, which might be a barrier to innovation as any exception would necessitate further Ministry of Transport permissions. Although the city is used to dealing with these restrictions by devising workarounds or using regulatory loopholes, there is little evidence that these barriers are being removed to facilitate innovation in the city's urban mobility.

LIVEABILITY

💡 **Environment (Noise) -** The city of Milan recognises noise as a significant problem and a factor that affects citizen's wellbeing and for this reason has developed a noise action plan and maps the levels of noise using noise maps.

💡 **Wellbeing (Quality of life -** Health, Safety, Affordability) - Analysis of quantitative indicators has shown that Milan can further improve the access to public transport as currently only 30% of services have higher frequency than 10 departures per hour at least once a day.

UPCOMING PROJECTS
STUDY OF THE IMPACTS OF ROBO-TAXIS ON FUTURE URBAN MOBILITY

AMAT has recently performed a study on the impacts of shared and autonomous electrically-powered robo-taxis on urban mobility. The City of Milan still has one of the highest European rates of car ownership (49.4 cars every 100 inhabitants) and the solution to this problem is seen in shifting from owning to sharing.

Using an open-source software for the Simulation of Urban Mobility (SUMO), custom functionalities such as ridesharing, autonomous driving and advanced data processing were developed and implemented via Python and SUMO's Traffic Control Interface (TraCI).

Furthermore, data such as vehicle counts, Google API data for average travel times along certain roads and Telecom Italia mobile phone usage data were used to derive the mobility demand.

The outcomes of the study have indicated that congestion in the city can be resolved by 30% of users switching to robo-taxis coupled with a 10% decrease in peak demand achieved through smart incentives, according to the report on the study. The study also suggests that a six-seater robo-taxis should be a core component of the fleet with a fleet of 9,500 robo-taxis sufficient to cover the demand in Milan.

↗ Source

MOLECOLA

MoLeCoLa (Mobility, Learning, Community Lab) is a project in the Bovisa neighbourhood in Milan. It concerns the implementation of an interchange hub between rail, public transport and smart mobility to connect the east and west areas of the station. Furthermore, the 'Bovisa Hub' will also be a laboratory to test new technological ideas. The project is a part of the Reinventing Cities Programme promoted by C40 initiative.

↗ Source

INNOVATIVE SOLUTIONS
PARTECIPAMI

PartecipaMi is the RCM Foundation initiative dedicated to Milanese citizens and their representatives in local institutions to provide them with spaces and tools for participation in the life and management of the city. The website administers a permanent forum dedicated to discussions on various subjects, including mobility, environment, Milan smart city or enables citizens to map parking for disabled people across the city. The portal calls for ideas from citizens on various subjects, for instance, a recent initiative has asked participants to present ideas on the applications for smartphones and the Internet of Things on health.

↗ Source

Montevideo

'Conceptually focusing mobility on people by promoting equity in access to employment, educational, cultural, and health opportunities allows the citizens to fully develop their human potential.' [Institutional Strategic Guidelines 2021-2025] (*based on desk research)
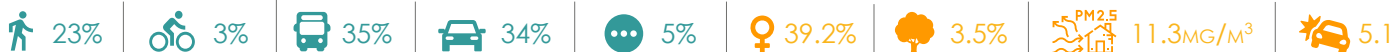
**GEOGRAPHICAL SCOPE OF STRATEGY**

Department

POPULATION	**AREA**
1,319,108	530 km²

🚶 23% | 🚲 3% | 🚌 35% | 🚗 34% | ⬤⬤⬤ 5% | ♀ 39.2% | 🌳 3.5% | PM2.5 11.3mg/m³ | 🚗💥 5.1

CITY BACKGROUND

Mobility Department of the Intendencia de Montevideo (Municipality of Montevideo) is responsible for supervising the public transit as well as for the organisation and regulation of road transport in the city of Montevideo. The department's strategic plan is postulated from a vision that conceives mobility as a basic right of all people, hence aiming to promote equity in access to employment, educational, cultural, recreational, and health opportunities in the city. From the sustainability point of view, one of the Mobility Department's wider goals is to shift the culture of private motoring that has prevailed towards public transport and active modes.
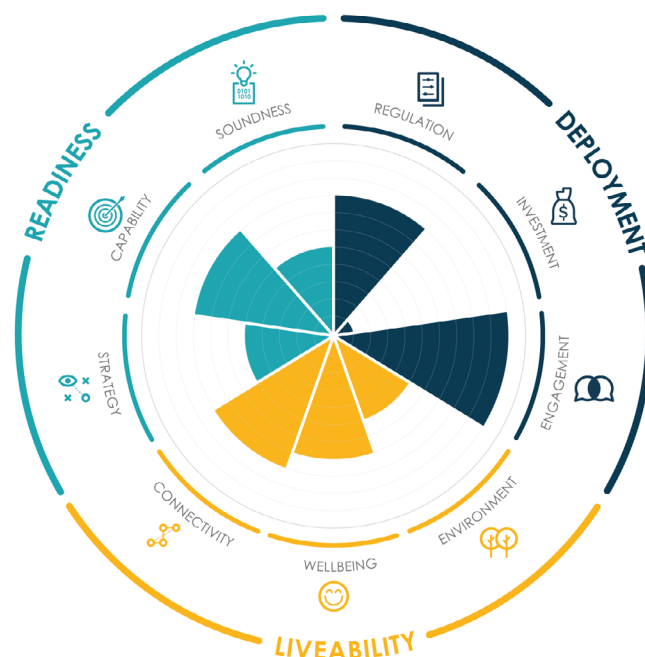
UMII PERFORMANCE
READINESS

💡 **Soundness (Data accessibility) -** The city of Montevideo has been among the first in LATAM to foster an open data culture by establishing an integrated online open data portal. While the datasets mostly consist of static data currently, they are updated regularly and available in the Open data catalogue. Furthermore, the municipality itself has adhered to The 8 Principles of Open Government Data.

💡 **Capability (Internal capacity to support innovation) -** Currently, there is no unit, or department leading mobility innovation in Montevideo. The mobility innovation in the city is usually led by the Mobility Division in collaboration with the Technology Department on top of their usual duties. The city could consider establishing a position with an agenda dedicated to fostering and coordinating urban mobility innovation.

DEPLOYMENT

💡 **Community engagement (User engagement) -** Apart from the conventional channels, the citizens of Montevideo can use the Montevideo Decide (https://decide.montevideo.gub.uy/) - a digital platform that allows the people of Montevideo to express their opinions, propose and influence the actions carried out by the Municipality of Montevideo. According to their different levels of registration, citizens can participate in debates, present project initiatives that seek to improve life in the city, as well as participate in surveys, interview the Mayor and his Government team and participate in the co-creation of documents.

Investment (Own investment) - Currently, there is no specific budget dedicated for innovation in urban mobility in Montevideo. The funds are unlocked on a per-project basis which leaves limited room for experimentation.

LIVEABILITY

Wellbeing (Fairness) – There is a part of the urban mobility strategy directly dedicated to female safety issues in public transport. The Intendencia de Montevideo runs successful initiatives to prevent harassment in the transport network. An excellent example is a harassment reporting system embedded in Montevideo's official travel app. Upon reporting an incident through the app, service operators contact the sender and provide her with legal support if necessary. The service is available on bus lines throughout the city regardless of the bus service provider. The city is making legal efforts to expand the service also to taxi and ride-hailing services.

Wellbeing (Sustainable and healthy mobility) - Transport users have mostly access to conventional mobility services only. The bikesharing system that has been established in the city is no longer operational due to the low popularity of bike ridership. Cycling infrastructure is often obstructed by private vehicles parking on bike lanes. A solution could be to separate the bike lanes from the rest of the infrastructure by physical barriers – an intervention which the municipality is continuously working on. In 2022, a call aimed at public bikesharing reintroduction in Montevideo will be launched.

UPCOMING PROJECTS
"WITH THE WIND IN MY FACE"

"With the wind in my face" is a project resulting from activities carried out in Montevideo's citizen-driven living lab (MVDLAB). It seeks to bring the use of bicycles closer to people with partial or total visual impairment. With an emphasis on the right for the city without barriers, the project seeks to contribute to equity, enjoyment, and inclusion of these people through a healthy and sustainable practice which they still do not have access to. The idea is to promote the practice of pedalling on tutored bicycles (tandem or other) as a new rewarding experience and significant value that involves aspects of freedom, integration, and cooperation between those who see and those who do not see.

Source

A MODEL FOR ESTIMATING THE POINT OF EXIT

Public transport users in Montevideo check-in upon boarding but don't check out when leaving a vehicle. In order to better estimate and analyse the origin and destination of user trips, Montevideo has developed a model to estimate an exact spot where travellers exit public transport.

INNOVATIVE SOLUTIONS
CITIZEN CONTROL APP

The Intendencia de Montevideo provides a mobile application that allows citizens to easily report traffic violations such as obstruction of an accessibility ramp or parking on a bike lane or bike path. Users are able to make complaints that affect co-existence in an agile way and accompanied by corresponding photographic evidence.

TRANSPORT SYSTEM FREE OF HARASSMENT

The city designed a protocol to acting in situations of sexual harassment from public transport drivers and other employees. Female travellers can easily report harassment right from the official public transport app and there is a dedicated team that processes the reports. They will contact the victim and with a legal advisor, they will get in touch with the company which is involved in the incident. The system now covers public buses, but the municipality plans to extend it also to taxis and ride-hailing services in the city.

MONTEVIDEO DECIDE

The city operates a digital engagement platform where it shares its running projects. Citizens can vote and comment on the projects as well as publish their own proposals and ideas. According to their different levels of registration, citizens can participate in debates, present project initiatives that seek to improve life in the city, as well as participate in surveys, interview the Mayor and his government team and participate in the co-creation of documents.

Source

OPEN STREETS FOR CITIZENS

During the Covid-19 pandemic, Montevideo closed two avenues for motorised transport during the weekends for citizen leisure activities. During this time, restaurants were allowed to use public space to increase the size of their terraces.

Montréal

'On the theme of resilience, we had a big deal of work and reflections and exchange with lots of partners and it's been embedded in the objectives of the PSD.'

GEOGRAPHICAL SCOPE OF STRATEGY
METROPOLITAN AREA

POPULATION	**AREA**
4,098,927	4,259 KM²

🚶 18% 🚌 37% 🚗 41% ⋯ 4% ♀ 32% 🌳 26.2% PM2.5 10MG/M³ 🚗💥 1.8

CITY BACKGROUND

The public transport in the Montreal metropolitan region is run by four public collective transportation organisations: exo, the Longueuil transport network (RTL), the Société de transport de Laval (STL), and the Société de transport de Montréal (STM). Since 2017, the newly created Regional Metropolitan Transportation Authority (ARTM) is responsible for the administration and integration of public transportation in the greater Montreal area.

With a view of sustainable development and regional cohesion, the ARTM plans, organises, finances and promotes public transport in the greater Montreal metropolitan area in order to offer a simple, integrated, fluid and efficient mobility experience. For the moment, the ARTM has successfully worked on the unification and simplification of the transport tariff system by creating new offers, fixing prices and overhauling existing tariffs. One of the most important assignments for ARTM was the creation of the first Strategic Development Plan (PSD) for the greater Montreal region. The plan published in July 2021 outlines in its vision that by 2050 the

majority of travel in the metropolitan area will be carried out in active and collective modes, contributing to a significant reduction in congestion and GHG emissions and further enhancing the economic viability and health of the citizens.
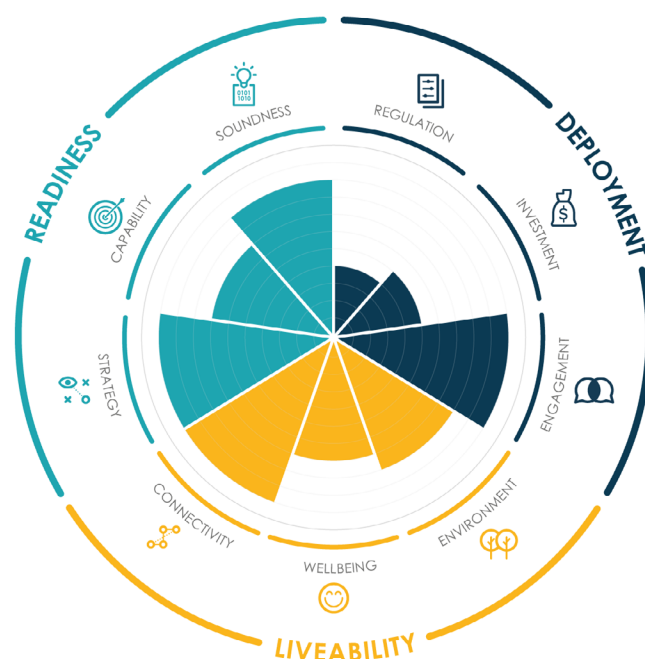
UMII PERFORMANCE
READINESS

💡 **Strategy (Comprehensiveness of the strategy) -** The PSD for the greater Montreal region sets, among others, innovation as one of its strategic pillars to increase the attractiveness of public transport. This includes promoting sustainable mobility, mastering technological advances and supporting the growth of emerging mobility services. Furthermore, the plan focuses on strengthening the resilience of the public transport system especially in the context of climate change and proposes to develop a plan for assessing vulnerabilities of the system and for adapting to climate change.

💡 **Capability (Skills and capabilities to deliver the strategy) -** The ARTM as the strategy owner has already established relationships with the universities in Montreal or other Canadian cities in the area of planning and development. For instance, all the metrics coming from origin and destination surveys have been done in cooperation with Polytechnique Montreal. ARTM is further looking to establish relations with other research entities as they are currently building their IT team. Putting in place different mechanisms such as partnerships or collaboration agreements for secondments, fora, advisory groups would further enhance ARTM's capabilities when strategizing/planning innovation in urban mobility and build internal capacity.

DEPLOYMENT

💡 **Community engagement (Information provision) -** The most complete information on the public transport network in greater Montreal is available to citizens through an app 'Chrono' developed by ARTM. It offers complete network information including alternative routes due to planned works, it allows a high degree of personalisation by enabling users to create their favourites, set up alerts for their usual trips and consult the level of crowding on the majority of buses and trains. Furthermore, the app includes a bike planner taking into account all bike paths in the city and a bicycle sharing scheme (bike reservation in advance possible). Additional features such as voice assistants (Siri, widgets for Android) are also available. The info is complemented by information terminals installed across the network or the possibility to receive the information by SMS.

💡 **Investment (Attracting investment) -** According to the evidence collected, ARTM has not pursued seeking to leverage the investments by external funding collaborations such as investments through a public-private partnership, match funding or fostering collaborative projects. In the future, similar initiatives might incentivise third party innovation in the city.

LIVEABILITY

💡 **Connectivity (Seamlessness) -** Montreal metropolitan region has been able to achieve a high level of integration of different mobility services as the networks of the four public transport operators are integrated on the spatial as well as tariff level. Also, their offers managed to include bike and car-sharing (using the OPUS travel card), while cycling is marking continued growth with the number of cycling paths usable during the winter increasing every year. ARTM is currently exploring the possibility to introduce MaaS in the city and is leading conversations with multiple mobility service providers with the aim of building conventions and agreements. They plan to release the first multimodal fair policies by 2024 which will secure complete integration between the services.

💡 **Environmental (Noise) -** According to the evidence found, Montreal has not yet addressed the issue of noise systematically. The overall nature of handling noise is decentralised and fragmented as local noise level guidelines differ between boroughs. In 2020, a study carried out by McGill University provided a set of recommendations on establishing a Noise Observatory. According to the research, Montreal should establish an environmental sound observatory based on international best practices. The research suggests core components and activities for an environmental sound observatory, and a governance mechanism for its implementation.

UPCOMING PROJECTS
MONTRÉAL IN COMMON

Montréal in Common is an initiative that aims to foster a culture of innovation and experimentation that is driven by community needs. Through this initiative, citizens may create and test practical solutions that the community envisions. The city is working with partners to test 13 innovative projects divided into three components - Mobility, Food, and Data and Municipal legislation. Some of these projects within mobility are reducing local solo automobile trips, simplifying access to sustainable mobility solutions to improve the efficiency and comfort of sustainable transport.These projects arose from the Smart Cities Challenge, a pan-Canadian competition that encourages communities to use innovation, to enhance the lives of their residents. Montréal in Common aspires to expand and sustain these initiatives to improve the population's well-being and quality of life.

🔗 SOURCE

INNOVATIVE SOLUTIONS
LOCOMOTION

LocoMotion is a digital platform that facilitates bike and car-sharing in Montr al's neighbourhoods. Its goal is to lessen reliance on individual, polluting modes of transportation while also making communities more attractive places to live. The LocoMotion platform, which was developed by the non-profit organisation Solon with the city's support, facilitates vehicle sharing with neighbours while improving neighbourhood life. In just a few clicks, people can reserve and borrow an electric bike, a bike trailer or a cargo bike, or rent a neighbour's car. People may also easily transfer ordinary bulky objects from one neighbourhood to another using LocoMotion's zero-carbon vehicles. This community approach is currently being tested in three quarters and seven neighbourhoods, with over 975 members sharing 136 vehicles.

🔗 SOURCE

DARWIN BRIDGES

The twin Darwin bridges located on Boulevard de l'île-des-Soeurs in Verdun are the world's first bridges built with concrete containing 10% of finely ground recycled glass powder. This innovative approach is the result of 17 years of research at the University of Sherbrooke. As cement production is one of the major sources of greenhouse gases, substituting 10% of it with recycled glass resulted in the use of 40 tons less cement and the avoidance of 40 tonnes of CO2. The new technology further contributed to the extension of the service life of bridges from 75 to 125 years. The project has earned the prestigious 2021 Award of Excellence in the Infrastructure category by the American Concrete Institute international organisation.

🔗 SOURCE

MOSCOW

'Sharing services are the future of urban mobility.'

GEOGRAPHICAL SCOPE OF STRATEGY
CITY

POPULATION	AREA
12,655,050	2,562 KM^2

🚌 62% | 🚗 38% | ♀ 40% | 🌳 50% | PM2.5 10.3MG/M^3 | 🚗💥 3.4

CITY BACKGROUND

The Moscow public transport system is a large complex consisting of many organisations and employing more than 200,000 people. Its principal regulatory body is the Department of Transport and Road Infrastructure Development of Moscow (MDOT). The duties of MDOT include passenger service regulation, traffic management and freight logistics regulation, control and supervision of transport and infrastructure as well as research activities. MDOT recently developed the new City Transportation strategy which aims "to provide transportation services personally to each passenger" and improve Moscow's transportation system in 7 areas including accessibility, technology services, affordability, safety, and environmental impact.
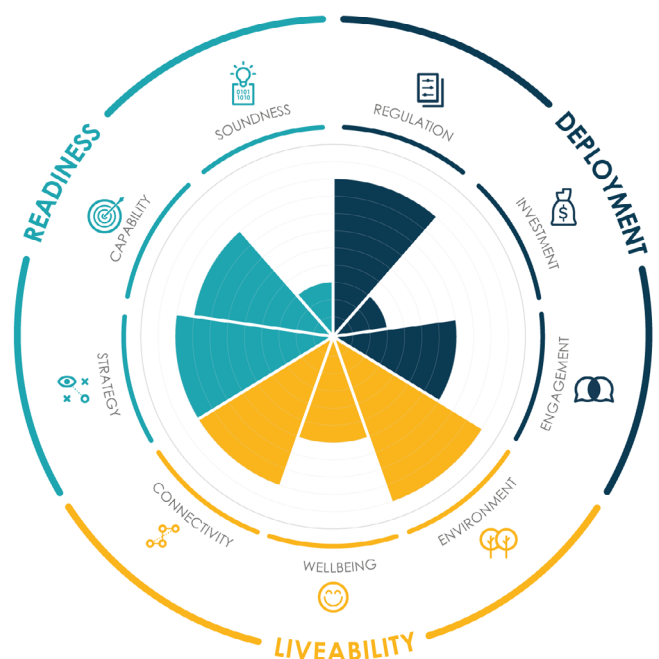
UMII PERFORMANCE
READINESS

💡 **Capability (Leveraging skills)** – MDOT involves a very wide range of external partners, including academic institutions, private sector and other stakeholders from both mobility- and non-mobility-related fields, when shaping the strategic documents. To foster knowledge transfer, the city established a transport accelerator, where startups or individual innovators present their projects, take part in the accelerator's programs, and experiment with their ideas on the real transport infrastructure.

💡 **Soundness (Data accessibility)** - The city has introduced mechanisms to automatically collect, validate, and standardise a wide array of transport data. Data is collected using IoT, AI analysis of video footage and electronic sensors. The data are used

to efficiently operate ITS and enhance the transport system by the authorities, however, the public access to open data is limited to bus tracking, parking session records and transport infrastructure objects locations, available on the municipal website (https://data.mos.ru/). A discussion about opening more data has already started, and currently the international open-data project CityTransitData is being implemented together with UITP.

DEPLOYMENT

💡 Regulation (Market barriers to innovation) – There is a well-developed approach to overcoming the policy, regulatory and legislative barriers to innovation and MDOT actively lobbies for regulation changes based on evidence from pilot projects. Outcomes of these efforts can be seen in the form of autonomous vehicles testing polygon or biometric ticketing already deployed in Moscow metro.

Investment (Own investment) – Although the city invests in urban mobility innovation, there is not a specific budget dedicated to innovation activities in urban mobility that would allow a room for failure inevitable when conducting innovation activities. The city allocates a budget for in-house labs for ticketing system development and ITS project realisation.

LIVEABILITY

Connectivity (Seamlessness) - The city introduced its fully integrated ticketing system based on contactless Troika cards in 2013. Apart from all the public transport modes available in the city, it even covers some other public facilities such as zoo, galleries, museums, etc. The system has been so successful that it is being adopted by other Russian cities as well. Biometric identification is already available in the metro and the FacePay system is deployed through all Moscow metro stations.

Wellbeing (Fairness) – There are some interesting initiatives fostering equity and gender balance among Moscow's transport system employees. Moscow Metro is in second place in the world for the share of female employees (out of 67 thousand employees - 36% are women). On the contrary, there are currently no examples of innovative services targeted specifically at women using public transport. On the positive side, MDOT is working on introducing some measures to make the transport system more inclusive, especially for mothers with kids.

UPCOMING PROJECTS
REINTRODUCING WATER TRANSPORT
MDOT is working on reintroducing the water transport service on the Moskva River. The vessels will be fully electric with expected capacity of 15-16 thousand passengers per day. The spacious cabin will be equipped with information screens, USB chargers, Wi-Fi, places for scooters and bicycles and comfortable seats with tables for working with a laptop. According to the current plan, the first regular services will be launched in 2022.

🔗 SOURCE

CARSHARING FOR FRIENDS
MDOT is running a pilot project of people's carsharing service called "Ruli" (Drive). The project allows an owner to rent out his/her personal vehicle for a fee, while legally covering the change of the driver for liability purposes. Data about the car will be available to the owner in real time - the owner will be informed where the car is, what its current speed is and the remaining fuel. At this initial stage it is possible to rent out the car only to friends and acquaintances.

🔗 SOURCE

INNOVATIVE SOLUTIONS
MOSCOW TRANSPORT APP
In December 2019, MDOT launched a single city transport application that combines all types of transport services in the city on the basis of MaaS. The application allows its users to build multimodal routes considering all possible modes of transport in the city, including bus on demand, private vehicles and walking. As a result, the service provides passengers with the most comfortable and convenient way to travel around the city based on personal preferences and needs. The user can plan a route according to many parameters such as price, travel time, number of interchanges, weather, or occupancy, which is important especially during Covid-19 pandemic. The app easily calculates travel time, number of interchanges and total cost of a trip. The app also allows the user to pay for the multi-modal trip. There are additional options allowing the user to select vehicles for low-mobility passengers or vehicles with Wi-Fi or air conditioning on board. The app is available in 6 languages: Russian, English, Spanish, German, French and Simplified Chinese.

MOSCOW TRANSPORT INNOVATION ACCELERATOR
To help with solving the existing needs of the transport industry, the city of Moscow launched the Transport Innovation Accelerator - a place dedicated to providing startups or individual leaders with the opportunity to go from the idea to a real application very quickly. Participants can present their projects, take part in the programs of the accelerator, and test how their ideas are working on the real transport infrastructure.

🔗 SOURCE

AUTONOMOUS VEHICLES PILOTS
The city is hosting two successful autonomous vehicles pilots. One of them consists of more that 100 autonomous cars moving around the city centre with a driver inside, testing the system and its reactions to different unexpected situations. The other pilot takes place in one of the city's major hospitals where an AV is helping to move around biological materials. The Moscow Metro is testing highly automated 'Lastochka' trains in the Moscow Central Circle line and an autonomous tram with the perspective of driverless service. The trials are in their final stage and the company is hoping to get the approval of the technology very soon.

Nairobi*

'Successful implementation of the Strategic Plan will be based on stakeholder engagement, good governance and a professional approach to doing business.' [Nairobi Metropolitan Area Transport Authority Strategic Plan 19-23] (*based on desk research)

GEOGRAPHICAL SCOPE OF STRATEGY
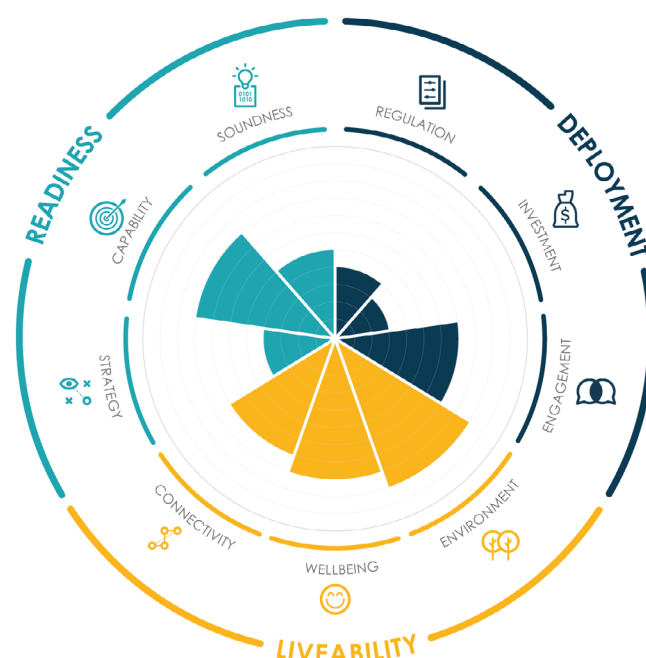METROPOLITAN AREA

POPULATION	**AREA**
4,397,073	696 KM²

🚶 39% 🚲 1% 🚌 46% 🚗 13% ⬤⬤⬤ 1% ♀ NA 🌳 NA 〽PM2.5 14.7MG/M³ 🚗💥 5.6

CITY BACKGROUND

The strategic vision for Nairobi is a safe, reliable, affordable and seamless Public transport system which transforms the quality of life within the Nairobi Metropolitan Area.

The Nairobi Metropolitan Area (NMA) has been experiencing significant challenges arising from increased vehicular traffic congestion; traffic jams within the city are estimated to cost the country Sh2 billion annually and it is estimated that Nairobi residents spend 55 minutes in traffic. There is inadequate integration of urban planning and transport planning and an absence of affordable, well-planned public transport services. The recently constituted Nairobi Metropolitan Area Transport and Safety Authority is looking into solutions such as integrated transport management. In addition, the region will soon get a new mass transport system, which will increase commuters' transport choices. The challenges are also being looked upon as opportunities to introduce new mobility models and technological advancements, as proven by the booming ride-hailing market and innovative initiatives such as Digital Matatu.

UMII PERFORMANCE

READINESS

💡 **Strategy (Innovation strategy)** - In 2019, the Nairobi Metropolitan Area Transport Authority published the 2019-23 Strategic Plan. The purpose of this Strategic Plan is to guide the activities of the Authority through the defined five years period with a vision and mission statements that are committed to transforming quality of life through an integrated, safe, reliable, affordable, seamless and sustainable Public transport system within the Nairobi Metropolitan Area.

💡 **Soundness (Data collection)** - Nairobi does not extensively use sophisticated mechanisms to automatically collect transport and mobility data in real-time to enable the intelligent operation of the network. Innovative data collection mechanisms such as crowdsourcing, IoT devices and other sensing are not utilised. However there are plans published in the strategic plan to start collecting real-time bus location data and modal classifications and counts.

DEPLOYMENT

💡 Regulation (Market barriers to innovation) - One of Kenya's biggest challenges for implementing innovative transport solutions was that institutional responsibilities were poorly distributed between various government bodies involved in policy making. For example, there was both a Ministry of Infrastructure and a Ministry of Roads that each had responsibilities for setting transport

policies and executing their delivery. This often led to confusion about who was in charge, where, and how each Ministry would coordinate their actions.

💡 **Investment (Own investment) -** Authorities in Nairobi do not have a specific budget (for both CAPEX and R&D activities) allocated to innovation activities in urban mobility, investment is assessed on an ad-hoc basis. By creating a dedicated budget for innovation activities, projects which align with the strategic direction can be delivered.

LIVEABILITY

💡 **Connectivity (Seamlessness) -** Used by 70 per cent of the population in Kenya, matatu buses are a dominant transport mode across the country. The automated fare collection platform utilises the M-Pesa mobile wallet, which is used by 90 per cent of the population in Kenya. Passengers enter a code on their phone and a debit is made on their wallet, which can be instantly seen by drivers to grant access to the bus. O-CITY says the platform removes unnecessary tickets and cash payments, instead offering an accessible payment solution that consumers already use, via a device already in their hand. The automated fare collection provider by BPC, has announced an initiative to drive contactless payments across bus services in Nairobi, Kenya.

💡 **Wellbeing (Fairness) -** Although Kenya's 2009 Persons with Disabilities Act mandates disabled-friendly public transport, only 3 percent of Matatu operators have policies to support disabled groups. There is little evidence of support provided for vulnerable and disabled people on the transport network and dedicated mobility services.

UPCOMING PROJECTS
SMART SENSORS
Faina Consultancy Limited, a Kenyan startup has come up with a Machine Learning computer surveillance system known as JichoSmart to augment the current existing infrastructure. The system can analyse real time footage of different modes of transport by using CCTV around the city. This data is being used to optimise traffic management and security in the city. They are working with the National Transport and Safety Authority (NTSA) and the Police Department.
↗ Source

START-UPS AND SMES
In 2021, Electric vehicle startup BasiGo announced the launch of its operations in Nairobi, bringing clean energy options to Kenya's public transport industry, currently dominated by fossil-fuel buses. The startup plans to sell locally assembled electric buses using parts from China's EV maker BYD Automotive, the company said

while announcing it had raised $1 million in pre-seed funding. BasiGo also disclosed that its buses will come in 25 and 36-seater capacities, with a range of about 250 kilometres, which it says is enough to cover daily round trips.

Other emerging EV companies in Kenya include electric motorcycle manufacturer Kiri Electric, and Drive Electric, which leases electric vehicles and provides charging station installation and e-mobility consultancy.

Opibus, since its launch in 2017, has specialised in the conversion of thermal engines into electric relies on renewable energy sources such as hydro, geothermal, solar and wind, which account for up to 70% of the electricity produced in Kenya. The process works by replacing the vehicle's powertrain with an electric drive system.

NopeaRide is also following the same logic by bringing electric vehicles with drivers to the transport market. Kenya hopes to break the mould of combustion engine vehicles in the near future to reduce air pollution in its major cities. In order to respond significantly to the need, several other labels are making themselves known, such as Drive Electric, which, in addition to renting electric vehicles, offers services for the installation of charging stations.
↗ Source

INNOVATIVE SOLUTIONS
IHUB
iHUB is an innovation centre dedicated to accelerating the application of social capital and technology for economic prosperity. In September 2020, in partnership with GSMA Africa, CcHUB launched a pan-African IoT (Internet of Things) community platform. Dubbed 'Building Wakanda', the platform is facilitating conversations relevant to the growth of the African IoT ecosystem, building awareness about the work being done by various stakeholders, and fostering knowledge sharing and collaboration towards common goals.
↗ Source

MAAS AND ELECTRIC MOBILITY
In Nairobi transport by motorcycle – or bodabodas, as they're known locally, is ubiquitous. Mazi now offers a fleet of bodabodas as a basic MaaS option, and what's more, its recently-launched fleet consists of Magnus 3000 (M3K) motorbikes, which are totally electric.
↗ Source

WAYFINDING TOOLS
Collaborations with international universities has led to innovative programs such as Digital Matatu, which aims to develop a complex digital bus route, available on map-based applications.
↗ Source

New York*

'New York City will enable reliable, safe, and sustainable transportation options so that no New Yorker needs to rely on a car.' [NY DOT] (* based on desk research)

GEOGRAPHICAL SCOPE OF STRATEGY

CITY

| POPULATION	AREA
8,804,190	1,224 km²

🚶 6% 🚴 1% 🚌 33% 🚗 55% 💬 5% ♀ NA 🌳 14% PM2.5 6.8mg/m³ 2.5

CITY BACKGROUND

New York is a vital global economic hub but faces several challenges in becoming a smart city. Its total land area is smaller than some other notable cities such as London, bigger than New York by about 138 square miles and has a comparable population size. New York is also an island, limiting its expansion scope.

With New York City's population projected to exceed 9 million by 2050, and with capacity already stretched thin on congested roads and subways, the city must prioritise and invest in efficient and sustainable transportation modes: biking, walking, and mass transit. By doing so, they are aiming to reduce greenhouse gas (GHG) emissions, support sustainable growth, and achieve the ambitious goal set in 2015 to have 80 percent of all trips in the city taken by sustainable modes by 2050. The city will prioritise sustainable modes in the planning and design of the built environment, and help make them the default choice in New York City so no one needs to rely on a car.

New York authorities are driving efforts to address present challenges while focusing on longer-term goals. With the emergence of connected, shared, autonomous, and electric mobility approaches, the city is embracing dynamic mobility service changes. It is investing in digital infrastructure while creating a collaborative environment between industry consortiums and financial investors.

One NYC - City's strategic plan for inclusive growth and climate action and was the first resilience strategy released by any city in partnership with 100 Resilient Cities. OneNYC set a global tone for the pursuit of sustainable development that has influenced initiatives across the city. The strategy was updated in 2019.
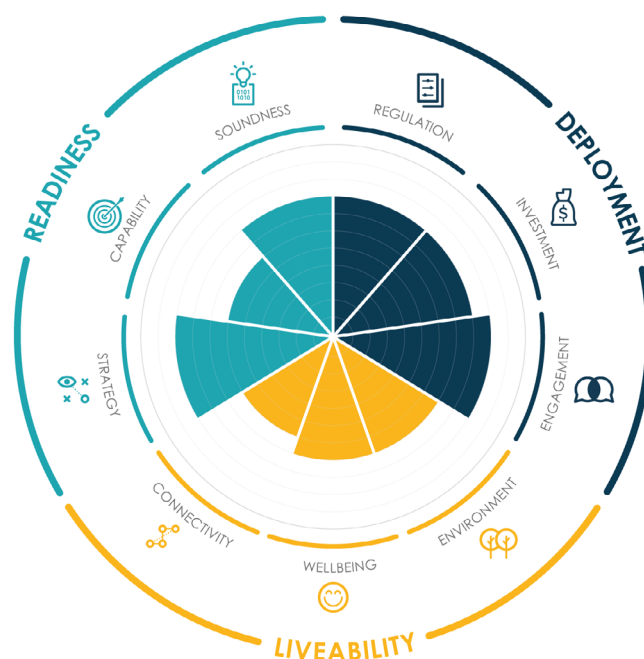
UMII PERFORMANCE
READINESS

💡 **Strategy (Stakeholder engagement) -** An extensive stakeholder engagement program was deployed prior to the development of the One NY 2050 strategy which demonstrates significant involvement of traditional and non-traditional mobility stakeholders in the development of the strategy. Engagement methods show great variety, several of which were maintained after the publication of the strategy.

💡 **Strategy (Comprehensiveness) -** Whilst the cities ONE NY strategy clearly and comprehensively accounts for the outcomes on the economy, society and the environment, they are not quantified or supported by a sound baseline assessment to make them easily measurable.

DEPLOYMENT

💡 **Regulation (Enabling new business models)** - There are examples of the DoT supporting innovation by helping to overcome/adhere to regulation which has led to the increasing success of new services. For example, in 2020, the city of NY DoT legalised the use of all e-bikes (Class 1-3) in NYC. To comply with regulations, e-bikes, e-scooters and similar powered means have to meet defined classifications; top speed, where it can be used, helmet requirements. The regulation applied to these modes of transport has led to healthy availability and competition for these shared, electric modes of transport in the city which has resulted in new business models and the sharing economy in New York.

💡 **Regulation (Enabling new business models) -** There are no examples of innovative mobility projects or services being deployed as a result of an emergency situation (e.g. Covid-19) which were initially constrained by regulation/policy/legislation challenges.

LIVEABILITY

💡 **Environmental (Air quality) -** The city health department has developed a comprehensive AQ monitoring and evaluation framework. The council has published a detailed approach and methodology for stakeholders to install air quality sensor networks, analyse data, combine data, predictive analysis for data and more.

💡 **Connectivity (Seamlessness) -** MetroCard is New York's integrated ticketing system which can be used on Subway, Buses, some railway operators, Tramway, retail stores and its coverage is constantly being increased. However, the smart ticketing system does not enable barrier free entry to different modes of transport which could increase accessibility and seamlessness of public transport access.

UPCOMING PROJECTS
AUTONOMOUS VEHICLE PILOT

The NYC DOT is leading a connected autonomous vehicle trial which aims to improve the safety of travellers and pedestrians in the city through the deployment of V2V and V2I connected vehicle technologies. This objective directly aligns with the city's Vision Zero initiative. These applications provide drivers with alerts so that the driver can take action to avoid a crash or reduce the severity of injuries or damage to vehicles and infrastructure.
The goal of this project is to show that the benefits

justify the sustainability of the operation and will encourage others to outfit their vehicles thus increasing the benefits to all. The project involves a broad network of public, private and academic partners. Approximately 450 road side units (RSU) will be installed in Manhattan, along Flatbush Avenue in Brooklyn, and at other strategic locations such as bus depots, fleet vehicle storage facilities, river crossings and airports.
RSUs will also be installed along portions of FDR Drive to support applications such as curve speed warning and over dimension vehicle warnings (over height and prohibited commercial vehicles). CV technology uses GPS location information which is augmented by other means to improve its accuracy. Each vehicle determines its position and time from the GPS signal. The vehicle then broadcasts (at approximately 10 times per second) its current position, where it has been (path history for the last few seconds), and its current heading to all nearby vehicles. At the same time, each vehicle processes the messages it hears from the other nearby vehicles and identifies potential hazardous situations. Then, based on the crash potential, it alerts the driver of the possible crash so that the driver can take appropriate action. In a similar fashion, the vehicles receive information from the traffic controllers that is analysed by the vehicles to alert the driver of an impending red light violation in order to reduce the crashes at intersections.

🔗 SOURCE

INNOVATIVE SOLUTIONS
OPEN DATA POLICY

The City enacted its Open Data Law in 2012, established the Mayor's Office of Data Analytics (MODA) in 2013, and enshrined it in the City Charter in 2018, with a mission to apply "strategic analytical thinking to data to help city agencies deliver services more equitably and effectively and increase operational transparency."

🔗 SOURCE

IOT STRATEGY

In 2021, NYC CTO developed the NYC Internet of Things Strategy in order to "support a healthy cross-sector IoT ecosystem in New York City – one that is productive, responsible, and fair." NYC CTO developed a "framework to help government and our partners responsibly deploy connected devices and IoT technologies in a coordinated and consistent manner." Through wide-ranging engagements with stakeholders from the public sector, private sector, and academia, as well as a survey of government agencies across the world, NYC CTO identified more than 450 best practices for IoT use. These findings were distilled into a set of "Guidelines for the Internet of Things" for New York City to follow.

🔗 SOURCE

Oslo

'We bring everybody along into the process and learn together and together find solutions.'

GEOGRAPHICAL SCOPE OF STRATEGY
City/Municipality

POPULATION	AREA
698,660	454 km²

🚶 29% | 🚴 6% | 🚌 30% | 🚗 35% | ♀ 47% | 🌳 21% | PM2.5 7.4 mg/m³ | 0.6

CITY BACKGROUND

Public transport in Oslo is coordinated by Ruter, a joint administration company for public transport owned by Oslo Municipality and Viken County Municipality. Ruter plans and manages all transport in the municipality performed by different operating companies. The public transportation system in Oslo is considered to be the most advanced system in Europe, which is confirmed by 398 million public transport journeys made in Oslo and parts of Viken in 2019. The aim of the Ruter is to make public transport along with walking and cycling, the first choice of citizens. The city's main mobility strategy is the Strategy for Sustainable Freedom of Movement developed in 2020, following Ruter's long term strategic mobility plan from 2016. The strategy is based on the goals and expectations set by the Municipality of Oslo and the County Municipality of Viken for the good and sustainable development of mobility services in the region. The strategy aims to facilitate a good life, social justice, and good urban and regional development with

respect to the earth. Oslo's Climate strategy for 2030, aims to reduce car traffic in the city by one-third by 2030 compared to 2015 levels.
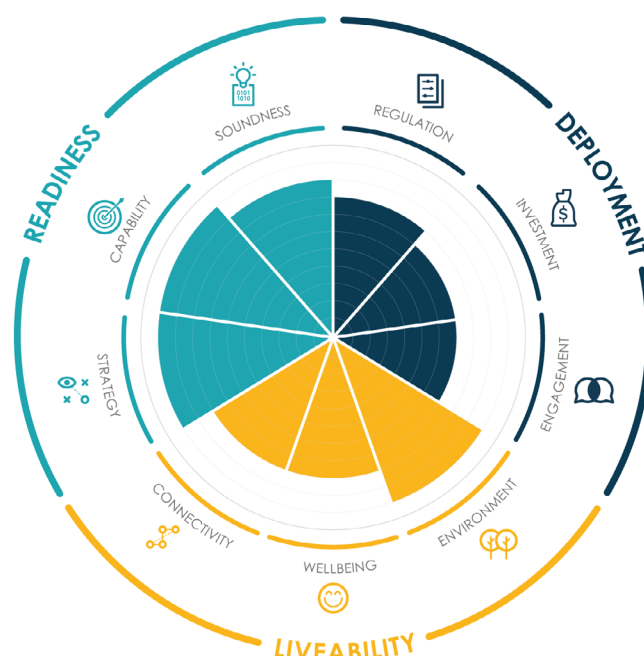
UMII PERFORMANCE
READINESS

💡 **Strategy (Stakeholder engagement) -** Capability (Leveraging skills) – Ruter has an innovation department, which organises a wide range of events, including radical innovation pitch sessions to engage with companies from different areas, start-ups, consultancy firms, universities, and people of many different skills. The aim is to present innovations, ask for suggestions and inputs related to vision and engage with the market and suppliers. When addressing partners, Ruter uses the procurement approach. They publish open invitations to pitch sessions in regional public procurement database, European union public procurement database and also on their website.

💡 **Strategy (Readily available innovation strategy to internal and external stakeholders) -** The city cooperates with many stakeholders, such as surrounding counties, suppliers, private companies, local communities, and selected advisors, during the development of the strategy. However, citizens are less involved in this process, as Oslo's strategy can be considered a high-level document. Therefore, citizens are more engaged in the processes related to the implementation of services.

DEPLOYMENT

💡 **Regulation (Market barriers to innovation) –** The city does not structurally identify barriers, but if any come up during the development of an innovative solution, it tries to work with the barriers and overcome them

by bringing all kinds of stakeholders to the process, learn together and find solutions. An example of this effort is the autonomous vehicles project which got the exceptions from current regulation and law to start trials. Ruter engaged with local police, schools, kindergartens, and other stakeholders to collaboratively address the practical, legal and regulatory barriers.

💡 **Investment (Attracting investment) –** Whilst Ruter presents mobility challenges on radical innovation pitch sessions to obtain new ideas that can result in research or other projects, they do not provide incentives or additional funding to promote third-party innovation. However, they are aware that they could improve in this area and mainly focus on cooperation with the start-up environment.

LIVEABILITY

💡 **Environmental (Air quality) –** Oslo is one of the capitals with the lowest values for PM2.5 and also belongs to the top of the world in terms of the number of electric vehicles per capita. The city has a near-zero emissions target for public but also private vehicles for 2030 which seeks to achieve by activities such as developing knowledge and research on emissions and pollution from vehicles, transition to zero emissions in the port of Oslo, restriction of projects focused on capacity-increasing motorways and other road projects.

💡 **Wellbeing (Quality of life -** Health, Safety, Affordability) - Although the city has more than 90 % share of the population living within walking distance of public transport, only 11 % of transport routes have a higher frequency than ten departures per hour at least once a day.

UPCOMING PROJECTS
AUTONOMOUS VEHICLES PROJECT

Transport Public Authority Ruter, in cooperation with the Norwegian Public Roads Administration and the Municipality of Oslo's Agency for Urban Development, launched a trial of autonomous vehicles as an integrated part of the region's public transport services in 2019. The pilot project aims to

- provide the public with the opportunity to gain their first experience travelling by autonomous vehicles
- explore possibilities of self-driving vehicle use in public transport system
- prepare all relevant stakeholders for the emergence of autonomous transport solutions. Ruter considers self-driving vehicles to be a key part of mobility in the future.

🔗 Source

CROWDSHIPPING

Oslo has a living lab aligned with its transport strategy to contribute to the decarbonisation of transport and reduce its externalities while improving mobility options. The living lab is part of the LEAD project, which brings together 6 living labs across Europe. One of the living lab activities is an exploration of the microhub concept through experiments and investigation of crowdshipping potential. The task is to focus primarily on non-dedicated trips, but the study will also consider and promote the use of public transport, non-motorised and electric vehicles for dedicated trips.

🔗 Source

INNOVATIVE SOLUTIONS
BUS AS A SERVICE

Ruter implemented buses sensors on more than 400 city buses to count the number of passengers and subsequently to transform the buses into IoT data collection devices to provide more data and move towards "bus as a service". They expect that this solution will improve transit coverage and rider experience leading to higher quality of living in the city.

🔗 Source

TICKETING APPLICATION

One of the innovations that facilitates travel by public transport in Oslo is the ticketing mobile application RuterBillet. With this application, passengers can buy their tickets from anywhere and at any time. In addition, the application users can plan their journeys, see departures, and bus occupancy in real-time, filter on transport modes, get relevant service disruption information, find the nearest available city bike and get journey suggestions for cycling and walking. Approximately 70 to 80% of passengers currently use the application, and Ruter is now trying to find a way to eliminate the use of plastic cards.

🔗 Source

Sao Paulo

'Being able of implementing a very good subway and metropolitan rail network from the very beginning up to date with our technological innovations is really something that we must be proud of.'

GEOGRAPHICAL SCOPE OF STRATEGY
Metropolitan area, City

POPULATION	AREA
22,001,281 (Metropolitan area)	7,947km² (Metropolitan area)
12,396,372 (City)	1,521km² (City)

| 🚶 32%	🚲 1%	🚌 36%	🚗 31%	♀ 20%	🌳 48%	PM2.5 16.2mg/m³	🚗💥 6.7

CITY BACKGROUND

The São Paulo Metropolitan Region (SPMR) belongs to the largest agglomerations globally, which entails extensive transport network requirements. SPMR comprises 39 municipalities, including São Paulo City which houses half of SPMR population.

Rail transit network and intercity buses are managed by São Paulo State Government Metropolitan Transportation Office. Metropolitan Transport strategy – PITU is renewed every 10 years. The Metropolitan Transportation Office is currently working on a new Integrated Urban Transport Plan (PITU2040).

Each municipality independently manages its own local bus services. The division responsible for mobility planning in São Paulo city, the largest among the 39 cities, is the Municipal Department of Mobility and Transit. It is responsible for formulating, proposing, managing and evaluating public policies to develop sustainable, integrated and efficient urban mobility with respect to health and the environment.

The current city's transport strategy is São Paulo Mobility Plan 2015. The Municipality of São Paulo developed it with the support of the Municipal Department of Mobility and Transit and public companies SPTrans and CET. The plan focuses mainly on infrastructure (building new cycle paths, sidewalk, construction of bus terminals), road safety and environmental management.
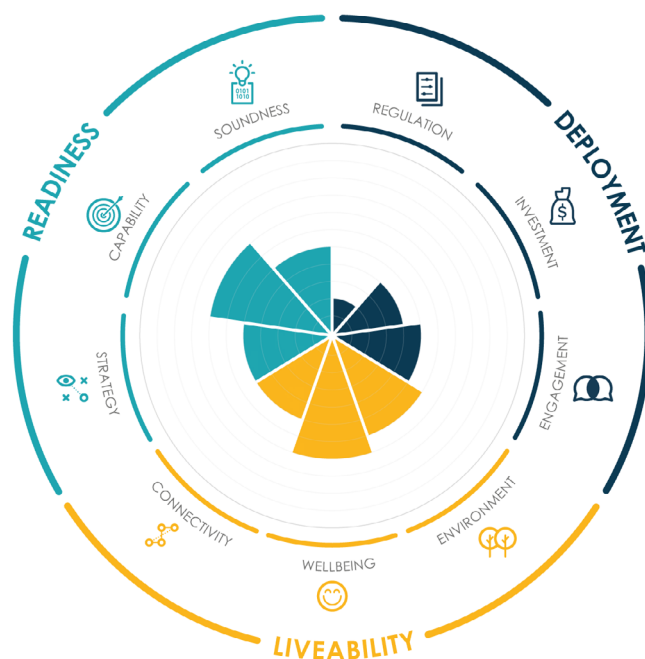
UMII PERFORMANCE
READINESS

💡 **Soundness (Data usability)** – São Paulo City and São Paulo State Government both organise competitions and hackathons to share challenges and data with its citizens and stakeholders and to solve identified problems. One of the last competitions was called MOBILIZA+SP: Radar Data. The competition consisted of two challenges. The first focused on developing a technological tool for organising data and making them available for public use. The second was oriented toward finding alternative solutions for the use of radar data. The best three solutions received a financial award, and authors of the best one were hired by the São Paulo City Hall to implement the final solution.

💡 **Soundness (Data accessibility)** – São Paulo does not have a single data platform. However, transport data is available at: SPTrans, Metrô, CPTM. Geosampa also offers extensive urban data about São Paulo City. Other SPMR municipalities offer similar data.

DEPLOYMENT

💡 **Community engagement (User engagement)** – In SPMR participation of stakeholders is encouraged in the planning processes and in the operation of the systems. Engagement processes are organised by companies and the public office responsible for transport planning and policies. Participation in planning is always open to improvement and disclosed to mass media.
Transport network users in São Paulo can communicate with the city or metropolitan services by social media such as Facebook, Twitter, Instagram and YouTube or through traditional channels such as e-mail, phone or personal meetings. The metropolis and the city agents actively approach users' engagement by communicating on social networks and websites and by organising events to share ideas.

💡 **Regulation (Enabling new business models)** – São Paulo City and São Paulo State Government have been actively engaged in promoting new business models, either by encouraging public companies to promote innovation initiatives and by maintaining development and innovation agencies. However, there is little evidence of innovative solutions that were deployed in the city as a result of efforts to remove regulatory, legislative or policy barriers.

LIVEABILITY

💡 **Wellbeing (Fairness / Disabled users)** - The city is aware of the importance of innovative tools for disabled users to safely use the city's transport network. The city provides special assistance service Atende +, which is a free of charge door-to-door transport for people with autism, deafblindness or physical disabilities. A similar service is offered by São Paulo State to elementary and high school students with disabilities. At metropolitan level, all metro stations and 76% of metropolitan rail stations are fully accessible to people with disabilities. Remaining train stations are being modernised to become fully accessible. Station personnel is regularly trained to properly assist passengers with disabilities. The new stations should have fully covered platforms, elevators, escalators, ramps, handrails, tactile floors, and maps in Braille..

💡 **Connectivity (Seamlessness)** – São Paulo city has the Bilhete Ùnico, a smart card for public transport payment. Transfers amongst city buses are free (limits apply), but there is an additional charge for bus-rail transfers. An intercity card called TOP can be used in metropolitan buses and allows integration between intercity metropolitan buses and the railway system, but also with additional charge. The tariff integration is missing amongst intercity and local buses. Other SPMR cities have their own smart card system for city buses. Some of them allow integration with metropolitan trains with additional charges.

INNOVATIVE SOLUTIONS
METRO SP INNOVATION LABORATORY

In 2020, São Paulo Metro Innovation Laboratory MetroLab was created to stimulate collaborative development of solutions through the participation of subway workers and research and development entities from the metropolitan transport and urban mobility ecosystem.

↗ SOURCE

APP WITH REAL-TIME INFORMATION ABOUT BUS LINES

SPTrans provides an application OLHO VIVO. Users can obtain information about specific bus lines in real-time based on the monitoring system of bus transport in São Paulo. They can see when the next bus will come to a bus stop and which bus line it is. In addition, the data about average speed and travel time are also available to the users.

MOBILE PHONE PAYMENT

In a recent innovation effort to discontinue the use of old Edmonson tickets for single trips payment in the rail network, São Paulo State deployed a QR Code system that allows mobile phone payment. This innovation brings important cost reductions including ticket booths demobilisation.

SMART TRAFFIC LIGHTS

São Paulo has a traffic light operation centre. The aim of this centre is to allow communication between the central and fixed-time traffic light networks, using GPRS, to control plans, schedules and receive failure alarms. The solution also includes the creation of a georeferenced graphical interface for registering and managing fixed-time traffic light networks.

POLLUTION SENSORS IN URBAN BUSES

Institute of Technological Research in São Paulo in 2017 completed a prototype of sensors to collect air pollution data. The sensors have been installed in regular buses, which allows the construction of urban pollution maps with a resolution of 100 metres. This way of obtaining pollution data provides a higher resolution than traditional measuring air quality tools, which helps get more accurate conclusions.

Seoul

'Smart use of transport data has made huge contributions in innovating/improving the lives of the citizens, and in making the city more resilient by identifying changing trends and needs in urban mobility.'

GEOGRAPHICAL SCOPE OF STRATEGY
CITY

POPULATION	**AREA**
9,828,094	605 KM²

🚶 17% | 🚲 1% | 🚌 54% | 🚗 25% | 💬 3% | ♀ 34.4% | 🌳 38.6% | PM2.5 23MG/M³ | 🚗💥 2.7

## CITY BACKGROUND

Seoul has undergone significant urbanisation and a boom in private car ownership since the 1970s, which resulted in increasing demand for road infrastructure. Nonetheless, car-oriented solutions have proved to be unsuccessful in addressing ever-growing private traffic. For example, the social cost induced by traffic congestion in Seoul reached approximately 7 billion dollars in 2009.

In 2013, Seoul Metropolitan Government – the entity responsible, among other areas, for the urban planning and transport policies, outlined an entirely different approach in its Seoul Transport Vision 2030. Prioritisation of pedestrians over cars, universal accessibility over mobility, shift from owning to sharing and accounting for equity, sustainability and economic aspects are the ambitious principles that are to contribute to liveable Seoul – without relying on cars.
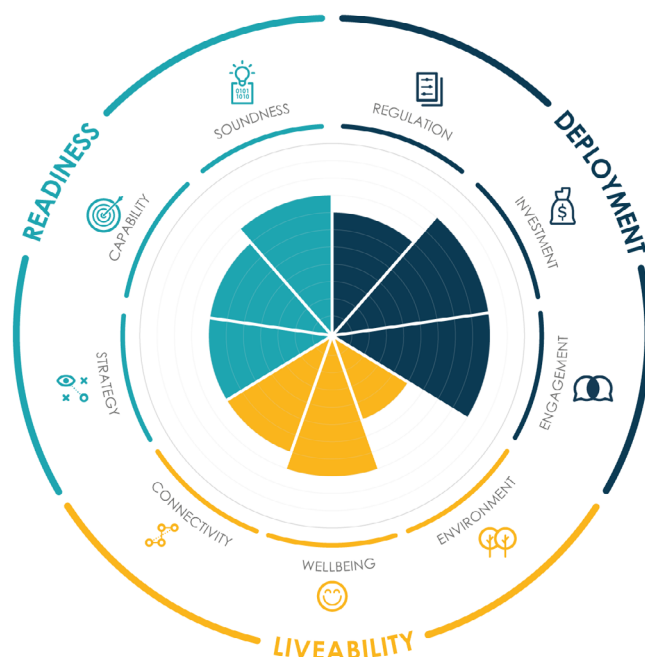
UMII PERFORMANCE
READINESS

💡 **Soundness (Data accessibility) -** The city strives to build solid connections between public institutions and the private sector to stimulate business activities and develop knowledge that can benefit all users. On its open data portal, the city makes accessible more than 300 datasets related to transport, including real-time information and active modes of transport. The SMG also supports and promotes the use of data by hosting hackathons and discussing transportation and mobility problems. A proposed city-wide IoT network is expected to boost data-driven service creation and solutions even further.

💡 **Capability (Skills and capabilities to deliver the strategy) –** At the moment, 34.4% of SMG's employees are women. Although this representation is already considerable, SMG can further work on having an equal representation of both genders in its organisation.

DEPLOYMENT

💡 **Community engagement (User engagement) -** SMG uses various channels to actively communicate with the citizens: The form varies from traditional communication means such as website and press releases to social media or public hearings. SMG noted that social media play an important role in promoting its policies and events to citizens and encouraging their participation in the city's activities.

💡 **Regulation (Enabling new business models) –** There is little evidence that the Covid-19 sanitary crisis resulted in the deployment of new projects or solutions that were previously prohibited by policy or legislation.

Nevertheless, SMG made several legislative changes during this period supporting the new mobility services, such as relaxing qualifications in obtaining a taxi driver's licence, which otherwise imposed high entry barriers to a local taxi market.

LIVEABILITY

💡 **Wellbeing (Quality of life) -** According to a variety of quantitative factors, Seoul has a great quality of life due to its transportation network's affordability and access. For illustration, 100% of its population has access to public transport service within 500 metres of their dwellings.

💡 **Environment (Air quality) -** Despite the city's efforts and many programs to enhance air quality, PM2.5 concentrations in Seoul have been high in the last three years. It should be noted that the problem might be stemming from external factors such as polluting air coming from surrounding countries and its tackling would also require close cooperation on an international level.

UPCOMING PROJECTS
RIDE-HAILING SERVICES WITH AUTONOMOUS VEHICLES IN SANGAM-DONG

Starting in early December 2021, Seoul has introduced public ride-hailing service operated by autonomous vehicles in real traffic conditions in its self-driving testbed area of Sangam-dong, western Seoul. To begin with, three driverless vehicles are available to users and can be hired using iOS or Google's Android application TAP!. Under current law, the cars drive by themselves, while a safety driver is present to take over in case of emergency. By 2026, the city plans to operate 50 autonomous vehicles in the district. The data collected from the service will serve for further enhancement of the driverless technology.

Moreover, Sangam is currently the world's only 5G converged self-driving testbed in regular traffic conditions. Spanning an area of 1.9 km sq, with 19.7 km in length, it has been established in cooperation with 25 companies, schools and organisations pioneering autonomous mobility.

🔗 Source

CITY-WIDE IOT

The Seoul Metropolitan Government is planning to complete the establishment of a citywide public IoT network by 2023, in line with its plan to create one of the world's first hyper-connected cities.

Through IoT sensors installed across the city, the SMG will be able to collect data on traffic, safety, environment, health, facility management, crime prevention, and disaster control, among other things. The network's

creation will allow for the rapid transmission of collected data, as well as the rapid development of connected services and the utilisation of big data processing and convergence technologies. The SMG's objective is to offer added value by supplying data to startups and research institutes, as well as developing a variety of services to improve citizens' quality of life.

🔗 Source

S-MAP

In April 2021, the Seoul Metropolitan Government set up an "S-Map", a three-dimensional replica of the city of Seoul in cyberspace. The model will be used to simulate and test potential impact/results of new projects and policies. S-Map is expected to reinforce SMG's capabilities to solve urban problems including environmental disasters and traffic based on multidimensional simulation.

SMG will use S-Map to make decisions on seven committees including the Urban Planning and Traffic Impact Assessment Committee to promote objective and scientific deliberation. The map can be accessed publicly on the portal (https://smap.seoul.go.kr).

🔗 Source

INNOVATIVE SOLUTIONS
TESTBED SEOUL

SMG has been carrying out a "Testbed Seoul" project since 2019 to foster innovation and support testing and development of innovative technologies. The project intends to provide companies (typically startups engaged in the areas of AI, IoT, robotics, drone, etc.) with an opportunity to verify and evaluate their prototype products or services before utilising and releasing them in the market. SMG opens various public spaces such as subways, schools, hospitals, etc. to the selected companies for testing and demonstration, and issues a certificate for products/services with proven safety and function. Companies can apply easily by submitting their application and proposal via a dedicated website.

🔗 Source

OPTIMISATION OF THE NIGHT BUS SERVICES

The city has carried out an initiative aimed at optimising night bus services using big data analysis through a cooperation with a leading telecommunications provider. The city has been granted access to a large set of anonymised mobile communication data that were used to establish the distribution and flows of late-night travellers. The optimisation of the services resulted in increased service satisfaction score and elimination of approximately 2.3 million car trips per year (as of 2016). It is worth to note that the improved bus services have led to an 11% rise in women's nighttime activities.

🔗 Source
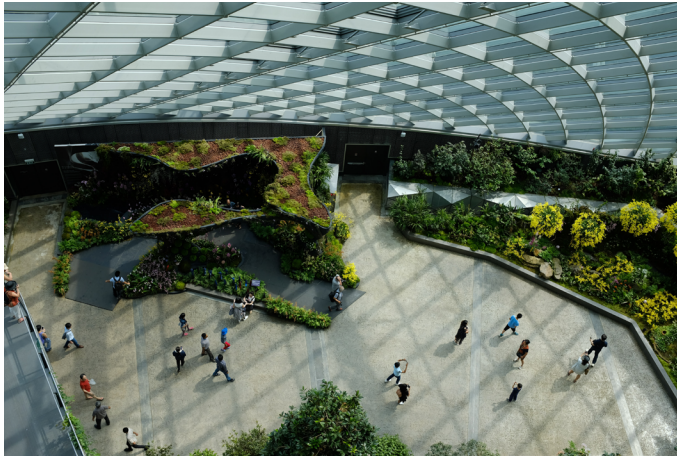
Singapore

'We bring together regulators and public transport operators because planning in isolation is not effective.'

GEOGRAPHICAL SCOPE OF STRATEGY
City-State

POPULATION	AREA
5,453,566	729 km²

🚶 10%	🚲 8%	🚌 58%	🚗 24%	♀ 39%	🌳 8%	PM2.5 14mg/m³	1.9

CITY BACKGROUND

The Land Transport Authority (LTA) of Singapore is responsible for planning, designing, building and maintaining the land transport infrastructure and systems across all modes of transport available in the city-state. Their vision is to create a people-centred land transport system by connecting people and places and enhancing the travel experience. The main urban mobility strategic document of Singapore is the Land Transport Master Plan which outlines the future of land transport for Singapore by 2040. Singapore envisions a 45-Minute City with 20-Minute Towns, transport for all and healthy lives, and safer journeys. LTA is looking to harness technology to strengthen public transport and develop exciting options for future land transport. Singapore aims to 'phase out Internal Combustion Engine vehicles and have all vehicles run on cleaner energy by 2040'.
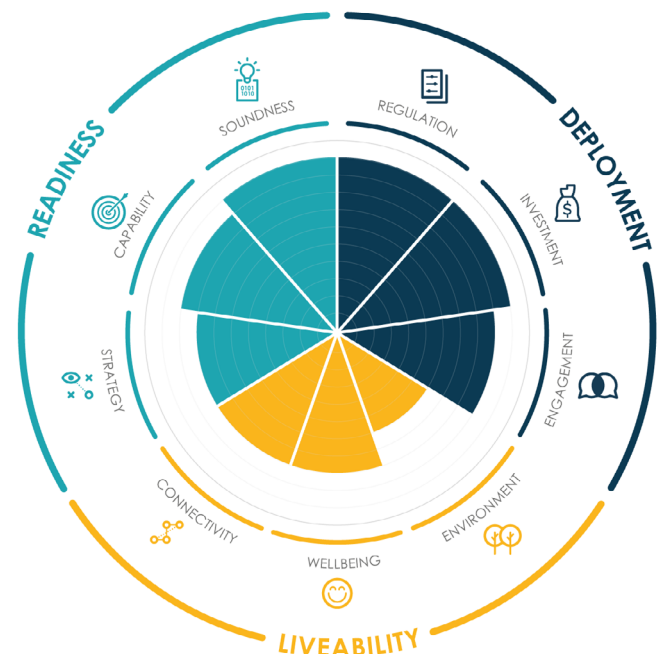
UMII PERFORMANCE

READINESS

💡 **Soundness (Data accessibility)** – An integrated data platform (The Land Transport Datamall) provides public access to a variety of datasets including live and static information for the transport and mobility system of Singapore. To date, more than 100 apps have been created using the government's open data. An open data policy has been developed which encourages open data practices across city stakeholders including enterprises, third-party developers, researchers, and other members of the public towards the creation of innovative and inclusive transport solutions.

💡 **Capability (Skills and capabilities)** – The share of women working in the transport/innovation department in Singapore was 24.5% in 2020, an indication of some level of gender inequality in the transport sector itself.

Balancing the employment of women and men within the organisation may assist in the realisation of the 'Transport for all' vision of the city: giving women a more proportional role in decision-making processes could enable a wider range of factors to be considered in support of more inclusive mobility.

DEPLOYMENT

💡 **Regulation (Market barriers to innovation)** – In Singapore LTA adopts a comprehensive approach to identify barriers and overcome them to foster innovation. They recognise the need to work closely with regulators and policy makers to set standards for different stakeholders and provide support to facilitate them. They have a dedicated budget for innovation to facilitate proof of concept, and are open to the public to help them identify barriers, potential risks and benefits of new solutions. There are examples of new, innovative

business models emerging from the city as a direct result of regulatory or legislative barriers being removed which is driving the success of new services. Similar services have been also deployed in the city as a result of an emergency situation (e.g. Covid-19) which were initially constrained by such barriers.

LIVEABILITY

💡 **Wellbeing (Fairness)** – Singapore has a great coverage in terms of the accessibility to public transport services for groups vulnerable to exclusion because of a physical disability or impairment. The city has both visual and audio technologies to help provide information to enable vulnerable citizens to navigate the network. Users have a direct point of contact at transport hubs and stations to ask for emergency assistance and Demand Responsive Transport is available.

💡 **Wellbeing (Fairness)** – Regarding female users of the transport network, there are no clear examples of services, or tools to support them to safely use the transport network. Such facilities or services could assist in improving fairness and inclusiveness of the transport system, similar to the AWARE group in Singapore which advises, among others, female commuters on handling sexual harassment on trains.

An initiative worth mentioning in this context is the effort of the Public Transport Security Command (TransCom). TransCom is a specialised transit police unit of the Singapore Police Force, whose officers conduct operational patrols and are a regular presence in bus interchanges, MRT stations and on trains to deter and respond to crime. Another effort called The Riders-On-Watch (ROW) scheme is a community policing initiative enacted in 2019 to keep crime out of the public transport network. More than 48,000 people have volunteered to be a part of this crime fighting effort, acting as 'Eyes and Ears' for the police during their commute.

UPCOMING PROJECTS
AUTONOMOUS VEHICLES

LTA will pilot the deployment of autonomous buses and autonomous on-demand shuttles in Punggol, Tengah and the Jurong Innovation District. The autonomous buses and shuttles will complement the existing public transport system and during the pilots the autonomous bus services will run alongside existing services, while the autonomous shuttles will provide on-demand, first-and-last-mile connection services to MRT stations and bus interchanges.

An 11-seater AV shuttle is deployed as a trial service for visitors of Jurong Lake Gardens from 3 Dec 2020, with the aim of improving accessibility within the garden. The Auto Rider at Gardens by the Bay is an autonomous shuttle service for visitors of the garden, easing accessibility within the garden.

🔗 SOURCE

TRAFFIC CALMING MARKERS

Three-dimensional (3D) traffic calming markings are being tested at the Whampoa Drive Silver Zone to encourage drivers to slow down. The markings, which were painted with thermoplastic, make the stretch of road appear narrower.

🔗 SOURCE

INNOVATIVE SOLUTIONS
AUTONOMOUS VEHICLES

Singapore set up in 2014 the Committee on Autonomous Road Transport for Singapore (CARTS) with the goal of transforming land transport through the deployment of AVs.

🔗 SOURCE

The Centre of Excellence for Testing and Research of AVs (CETRAN) was established in 2016 to facilitate the testing of AV navigation controls in a real-world environment, with an area of two-hectares designed to replicate the different elements of Singapore's roads with common traffic schemes, road infrastructure and traffic rules. The circuit located at the Nanyang Technological University also features a rain simulator and flood zone to test AVs' navigation abilities under different weather conditions.

🔗 SOURCE

Singapore aims to 'phase out Internal Combustion Engine (ICE) vehicles and have all vehicles run on cleaner energy by 2040'. The National Electric Vehicle Centre (NEVC) will spearhead EV adoption and also facilitate the safe and innovative development of new EV-related technologies in Singapore.

🔗 SOURCE

LIVING LABS

Sustainable Living Lab is an open-innovation ecosystem driven by Public-Private-People partnerships, with the aim of developing impactful, sustainable solutions in line with the UN's Sustainable Development Goals, utilising technology as a lever for sustainability and applying a community-driven approach for implementation.

🔗 SOURCE

The Living Lab Programme is a platform for Changi Airport Group to collaborate with innovation-driven companies and start-ups, to develop and demonstrate new technology solutions in a live airport environment.

🔗 SOURCE

DIGITALISATION TO SUPPORT EVIDENCE-BASED PLANNING

The Urban Redevelopment Authority (URA) of Singapore works closely with agencies (including LTA) to assemble data to support urban planning analysis to address activity and mobility patterns in communities, accessibility and utilisation of amenities as well as

access to employment opportunities. Digital animation and virtual reality experience is also used to assess future planning areas and gather feedback from the public.

⬈ Source

FOSTERING A CARING COMMUTING CULTURE

The Caring SG Commuter initiative was launched to build upon the collective and sustained efforts from the Caring SG Commuter Committee, members of the public, and volunteers to show care towards vulnerable commuters. Building a caring commuting culture is a concerted movement which aims to transform the public transport system of Singapore into a more caring, welcoming and inclusive one.

⬈ Source

TRAVEL SMART SCHEME

Travel Smart Journeys is a reward scheme introduced by LTA to help distribute peak hour public transport demand by encouraging commuters to adopt alternative modes of travel during rush hours. In particular, commuters are incentivised to switch to buses so as to ease the morning peak hour crowds on the rail network.

⬈ Source

PUBLIC TRANSPORT INTEGRATION

Within the Walk2Ride programme, LTA has expanded the network of sheltered walkways, allowing more commuters to enjoy convenient connections to public transport nodes. Where feasible, walkways have been built to schools, healthcare facilities and other public amenities within a 400-metre radius of MRT stations, and within a 200-metre radius of bus interchanges, LRT stations and selected bus stops with high commuter volumes.

⬈ Source

MOBILITY OPEN CHALLENGE

Singapore Mobility Challenge is an open innovation initiative for technological solutions that can benefit the public transport industry and commuters and is jointly organised by LTA, SBS Transit, SMRT and co-organised by Enterprise Singapore.

⬈ Source

INNOVATION FUNDS

The Land Transport Innovation Fund facilitates innovation and technological advances in Singapore's land transport ecosystem, providing funding support for conceptual-stage research and pilot trials of innovative ideas.

⬈ Source

LTA launches regular research and technology grant calls. The focus is on use-inspired research proposals that have significant potential for scientific breakthrough or deployment with a vision of creating a car-lite environment in Singapore. An example of such a grant call was the one for 'Applied Research Projects to Enhance Traffic Management and Road Safety with Vehicle-to-Everything (V2X) Technologies'.

⬈ Source

Accelerating Co-innovation for Transformation and Export (Xcite) is led by LTA in partnership with Enterprise Singapore (ESG) and is aimed to work with industry to develop innovative solutions (e.g. AI, image analysis and automation) to improve productivity and efficiency in transport operations and maintenance.

⬈ Source

The concept of a future town centre in Singapore with autonomous vehicles during the day, Source: 'Ministry of Transport, Singapore'

Light Rail Vehicle in Sydney CBD. Scott Riley. Transport for NSW.
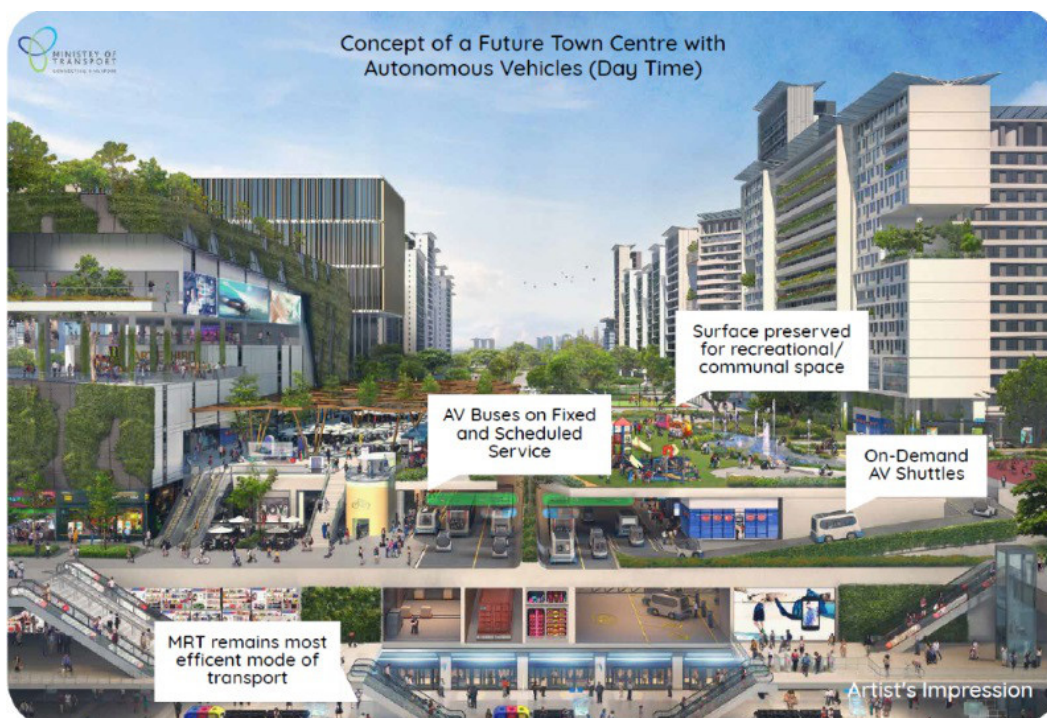
Sydney

'Just because the Open Data Hub exists - by allowing third-party innovation to happen, we have seen so many good things in terms of apps and other innovations that have come out of just making data accessible.'

**GEOGRAPHICAL SCOPE OF STRATEGY**
STATE

POPULATION	**AREA**
5,367,206	12,368 KM²

| 🚶 5% | 🚲 1% | 🚌 27% | 🚗 65% | 💬 2% | ♀ 40.4% | 🌳 9% | PM2.5 8.3 MG/M³ | 🚗💥 4 |

CITY BACKGROUND

Transport for New South Wales (TfNSW) is a government agency responsible for transport planning, strategy, policy, funding and procurement across all modes of transport available in New South Wales. These include road, rail, ferry, light rail, point to point, cycling, walking and regional air. The agency also provides information about transport and ticketing to the customers. The vision of TfNSW is "to create a modern and connected roads and public transport network that gives people the freedom to choose how they get around, no matter where they live and work". As a guide towards this vision, TfNSW set its priorities and targeted outcomes in two important strategic documents – 10 Year Blueprint and Future Transport Strategy 2056.
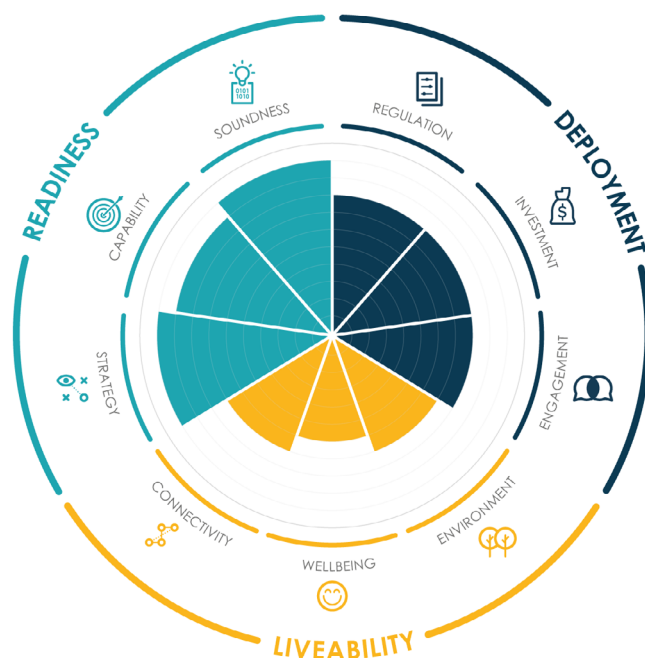
UMII PERFORMANCE

READINESS

💡 **Strategy (Readily available innovation strategy) –** TfNSW developed a huge body of strategic documents which guide the agency in every aspect of transport and mobility. The strategic goals of TfNSW align with the United Nations Sustainable Development Goals and the agency has developed and continuously updates Sustainable Design Guidelines to help TfNSW and its stakeholders deliver sustainable development practices by embedding the sustainability initiatives into the planning, design, construction, operation and maintenance of transport infrastructure projects.

DEPLOYMENT

💡 **Community Engagement (Information use) –** Insights from citizens are actively used by TfNSW to understand the needs of the users and to improve local services and inform decision making. An example might be the Household Travel Survey that has been running continuously every day of the year since 1997/98. Within

the survey, daily travel patterns of the respondents are recorded for an entire week. Approximately 4000 households in the Sydney Greater Metropolitan Area participate in the survey annually. Those data are used to adjust the modes, routes and frequencies of the services to increase accessibility and attractiveness of the public transport.

💡 **Investment (Attracting investment) –** Although the innovation activities seem to be well funded from the TfNSW, state and federal budget, there is little evidence of mechanisms to leverage additional investment from other public, or non-public funding opportunities.

LIVEABILITY

💡 **Wellbeing (Fairness) –** TfNSW actively supports the development of innovative digital tools aiming to enhance the safety of female travellers and support vulnerable user groups. Examples of those innovations include the Safety after Dark initiative, Stop Announcer and Metarove apps. Representatives of the agency regularly meet the vulnerable users and adapt transport

services to increase their accessibility. TfNSW aspires to increase the inclusiveness of its services also through the Transport Reconciliation Action Plan - a strategic document that aims to promote fairness by better understanding the culture and growing career opportunities of Indigenous peoples.

UPCOMING/LIVE PROJECTS
QUANTUM COMPUTING
Transport for NSW recently unveiled a world-first plan to deploy quantum computing to process and enhance large amounts of available transport and mobility-related data. A new centre for quantum computing will be established in Sydney with pilots scheduled to be launched in early 2022. Potential areas of application for quantum computing technology include dynamic scheduling and re-routing of services to reduce waiting times based on crowding across the network, intelligent traffic control, real-time responding to network disruptions, mobility-as-a-service, and predictive maintenance scheduling.

[↗ SOURCE]

INTELLIGENT CONGESTION MANAGEMENT PROGRAM
Transport for NSW is building a multi-modal Intelligent Congestion Management Program (ICMP) facility which uses real-time data collected by automated sensors. Using both offline and real-time simulation, ICMP will support planning for future transport including the need to support the rate of development across the city, ease congestion and provide the best incident response plans. Furthermore, ICMP will provide real-time status of all transport modes and automatically generate congestion alerts, enabling operators to quickly identify and respond to potential issues. The simulation capability will support road occupancy licensing and planning of major events.

[↗ SOURCE]

INNOVATIVE SOLUTIONS
OPAL CONNECT
In late 2019, Transport for NSW introduced Opal Connect - a new MaaS ticketing solution that enables customers to move across the transport network, modes and providers with a single digital account. The platform provides a new way for customers to keep track of all their public transport payments, whether this is via Opal card or credit or debit cards. Customers can use their Opal Connect account to sign in to different transport operator's apps to book and pay for their travel. In 2020, Opal Connect was named Australia's IT project of the year by iTnews Benchmark Awards.

[↗ SOURCE]

SAFETY AFTER DARK
Safety After Dark is a digital initiative to reduce the risk of crime against women travelling at night in the Greater Sydney area. The projects which are now being trialled within the initiative include AI and surveillance to automate the detection of threatening behaviours

as well as increase the perceived level of safety, a route planner that provides safer journey options, and a new platform for public safety and assistance. These innovative solutions came as a result of the Safety After Dark innovation challenge, organised by the Transport for NSW in 2020.

[↗ SOURCE]

POP-UP CYCLEWAYS
In March 2020 the Government of NSW amended the Environmental Planning and Assessment Act to include a new regulation in response to the pandemic. This flexible regulation allowed the City of Sydney and Transport for NSW to quickly establish new pop-up cycleways across the city. Within the initiative, new spaces for pedestrians and cyclists are created to allow safer travel between workplaces, schools, health care facilities, and the city centre. These include six new pop-up cycleway connections that enable people to safely use bikes and take the pressure off public transport and roads. The new cycleways are separated from the driving lanes by temporary physical barriers. Speed limits along some of these pop-up cycle routes have been reduced to increase the safety of the cyclists and to increase the modal shift towards active mobility. In the future, public consultation is envisaged to decide whether the new cycleways become permanent.

[↗ SOURCE]

ZERO EMISSION BUSES
As part of TfNSW's commitment to achieve net zero emissions by 2050, planning is currently underway for the transition of the 8,000 plus NSW bus fleet to zero emissions technology. Along with delivering on the sustainable transport goal, this transition will provide more comfortable journeys and liveable places for customers and communities. The Zero Emission Bus Transition Strategy has established a pathway to this goal and trials have commenced with 22 zero emission buses in passenger service across Greater Sydney.

[↗ SOURCE]

CENTRAL PRECINCT RENEWAL PROGRAM
Central Precinct will become a thriving new hub for business and the community by renewing up to 24 hectares of Government-owned land in and around Australia's busiest transport interchange – Sydney's Central Station. TfNSW is in a unique position to use its infrastructure to transform these key interchanges into new Sydney destinations.
Central Precinct's vision is to be a vibrant and exciting place that unites a world-class interchange with innovative and diverse businesses and high-quality public spaces. Unlocking this Government-owned land at Central will drive the success of Tech Central, create jobs of the future and support the vision for a 24-hour economy.

[↗ SOURCE]

Vancouver

'We're here to try to achieve these broad, regional goals that help the most people, and we try to keep equity and access in mind for the most vulnerable population - the elderly, children, people with disabilities, low income, etc.'

GEOGRAPHICAL SCOPE OF STRATEGY
METROPOLITAN AREA

POPULATION	**AREA**
2,460,000	2,877 KM²

🚶 14% | 🚴 2% | 🚌 12% | 🚗 72% | ♀ 48% | 🌳 47% | PM2.5 6.1 MG/M³ | 1.6

METROPOLITAN AREA BACKGROUND

TransLink is the overseeing integrated multimodal transport authority in the Vancouver metropolitan area. Its mandate covers all modes, including walking and cycling, public transport (transit), roads and bridges, trip planning, as well as innovation processes, citizen engagement and strategic planning. Translink acts as the region's urban mobility coordinator and 'consensus-maker' for trials and innovations.

Long term plans are revisited every 5 years, and a draft Transport 2050 regional strategy was available for public engagement at the time of writing. The new plan is based on a vision of providing access to everyone: "We all have real choices, that we can count on, that we can afford, that we can safely enjoy, now and into the future". The plans strengthen transformative actions and innovation zones towards an inclusive, future-ready and resilient transportation system in a world of shocks and disruptions.

CITY OF VANCOUVER SNAPSHOT

Its Transport 2040 strategy was adopted in 2012 and was based on the Greenest City 2020 Action Plan, and it is bearing fruit today. The plan aimed to "make walking, cycling and public transit the preferred transportation options". The transport strategy established a hierarchy of modes : 1. Walking 2. Cycling 3. Transit 4. Taxi, commercial transit and shared vehicles, and (last)

5. Private automobiles. The comprehensive plan recognised the importance of walking as "everyone is a pedestrian for at least part of the journey", the need for "separated cycling facilities to be included in all new major roadway design and construction", and the recognition that "the best transportation plan is a good land use plan". It aims to reduce transport emissions by 65% by 2030 compared to 2010 baseline.
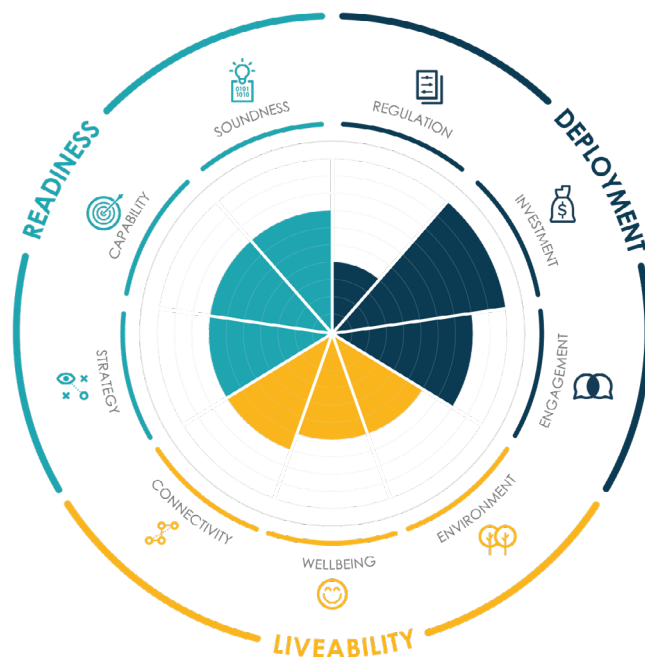
UMII PERFORMANCE
READINESS

💡 **Capability (Supporting innovation) -** TransLink created its own team with the specific remit of fostering innovation in urban mobility. It is mandated by the Mayor's council to explore mobility innovation policies, to pilot projects, and to establish wide partnerships and novel business models. TransLink Tomorrow's

Open Call for Innovation and the Mobility Lab Academic Partnerships are examples of initiatives designed to foster and reach out on innovation with citizens and academia respectively. TransLink also engages with the private sector that may have economic or job-creation interests to help lobby and move the ball forward on innovation.

Soundness (Data collection) - Data collection and modelling efforts are extensive, and new initiatives are aiming to develop digital twin technologies that could be multimodal, recreating the city experience. TransLink has an open data principle based on cost-neutrality, and both the Vancouver and TransLink open data portal provides APIs to access real time transport data. The metropolitan area could improve these efforts by also collecting qualitative data on the experience and satisfaction of active mode users — pedestrians and cyclists.

DEPLOYMENT

Community engagement (User engagement) - TransLink won an award for their broad public outreach effort for the Transport 2050 30-year vision. For example, TransLink worked closely with Vancouver Coastal Health to ensure nurses and doctors can arrive on time at major hospitals and that their shifts are well suited. Their website is notably friendly and makes comprehensive use of short videos to explain key issues to citizens.

Regulation (Regulatory barriers) - Provincial-level transport regulations strongly prioritise safety first and are therefore cautious to make regulatory changes e.g. the Motor Vehicle Act does not allow for the testing of automated vehicles. However, TransLink tempers this wait-and-see approach: "sometimes it's not that bad to be a fast-follower rather than the first mover, as a case in point the ride-hailing". On the positive side, TransLink is grateful for having a dedicated budget earmarked to keep innovating and experimenting.

LIVEABILITY

Wellbeing (Quality of life) - Vancouver (Metropolitan area) scores high in terms of quality of life, particularly for health, safety, affordability and accessibility of its transit network for vulnerable citizens. "Zero fatalities is the only acceptable goal" (Transportation 2040), and it aims to be achieved by 2050. Since a majority of fatalities are pedestrians and cyclists, the new 2050 plan focuses on making active transport the most convenient choice for short trips by prioritising the completion and improving the connected score for bike and walk networks.

Environmental (Noise) - Vancouver airport has a noise management plan, and the previous 2040 plan contained goals to reduce transit-related noise. But Vancouver could increase its commitment by more systematically measuring and communicating noise levels and its impacts on citizens, and by proposing initiatives to decrease noise levels in synergy with its other goals.

UPCOMING PROJECTS
DIGITAL TRANSFORMATION INITIATIVE / DIGITAL TWIN TECHNOLOGIES

Building on the Internet of Things and improved data collection based on cameras and sensors, Translink is experimenting with new ways to collect information about how people travel. One promising innovation is to create a 'digital twin', a multimodal virtual model recreating the city experience. Understanding better customers' experience can help make planning more efficient and funding allocation more cost-effective.

↗ Source

SKYTRAIN EXPANSIONS

SkyTrain is a fully automated and completely grade separated (elevated, tunnelled, trenched, or fenced-off at ground level) rail transit system. The complete automation enables greater flexibility in frequencies and scheduling, and full-grade separation improves reliability and speed compared to street-level rapid transit. Vancouver is planning two major expansions of the service towards the growing Surrey and Langley communities (south east of the city) and the University of British Columbia (on the west end).

↗ Source

INNOVATIVE SOLUTIONS
NEW MOBILITY LAB ACADEMIC PARTNERSHIPS

The Mobility Lab grants funding to professors, PhDs and master's students to provide unbiased and forward-thinking perspectives to push the envelope on a variety of transportation planning and policy initiatives. Examples of innovative research includes analysing anonymous Twitter tweets in different languages over a certain amount of time, creating a word cloud of customer perceptions, and merging this data with additional data such as the weather, service disruptions, frequency of service, location etc. This helps reveal information on how people are experiencing the system and where improvements can be made.

↗ Source

OPEN CALL FOR INNOVATION – TRANSLINK TOMORROW

TransLink organises yearly open calls for innovation to continuously explore, test and implement innovative solutions and ideas from the public and private sectors. This initiative is part of the broader plan to partner with industry leaders, innovators, academics, and policymakers to collaborate on new mobility solutions that will help enhance the livability of Metro Vancouver.

↗ Source

COPPER PILOT PROJECT

Following a successful first phase which demonstrated copper's ability to kill up to 99.9% of bacteria on surfaces, antimicrobial copper coatings have been installed on high-touch transit surfaces in TransLink vehicles as part of Covid-19 response.

☑ Source

ROOM TO RIDE: BUS CAPACITY PREDICTIONS

An outcome of the 2020 Open Call for Innovation, bus capacity predictions are generated by the Transit app based on historical trends and Automated Passenger Counter (APC). Icons convey three levels of capacity: 1) Many seats available (more than 50% free), 2) Some seats available (10 to 50%), or 3) Standing room only (less than 10%). This app feature helps travellers better plan their transit trips.

☑ Source

PATIO PROGRAM

An example of roadspace retrofitting, the temporary expedited patio program (TEPP) was introduced during the pandemic to allow restaurants to continue operating and to let people be out safely. It is led by municipalities with TransLink coordination and support. The program allows businesses to apply for a free permit to set up a temporary, summertime patio in an on-street parking space or directly on the sidewalk. Because of its success, the program will operate annually, with provisions to ensure accessibility for wheelchair users.

☑ Source

Vienna

'An innovative project is always a risk because if we knew that it works, it would not be an innovative project.'

GEOGRAPHICAL SCOPE OF STRATEGY
City

POPULATION	**AREA**
1,920,949	415 km^2

🚶 35% | 🚲 9% | 🚌 30% | 🚗 26% | ♀ 14% | 🌳 50% | PM2.5 12.8mg/m^3 | 🚗 1

CITY BACKGROUND

The city of Vienna builds on the long tradition of strategic transport planning and implementing the measures stepwise and consistently. Its mobility system is a critical component of the city's outstanding quality of life, for which it has repeatedly received international recognition.

The management of Vienna's mobility development is under the competence of city administration and entails the provision of fundamental planning tools ensuring innovative development in line with social, economic and ecological requirements. In 2014, the City Council adopted the Urban Mobility Plan with a central theme 'Together on the move' outlining the steps to be taken within the next ten years. The plan further consolidated the general goals and tasks set in the Smart City Wien Framework Strategy (up to 2050) and the STEP 2025 Urban Development Plan. The main long-term objective for Vienna as defined by Smart City Wien Strategy is 'The best possible quality of life for all people in Vienna whilst conserving resources to the greatest possible extent, which requires extensive innovations.' This goal has been extensively reflected by the Urban Mobility Plan.65% by 2030 compared to 2010 baseline.

Long term plans are revisited every 5 years, and a draft Transport 2050 regional strategy was available for public engagement at the time of writing. The new plan is based on a vision of providing access to everyone: "We all have real choices, that we can count on, that we can afford, that we can safely enjoy, now and into the future". The plans strengthen transformative actions and innovation zones towards an inclusive, future-ready and resilient transportation system in a world of shocks and disruptions.
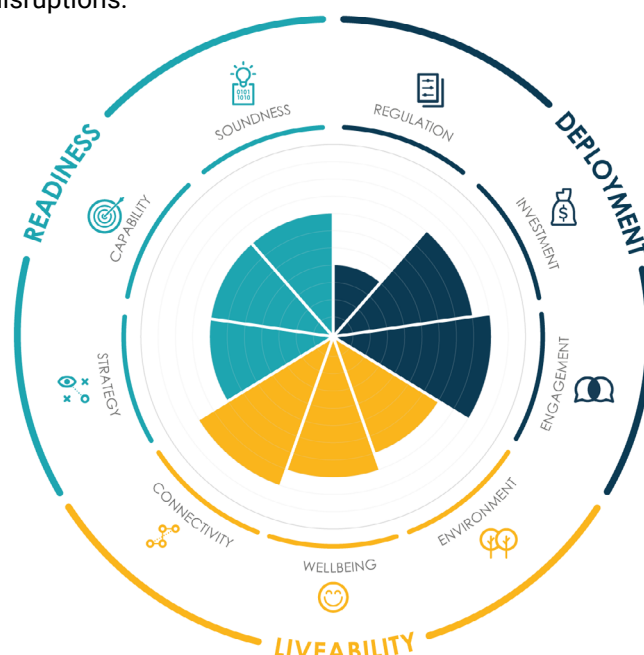
UMII PERFORMANCE
READINESS

💡 **Strategy (Comprehensiveness) -** Vienna's mobility strategy stands out for its holistic approach to mobility, as seen by the shift in paradigm from transportation planning as solely a technical-logistic effort to mobility as a societal problem. Furthermore, the strategy builds resilience into its transportation system by developing crisis-proof solutions that are primarily tailored for the

increased likelihood of extreme weather stemming from climate change. As stated in the plan 'mobility should be possible without necessarily owning a means of transport'. In addition, the mobility innovation goals and policies outlined in the strategy underwent a 'fairness check' - analysis and assessment of gender and diversity fairness conducted by a team of experts.

💡 **Capability (Skills and capabilities are leveraged to**

create / deliver the strategy) - In terms of developing a gender balance in the transportation and innovation areas, Vienna may still have space for improvement. For example, the city's largest transport operator Wiener Linien, has only 14% of women working in such professions.

DEPLOYMENT

💡 **Community engagement (Information provision) -** Vienna has advanced methods for providing information on transportation networks. The WienMobil App, developed by Wiener Linien, is noteworthy since it incorporates a variety of modes in addition to traditional public transportation. Walking, taxis and carsharing are all included, with the option to pay directly through the app. The travel information is complemented with details such as the route's environmental friendliness.

💡 **Regulation (Market barriers to innovation) -** According to the findings, Austria still faces some impediments when introducing and assessing innovative types of mobility. For instance, Wiener Linien has faced regulatory obstacles when testing its autonomous buses - not being able to ride them without a driver. In this case an alternative solution has been implemented where a monitoring driver was present for the safety and the project could have been carried without restrictions. Nevertheless, for the future the government might consider more systematic removal of the barriers to innovation.

LIVEABILITY

💡 **Wellbeing (Sustainable and healthy mobility) -** Vienna offers a broad range of alternative mobility solutions, particularly extensive in carsharing and bikesharing systems. Multiple ongoing projects further investigate the efficiency of the various urban mobility solutions, such as the REBUTAS project, which aims at improving the utilisation of free-floating mobility sharing offers and optimising the usability of the booking systems. On top of that, Vienna has its agency focusing on and promoting active modes of travel - walking and biking.

💡 **Wellbeing (Quality of life - Health, Safety, Affordability) –** The room for improvement in Vienna is seen in terms of access to public transport, since only approximately 23% of the public transport routes offer high frequency service (more than 10 departures per hour) at least once a day.

UPCOMING PROJECTS
ASPERN SEESTADT MOBILITY LAB
Aspern Seestadt is a new area under development located in Vienna's north-eastern suburbs. Set for completion in 2028, the area already serves as a display project and a "living lab" for new technologies. Given the

unique nature of its development, the area has its own mobility lab focusing on innovative mobility solutions with the ultimate aim for people to "use mobility, instead of owning their own transport".

The lab is run by an interdisciplinary team of the Vienna University of Technology cooperating with numerous partners from science and research, city administration, business, users and local experts. Since 2017, the lab has an extensive track of involvement in innovative projects such as SmartHubs - a project investigating the role of mobility hubs and their impact on sustainable urban mobility and its accessibility, Sharelivery - an initiative with the goal to combine various services in the field of shared mobility and logistics or Phobility Active helping people with phobia, anxiety or fear developed due to depression equal participation in social life and active mobility.

🔗 Source

INNOVATIVE SOLUTIONS
PHOTOVOLTAIC FILMS POWERING UNDERGROUND STATION
The City of Vienna is heavily invested in rolling out photovoltaic systems and sustainable energy solutions across the city. A recent pilot carried out by Wiener Linien together with Wien Energie entailed an installation of special photovoltaic films on the flat roof of the Ottakring subway station. The photovoltaic system, which covers 360 square metres and generates 62,000-kilowatt-hours of solar power, is utilised to power the building's lighting, escalators, and elevators. This results in an annual reduction of CO2 by 21 tonnes.

🔗 Source

THE RESEARCH PROJECT AUTO.BUS - SEESTADT
Auto.bus Seestadt was a four-year long research and testing project (finalised in June 2021), which aimed at enhancing the operational quality of future autonomous bus routes. The project took place in Vienna's 'urban lab' - Aspern Seestadt, where two autonomous e-buses periodically served a two-kilometre circular route. The test operation was used to further develop sensors for autonomous driving, test IT security systems and see the response of passengers to buses. The service was provided for free and the e-buses could fit up to 10 passengers and a pram each.

🔗 Source

DIGITAL GIRLS HACKATHON
The first Digital Girls Hackathon took place in Vienna as part of the Digital Days 2021, with the goal of promoting young women and girls to pursue IT training and careers. On the 18th and 19th of October, over 30 students aged 14 to 19 worked in teams to develop digital solutions for a sustainable city in response to the theme "Ingenious Digital: The Sustainable Vienna!"

🔗 Source

Warsaw

'The inhabitants should not only be well-informed, they should be engaged.'

GEOGRAPHICAL SCOPE OF STRATEGY
City/Municipality

POPULATION	AREA
1,792,718	517 km²

🚶 18% | 🚲 3% | 🚌 47% | 🚗 32% | ♀ 50% | 🌳 44.2% | PM2.5 7mg/m³ | 💥 2.3

CITY BACKGROUND

The Public Transport Authority (ZTM) is a public transport organiser in Warsaw. It is responsible for creating convenient connections of public transport services (tram, bus, metro, and urban rapid rail), for arranging of routes, timetables, sales of tickets and other services in Warsaw. The main strategic document of the city is #Warsaw2030 Strategy developed in 2018. It is a complex strategy divided into separate strategic objectives and subsequently into operational objectives. The operational goal "we use a convenient transport system" focuses on urban mobility. The aim is to efficiently connect various parts of the city and ensure convenient transport modes. The strategy is also looking at ways to foster innovations. The city's goal is to create a flexible mechanism for facilitating the exchange of thoughts, experimenting, testing new solutions in various areas of life, and developing cooperation between the city and stakeholders.
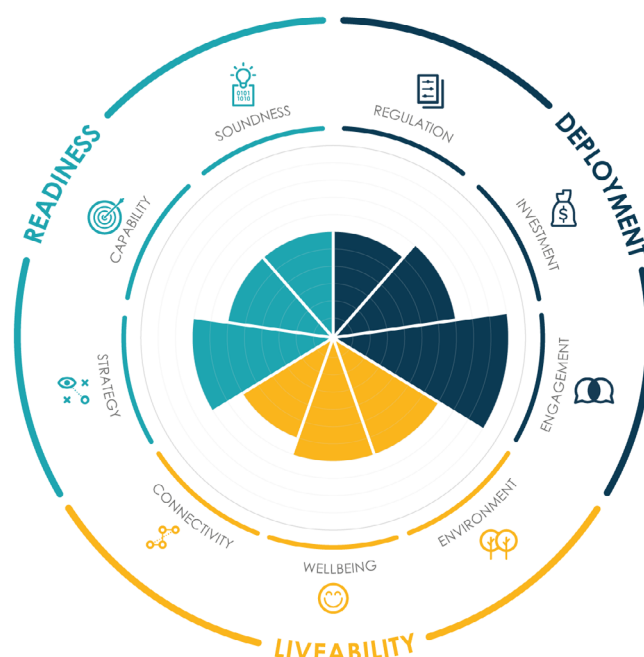
UMII PERFORMANCE
READINESS

💡 **Strategy (Readily available innovation strategy to internal and external stakeholders) –** The #Warsaw2030 strategy was developed based on a participatory and expert model approach. The city has a standard procedure, by which it involves different groups of stakeholders at different stages of the decision-making process. During strategy development, it organises expert discussion panels, open discussions, workshops with residents (young people, students, families with children up to 18 years of age, seniors), entrepreneurs, non-governmental organisations, and other institutions. One of the strategy executive programs is "We generate innovations". The program is oriented on creating a mechanism to facilitate the exchange of thoughts, experimenting, and testing new solutions in various areas of socio-economic life, developing a network of cooperation between the city and many different entities, and an open information policy.

💡 **Capability (Internal capacity) –** Although the strategy of Warsaw focuses on generating innovations, the city does not have a dedicated department or team coordinating innovation activities in urban mobility. Topics related to innovations are covered by other departments, depending on projects.

DEPLOYMENT

💡 **Community engagement (Information use) –** The city of Warsaw and ZTM are aware of the importance of data and consider it crucial in decision-making. The

main source of obtaining data is survey research. The city conducts a twice a year survey for inhabitants of Warsaw, which covers every specific city sector. They also conduct surveys to prepare social campaigns related to solutions and innovations focused on improving transport services and quality to meet customers' satisfaction. ZTM also conducts annual passenger satisfaction surveys and it holds public consultations regarding intended changes, and developments.

💡 **Investment (Own investment) –** Warsaw does not have a specific budget allocated to urban innovation activities. However, innovations in urban mobility embedded in projects are included in the city budget which one part is related to transport.

LIVEABILITY

💡 **Wellbeing (Sustainable and healthy mobility) –** The city has a high share of active modes of transport (21%) and public transport (47%). In addition to the public bikesharing system, the city supports shared transport services by providing benefits to their providers (e.g. cars of carsharing companies are not obligated to pay for parking lots).

💡 **Wellbeing (Fairness / Women) –** Designated seating in public transport vehicles for pregnant women is the only initiative available to female users to safely use the transport network. The city does not design specific services for females. However, to feel safe during travel in Warsaw, passengers, both females and males, can use a panic button in risky situations.

UPCOMING PROJECTS
IP4MaaS
ZTM is part of Shift2Rail IP4MaaS project, coordinated by UITP, which focuses on creating a digital ecosystem for providing door-to-door multimodal travels across Europe, based on railway transport. It is aimed at increasing the popularity of railways and public transport in general, make pan-European travels seamless and leverage decarbonisation of European transport systems. One of the objectives of the project is to demonstrate the IP4 technologies in 6 different locations in Europe. One of them is Warsaw. The Warsaw pilot will take place in 2023.
🔗 Source

SAFETY PROJECTS
ZTM takes part in two European projects concerning safety. As a member of the User Observatory Group at Prevent PCP project provides inputs for creating a new, innovative solution to detect unattended items in vehicles and at the stations. Under the ongoing Safe

Bus project, ZTM will prepare an e-learning portal and courses to ensure knowledge about transport safety and emergency procedures for public transport operators.

INNOVATIVE SOLUTIONS
PASSENGER COUNTING SYSTEM
Warsaw has installed photocells in public transport lines to collect bus, tram lines, and metro and city train (SKM) occupancy data. Based on this data, they can see the most loaded lines, assess travellers' interest, and thus react flexibly to the situation by sending so-called "plugs", additional vehicles, on identified lines. The data can be obtained online and just a few minutes after registration. However, data is available only for the transport authority. Every day, a report on using a particular vehicle is automatically generated.

VEHICLE POSITION MANAGEMENT SYSTEM
ZTM uses the integrated system for vehicle position management to control the operation of public transport vehicles. The system covers 100% of the bus fleet and allows users to see the actual position of buses, lines and brigade numbers, the direction in which they move, their speed and amount of minutes of delay. It also allows sending announcements to buses, for example, to ask people to evacuate or ask drivers to stop. This positioning system helps them to manage daily public transport in Warsaw.

FAULT DETECTION AND TROUBLESHOOTING SYSTEM
ZTM uses an IT system called CERBER, a tool for improving the elimination of defects in public transport vehicles. The system ensures that ZTM has a constantly updated database of all public transport vehicles and can carry out inspections and eliminate defects in the vehicles.

GENDER INCLUSION IN TRANSPORT SYSTEMS
The Public Transport Authority of Warsaw is one of 13 partners in the DIAMOND project carried out under the Horizon 2020 program. The project aims to gain knowledge from data analysis to support gender inclusion in current and future transport systems. ZTM has conducted the survey in order to obtain data on the evaluation of metro and urban railway public services within the project. Then data mining and analytics should be used to analyse gender disaggregated data and identify measurements to meet women's needs and expectations from the perspective of women as passengers and professionals in the transport sector. The project also aims to propose recommendations on achieving fair gender inclusiveness and improving female employment in the transport sector.
🔗 Source

LIKE A FOREST, A CITY IS HEALTHIER AND MORE RESILIENT IF ITS ECOSYSTEM IS RICH AND DIVERSE.

"Cities should thrive to embrace complexity, not just in transportation systems but in human experience. Cities should abandon old mobility, a system rigidly organised entirely around one way of moving, and embrace new mobility, a future in which we would all be free to move in the greatest variety of ways.

(...) A city that enables endless combinations of mobility will adjust more easily to shifts in economics, human taste and energy supply, it will fill in the blanks that master planners cannot see within the tangle of the complex urban system, and it will make most of technologies that can solve the problems particular to cities: tight spaces, congested streets, and most of all, people with wildly varying preferences."
(excerpt from the book Happy City[3])

Conclusions

Highly innovative cities share many similar characteristics, one of which is a strong commitment to experimenting a combination of innovative approaches for implementing a smooth and integrated door-to-door travel experience. This entails combining public transport and novel forms of electric and shared mobility, including giving a strong role to active mobility such as walking and cycling.

Today, the reality is more complex, and city transport planners need innovative solutions to address many more challenges than conventional problems like public transport accessibility, road safety or congestion. Cities also aim for example at reducing the carbon footprint of urban mobility, improving the quality of the travel experience, and providing opportunities for health benefits with active mobility (see Main findings section for more examples).

This Urban Mobility Innovation Index 2nd report demonstrates how many cities around the World have adopted this ultimate goal of getting not only an efficient transport system but an inclusive, sustainable and resilient urban mobility, in line with the UN Sustainable Development Goals. This in fact triggers even more innovation of different types. High performing cities do not put all their eggs in the same basket: they cover all types of innovations and strategies in a balanced way. Packages of interventions allow cities to create the conditions for the sum of the benefits to be bigger than the sum of its parts.

For example, a simple - but innovative in some context – electric bike sharing system together with protected road and parking infrastructures can serve as a last-mile solution to public transport, thereby making the overall network more attractive. Such a combined package of innovations can also expand mobility to younger or older age groups who would otherwise fear to share the road with bigger vehicles. It also reduces both emissions and carbon per kilometre travelled, and improves the health of citizens directly (with the exercise) or indirectly (with reduced air pollution).

Learnings from this report resonate well with the conclusions drawn from the Urban Mobility Innovation Index report of 2017. One key enabler to innovation is setting a compelling and widely consulted long term vision and strategic goals to aim for.

Having a collectively agreed future vision for a city takes time, but it allows to justify the deep changes that will result and to lower innovation adoption barriers down the line. Having a clear long-term mobility vision also allows to break through path dependencies and to more clearly judge the extent to which innovations can serve as stepping stones towards a desirable future – or in some cases, sidestep solutions that appear attractive but may not be scalable or beneficial in the longer run. Having a long-term vision opens the door to innovation, because it sets challenges and goals without prescribing solutions, which can be further created and experimented with a co-design and shared approach along the way. Finally, a desirable future vision of the city, obtained by wide stakeholder consensus and deep citizen engagement, gives purpose to the innovation process.

In this way, innovation is both a culture and a learning opportunity. Innovative cities often have a dedicated and multidisciplinary innovation team tasked with fostering innovation within and beyond their organisation. The 'best' organisational structure is unclear, since it is often dependent on geographical, cultural and historical context. While some metropolitan areas have a fully integrated authority in charge of planning both land use and transportation on all modes, others are more fragmented. The key for success is on one hand for one actor to take charge of multimodal and spatial integration and innovation, and on the other to ensure citizen engagement and stakeholder collaboration. Becoming a leader in innovation brings the opportunity for a transport authority to develop expertise, which may bring revenues and improve longer term financial resilience.

Aiming for a wide set of goals might seem out of reach for cities struggling to provide more basic public transport services in the first place. But more than ever, there is an opportunity for aspiring cities with limited transport systems to leapfrog ahead by learning from ongoing innovations elsewhere to avoid the car-based development other cities are struggling to free themselves from, and doing so by giving special attention to understanding citizen needs and engaging them in open and transparent ways in the full innovation process.

In terms of future opportunities, two areas have emerged as promising for future improvement, particularly in terms of achieving a well balanced portfolio of mutually supporting innovations (see Table 1 in the Main findings section). The first concerns innovations with regulatory and financial enablers, which may include creating regulatory sandboxes, banding transport authorities together to challenge national regulation, creating an equal level playing field for industry actors to innovate, and involving academia and economists to better assess and monetise the wider benefits of packages of interventions. The second concerns land use planning innovations, which has a direct impact on transport demands: this may include reforming urban development around principles for diversity and proximity, reducing not only the need for high motorised mobility but the need to travel altogether, and limiting the expansion of cities to preserve remaining natural resources, which in many cases have a direct incidence on citizens' quality of life.

We have entered an epoch where innovation and technology have clearly become the main drivers of change, but where they also represent the expected solutions. Which future visions will emerge will be the outcome of today's collective innovative choices, and cities have a key role to play in guiding these choices. Cities therefore need to continue building internal and external capacity to trial and scale innovations that support their vision, allowing for UMIs to be co-designed and tested with all stakeholders, and where cities not only inform but learn from innovation processes. The UMii framework empowers cities to crosscheck their own practice with known best practices of the urban innovation process: it allows them to plan urban mobility in a holistic way and to track their maturity to innovate and their efficiency in deploying solutions.

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Kolawole Ojelabi - Assistant Director, Corporate
Communication, LAMATA

Obafemi Shitta-Bey -Deputy Director, Corporate and
Investment Planning

Olasunkanmi Okusaga - Director, Rail Transportation,
LAMATA

Simisola Elegba - Public Transport Engineer, LAMATA

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People interviewed
Sofia Taborda – Director of innovation and mobility
solutions, EMEL

Ana Vasconcelos – Su-stainable Mobility Consultant -
Lisbon City Council

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People interviewed
Rikesh Shah, Head of Commercial Innovation, Transport
for London (TfL)

Steve Newsome, Director of News and Relations,
Transport for London (TfL)

Rhyanna King, Business Operations Manager, Transport
for London (TfL)
Laura Fenimore, Head of EU and governmental relations,
Transport for London (TfL)

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PEOPLE INTERVIEWED
Tomas Carranza – Principal Transportation Engineer, Los Angeles Department of Transportation

Rubina Ghazarian – Supervising Transportation Planner II, Los Angeles Department of Transportation

Rogelio Pardo - Program Director, Urban Movement Labs

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PEOPLE INTERVIEWED
Laura Delgado Hernández, Chief of External Relations - Consorcio Regional de Transportes de Madrid

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MANCHESTER
PEOPLE INTERVIEWED
Ian Inglis, Senior Project Manager, Innovation team, Transport for Greater Manchester (TfGM)
Nicola Kane, Head of Strategic Planning, Insight and Innovation, Transport for Greater Manchester (TfGM)

Mick Edwardson, Insights team, Transport for Greater Manchester (TfGM)

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MEXICO CITY
PEOPLE INTERVIEWED
Daniela Muñoz, Planning Director, SEMOVI

Adriana Cardona, Director of Mobility Project Management, SEMOVI

Arturo Edgar Pérez Hernández, Head of Departmental Programming Unit, SEMOVI

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MILAN
PEOPLE INTERVIEWED
Valentino Sevino - Director of mobility department, AMAT

Paolo Campus – Mobility Expert in the Mobility Planning Area, AMAT

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MONTEVIDEO
PEOPLE INTERVIEWED
Carolina Romero – Economics Analyst, Transport Division, Mobility Department, Municipality of Montevideo

Paula Decia - Economics Analyst, Transport Division, Mobility Department, Municipality of Montevideo

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MONTRÉAL
PEOPLE INTERVIEWED
Rémi Villeneuve - Head of Intelligent Transportation Systems
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MOSCOW
People interviewed
Olga Smirnova - International Relations Coordinator,
Department of Transport and Road Infrastructure
Development of Moscow (MDOT)

Olga Pishchikova - International Affairs Advisor to the
Head of the Department, Department of Transport and
Road Infrastructure Development of Moscow (MDOT)

Maria Mayorova - Deputy head SPI "Organiser of
Transportation", Department of Transport and Road
Infrastructure Development of Moscow (MDOT)

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People interviewed
Vibeke Harlem – Director radical innovation, Ruter

Endre Angelvik – Executive vice president for radical
innovation, Ruter

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People interviewed
Luiz Antonio Cortez Ferreira - Planning and Environment
Manager, Metrô de São Paulo

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BoRam Jeong – International Relations Manager, Seoul
Metropolitan Government

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SINGAPORE
People interviewed
Wee Shann Lam – Chief Innovation & Transport
Technology Officer, Land Transport Authority

Christopher Gan – Senior Manager, Transport Research,
Technology & Industry Development Group, Land
Transport Authority

Joel Teo – Senior Manager, Transport Research,
Technology & Industry Development Group, Land
Transport Authority

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SYDNEY
People interviewed
Felix Hamilton – Manager Research & Evaluation,
Transport for New South Wales
Chris Pope - Senior Researcher, Transport for New South
Wales

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VANCOUVER
PEOPLE INTERVIEWED
Keane Gruending, Senior Communications Advisor, TransLink
Arina Roudometikina, Corporate Communications Advisor, TransLink
Niklas Kviselius, Manager, New Mobility, Translink
Graham Cavanagh, Senior Planner, New Mobility, TransLink

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VIENNA
PEOPLE INTERVIEWED
Cornelia Nussbaumer – Innovation Manager, Wiener Linien

Bernd-Peter Ivanschitz - Head of Department Mobility Statistics and Market Research at Wiener Linien

Lilian Izsak - Scientific employee, Wiener Linien

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WARSAW
PEOPLE INTERVIEWED
Piotr Załęcki – Head of the Unit of Internal and International Cooperation, Marketing Department, Public Transport Authority

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