URBAN
MOBILITY
INNOVATION
INDEX

UMii

Foreword

CATAPULT Future Cities

UITP ADVANCING PUBLIC TRANSPORT

At Future Cities Catapult, we work with cities around the world to help deliver innovation at city scale. We know that to achieve such results cities must share knowledge, build partnerships and ultimately create an ecosystem where businesses and people thrive. The framework proposed by the UMii project provides a guide for cities to foster innovation in their urban transportation systems. Importantly, it is also a practical playbook for action.

The framework engages with city governments and offers powerful visualisations of urban mobility data, which will help unlock the information cities already collect, and turn it into useful tools to inform better decision-making. It will encourage inter-city learning and networking and, ultimately, it will enable city leaders and their officials to develop policies and conditions that result in innovative mobility solutions that are adopted at scale.

Once cities have visions and strategies for vibrant, liveable places, they can validate how different innovations can help them realise their preferred future, including the integral role that mobility plays within that.

Scott Cain
Chief Business Officer
Future Cities Catapult

At UITP, the International Association of Public Transport, we have championed sustainable urban mobility over the last decades.

Today, UITP recognises more than ever the challenges that cities are facing to respond to a growing demand of mobility, and to address, at the same time, political goals of a healthier, fairer, more integrated, accessible and sustainable urban transport.

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

"Innovation" and "Sharing", being part of UITP core values, we 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 to maximise the benefits of innovation.

UMii fits perfectly in UITP's mission of promoting excellence and exchange between urban mobility stakeholders. UMii is a catalyst for more cooperation between city leaders and mobility providers, practitioners and innovators, from traditional and non traditional mobility sectors.

All UITP members are committed to innovation, and some of them are leading the way to innovation for urban mobility. Best practices have been captured thanks to the development of the UMii framework and translated into practical and actionable recommendations for cities, to strategically integrate innovation as part of urban transport planning and to develop greater urban mobility services.

We would like to thank all the cities that have contributed to UMii, and extend our thank you to the Roads and Transport Authority of Dubai (RTA) for its leadership and support, and to our partner Future Cities Catapult.

Alain Flausch
Secretary General
UITP

Glossary

City
Each country's definition of a city.

Strategy owner
The organisation that owns or leads the local innovation agenda for urban mobility.

Innovation[1]
The implementation of a new or significantly improved product, process or organisational method. Innovations do not have to be game changers or new worldwide solutions, as innovation is contextual.

Living lab
A concept 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
The economic area containing the bulk of daily home–work journeys, sometimes referred to as the "labour catchment area".

User
Any person who benefits from any opportunity the city provides (incl. citizens, commuters, tourists).

Proxy indicator
A variable, which is used to represent one that is difficult to measure directly.

Transport mode
Any available transport mode with a significant share (more than 0.1%). This includes private cars, buses, rail, metro, taxis and active modes of travel, such as walking and cycling.

Geographic coverage
What the strategy owner considers to be the right scale of action, e.g., city, metropolitan area etc.

- 🚆 Train
- 🚌 Bus
- 🚋 Tram/Light rail
- 🚗 Private car
- 🚶 Walking
- 🚠 Cable car
- 🚲 Cycling
- 🚲 Bike-sharing service
- 🚗 Car-sharing service
- 🚕 Ride-hailing service
- ⛴ Ferry

[1] Based on the Oslo Manual: Guidelines for Collecting and Interpreting Innovation: "An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations."

Table of Contents

The Journey

INTRODUCTION

The Urban Mobility Innovation Index (UMii) is a framework that assesses the maturity of a city's innovation ecosystem in urban mobility, using a collection of indicators that capture multiple features of the innovation value chain.

Inspired by the CITIE[2] framework, UMii provides insight into urban mobility and innovation in cities across the world by uncovering city data and unlocking its value to enable more informed decision making. Rather than scoring and ranking cities competitively, UMii seeks to empower city leaders to implement urban mobility policies and measures that are relevant to their ecosystem and enable innovation, whilst promoting knowledge sharing and dialogue.
UMii encourages city leaders, mobility providers, practitioners and innovators from traditional and non traditional mobility sectors to work together to make cities better.

Building on a prototype developed in 2015 by RTA Dubai and Future Cities Catapult, in collaboration with Nesta and University College London, the UMii Framework was reviewed with UITP and tested it on a selection of 30 cities. This report captures the results of the research conducted in UMii. The project is sponsored by the Roads & Transport Authority of Dubai (RTA) and implemented by the International Association of Public Transport (UITP) in partnership with Future Cities Catapult.

[2] The City Initiatives for Technology, Innovation and Entrepreneurship (CITIE) framework looks at the capability of cities to catalyse innovation and entrepreneurship. CITIE is the product of a partnership between Nesta, Accenture and Future Cities Catapult.

APPROACH

The process of developing the UMii framework began by defining the fundamental concepts and terms that would guide the establishment of system boundaries. To ensure that UMii could be applied to the greatest number of cities, the terminology used in the framework follows widely recognised concepts, such as 'innovation' or contextually defined terms, such as 'city'.

The next step was to define the indicators that would compose the framework, adopting whenever possible, already existing (quantitative) indicators.

An important feature of UMii is that it 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.

UMii has been tested in 30 cities worldwide, with a well-balanced representation of innovation ecosystems across a wide spectrum of transport systems set-ups, city governance models and economic development stages.

1
System boundaries

2
Develop framework from theory to practice

3
Measuring the ecosystem
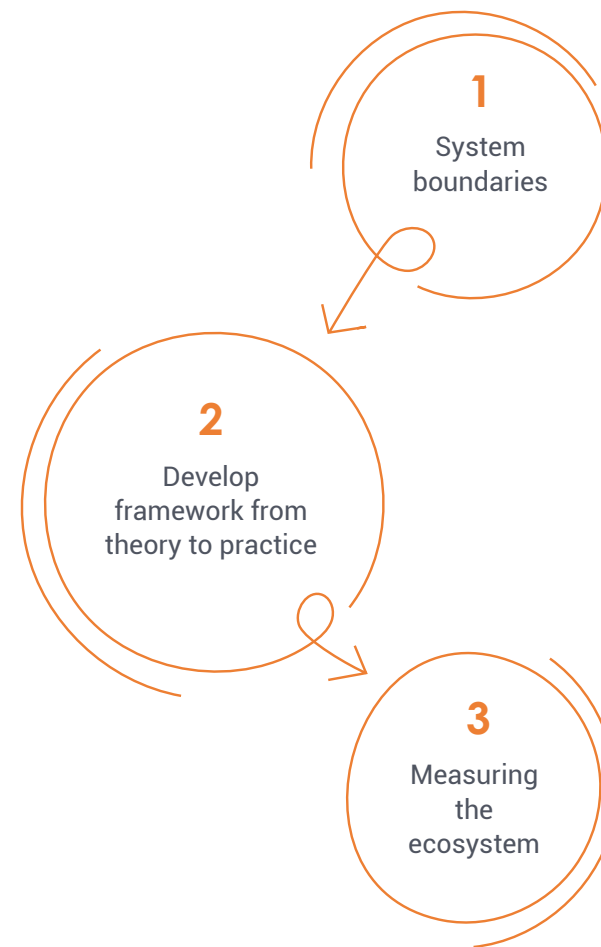
METHODOLOGY & RESEARCH PROCESS

The assessment of the 30 UMii cities was undertaken through a combination of qualitative and quantitative research methods.

The qualitative research began with an initial desk research phase to collect snapshots of the UMii cities.

The main research phase consisted of a campaign of semi structured phone interviews to local stakeholders. A set of pre-determined, open questions were asked during the phone interviews, which allowed us to understand the local innovation ecosystem, but also gave us space to ask unscripted follow-up questions and go into more depth on particular areas.

To ensure a consistent approach across the 30 cities, the process began with a phase of screening interviews to determine who was the best placed stakeholder to represent the strategy owner in each city, and to identify the right contact person within each organisation.

This was followed by an additional phase of desk research to collect objective data to complement the interview insights, and to cross-check the information provided by interviewees.

The quantitative indicators were collected through an online survey completed by the strategy owners, and complemented with secondary desk research. To ensure that the data was sufficiently reliable, preference was given to official sources of statistical data, such as Eurostat, the World Health Organisation (WHO), Organisation for Economic Co-operation and Development (OECD) and the United Nations (UN).

UMII CITIES

Geneva
Helsinki
Munich
Warsaw
Vienna
Manchester
London
Amsterdam
Montreal
Barcelona
Lisbon
Istanbul
Los Angeles
New York City
Chicago
Casablanca
Hong Kong
Kuala Lumpur
Mexico City
Milan
Dubai
Singapore
Abu Dhabi
Abuja
Nairobi
Delhi
Amman
Sao Paulo
Johannesburg
Sydney

UMII Framework

DIMENSIONS AND LEVERS

The UMii framework looks at challenges and opportunities across three dimensions, which capture elements of the different innovation stages: readiness, deployment and liveability.

Housed within the UMii dimensions are nine innovation levers: a combination of policy features, which can be acted upon at a city level to drive urban mobility innovation:

- Strategy
- Capability
- Soundness
- Regulation
- Investment
- Engagement
- Connectivity
- Wellbeing
- Environment

Each lever then expands into multiple qualitative and quantitative indicators, which measure how well cities are performing in specific domains.
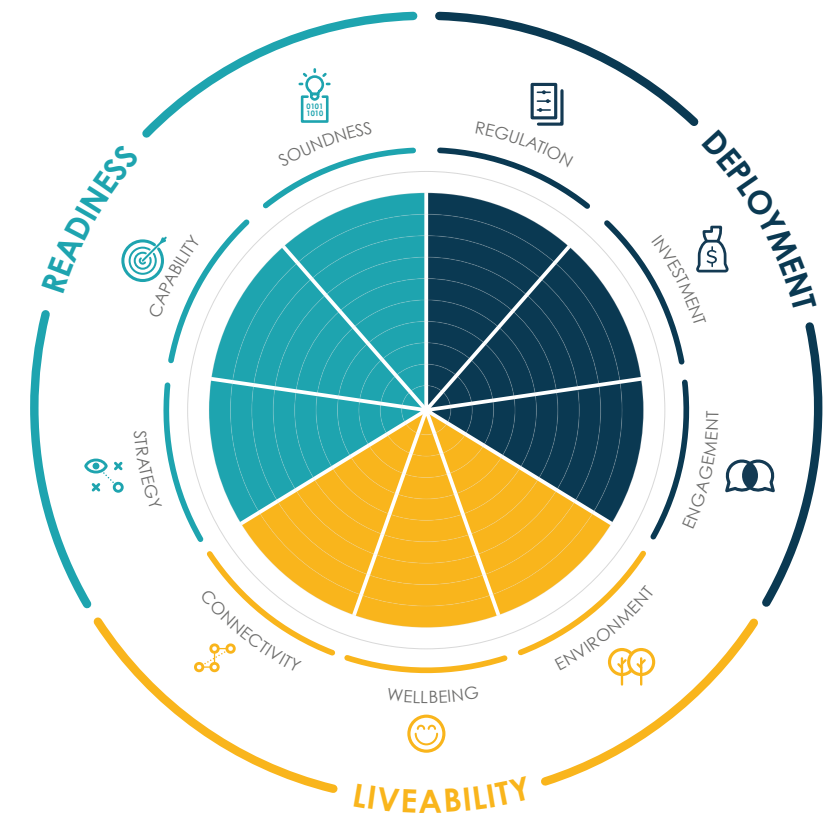
Readiness

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.

Strategy also explores the foundations of the plan, assessing how well informed the process is and whether the strategy is translated into specific SMART[3] actions.

This lever combines a set of indicators, which assess the following features:

- Is the innovation strategy readily available and was there a process of engaging stakeholders?

- How comprehensive is the strategy?

- Is there a feasible plan for how to execute and monitor the strategy?

CAPABILITY

Capability looks at how the city builds internal capacity to support innovation, and leverages the skills and capabilities of external stakeholders.

To assess how open the city is to experimentation, capability investigates the maturity of the open innovation ecosystem by looking at whether the city has created a real-life environment where innovation could take place, and how close it is to becoming a living lab.

This lever combines a set of indicators, which assess the following features:

- Is there internal capacity to support innovation?

- Are the city's skills and capabilities leveraged to drive innovation?

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 of data, both internally and externally, to support the development of new and improved mobility solutions in the city.

Soundness explores the maturity of the processes adopted to collect mobility related data and data beyond traditional transport information (investigating the intersection of the transport sector with non-traditional areas that might have an impact on mobility) as well as how open and useable the data collected is.

This lever combines a set of indicators, which assess the following features:

- How mature is the data collection?

- Is data accessible?

- Is data usable?

[3] Specific, Measurable, Attainable, Relevant, Time-bound.

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 have impacted the creation of new business models.

This lever combines a set of indicators, which assess the following features:

- Are there market barriers to innovations?

- Is there an emergence of new business models?

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.

Engagement also looks at how data regarding user experience of mobility services in the city is collected, how it is used to understand the needs and preferences of city users, and how it informs decision-making processes, improves local services and overall, drives local innovation.

This lever combines a set of indicators, which assess the following features:

- What are the city's user engagement practices?

- How does the city collect data?

- What is the city's communication and information provision?

INVESTMENT

Investment focuses on how risk-averse the city is and the level of financial resources they have committed to supporting R&D projects in urban mobility.

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:

- What is the city's own investment?

- How well does the city attract investment?

Liveability

How well is the city performing when it comes to quality of life?

CONNECTIVITY

Connectivity investigates how integrated the transport system is, at both a physical and digital level.

Connectivity assesses the quality of a typical journey through the transport system – based on how barrier free and easy the system is to navigate.

This lever combines a set of indicators, which assess the following features:

- How seamless a user's journey is
- The usability of the city's transport systems

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:

- Quality of life
- Fairness
- Sustainable and healthy mobility

ENVIRONMENT

Environment looks at two key environmental pressures to assess the performance of the city and its progress regarding energy consumption and air pollution as markers for environmental sustainability.

This lever combines a set of indicators, which assess the following features:

- What is the city's air quality?
- What is the city's level of energy consumption?

Main findings

This section presents the main insights gathered for each question underpinning the nine levers of the innovation ecosystem.

Each question is followed by a wheel, which illustrates the performance of the 30 UMii cities according to their maturity level in that specific lever. The outer circle of the wheel highlights the top five performers, the middle layer indicates the cities who – although not in the top performers' group – have demonstrated a level of maturity beyond current state-of-the-art practices, and those cities that are less mature are located in the inner circle.

STRATEGY

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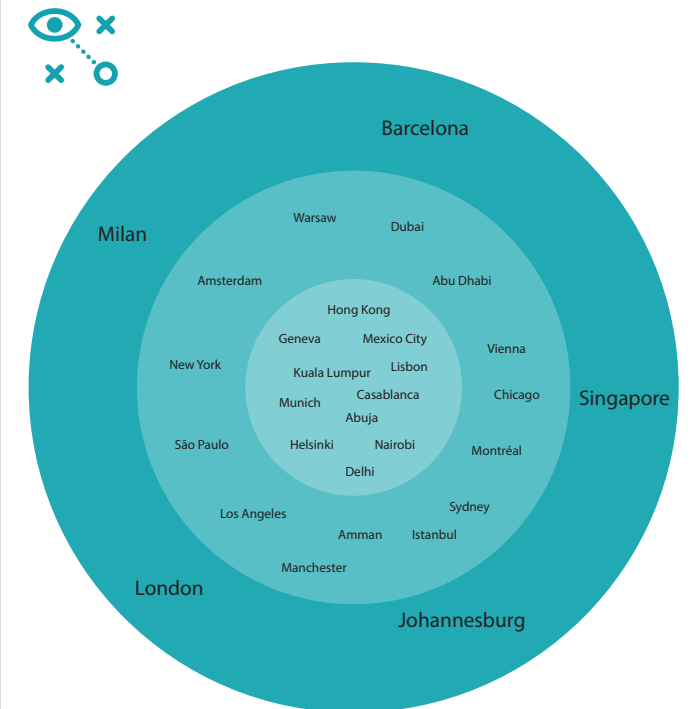

Whilst most cities do have an established strategy for urban mobility, research shows these are frequently a statement of ambition and guiding principles, rather than a roadmap set out to address concrete local challenges, informed by comprehensive data.

Developing a mobility strategy and plan should be the beginning of an innovation process, as it offers a tangible commitment towards all city users and provides a space for meaningful dialogue with stakeholders in the search for common ground. This also helps achieve shared responsibility for a successful implementation of the strategy.

More advanced cities are already breaking policy silos and adopting multidisciplinary approaches towards mobility, but examples of cities going beyond this and effectively looking at urban mobility in the wider context of sustainable urban planning, is sporadic. Accessibility – as the ability to reach opportunities – is an unexplored concept to most cities and strategies and are often standalone processes with relatively poor stakeholder engagement – particularly from non traditional mobility areas.

Action plans tend to be a collection of potentially impactful interventions, but it is often difficult to understand how they will contribute to the overarching city targets. Most plans lack a sound baseline analysis and quantification of the potential benefits of the proposed interventions, as well as a robust monitoring system, making it difficult for cities to track the progress of interventions and measure change over time.

Barcelona is a good example of a city that has invested well in their approach to innovation in urban mobility. Urban mobility is planned at two levels: a regional plan and a local plan, which look into all types of mobility, including freight and logistics. The plan – developed by the city council – is underpinned by a comprehensive baseline of the supply and demand of mobility options available in the city. This is followed by a detailed set of actions, which consider potential scenarios, scales and benefits across the various urban systems.

In regard to type of innovation, for cities at an earlier stage of development, innovation is fundamentally incremental and frequently not even recognised as innovation. The mobility system of cities, such as Abuja, Amman, Kuala Lumpur, Nairobi and Delhi, is still limited and, therefore, their strategies revolve around the provision of core infrastructure to improve the fragmented road networks or the development of mass transit systems.

Conversely, in the case of cities at an advanced stage of development, there is a stronger manifestation of high-technology innovation to improve their urban mobility system, as strategies shift towards a more service based focus to address the challenges of intelligent mobility. Examples include Los Angeles, Singapore and Sydney.

CAPABILITY

# Do cities have the skills required to test, deploy and implement mobility innovation?

In order to develop a mobility strategy, a city must ensure they have the appropriate institutional and human capacity and the right set of capabilities to create an innovation-friendly environment, which invites innovators to experiment in the city.

Most cities refer to their limited internal capacity to effectively address innovation in urban mobility. To cope with the demanding future of cities, and in an effort to build a network of talent that they can draw upon, some cities – such as Helsinki, Amsterdam and Sao Paulo – have created autonomous structures dedicated to urban innovation. Examples of this include innovation labs and others stakeholder platforms, which work together towards a common vision. Less advanced cities have established partnerships or collaboration agreements with universities and industry.

Amsterdam is a particularly interesting example. Two initiatives highlight the city's investment in skills: Amsterdam Smart City, a forum for local stakeholders and innovators to explore potential solutions for some of the city's most common urban challenges, and the Amsterdam Institute for Advanced Metropolitan Solutions, which aims to retain and attract international talent to address the metropolitan region's challenges with research and innovation projects.

Overall, research reveals that a lack of skills and capabilities is one of the key obstacles cities face in addressing the challenges that intelligent mobility demands.

To counterbalance the deficit in city-level competencies, many cities have been building open innovation ecosystems to create welcoming environments that enable experimentation. There are already some examples of cities that have embraced
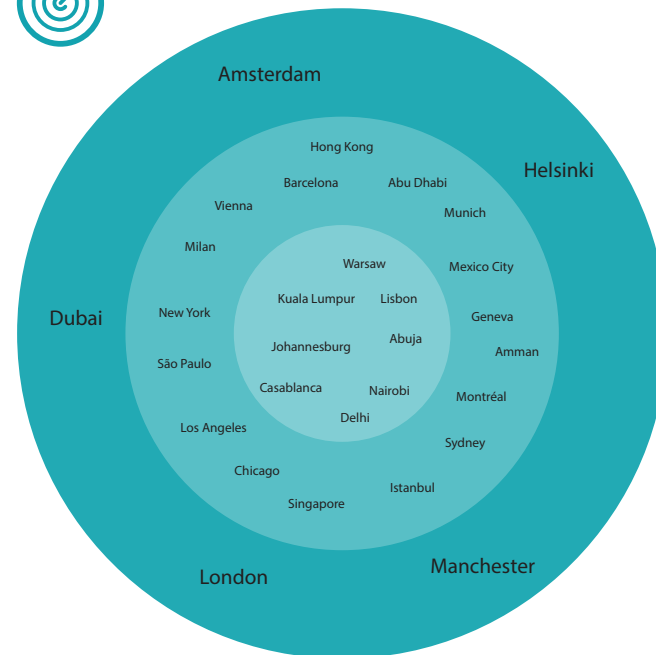
the concept of a living lab – promoting co-creation processes for innovators to experiment new solutions in a real-world context. Examples include Amsterdam, Barcelona and Helsinki. However, despite engaging the users in innovation processes, this is not yet an embedded approach for most cities.

SOUNDNESS

How is data used to inform and enable mobility-enhancing innovation in cities?

The quantity of data available in cities is increasing and there has been remarkable progress on the collection of different types of data at a city level – from manual collection, to service provider generation and sensor-derived, both static and real time.

Research shows that the most common data collected by urban mobility authorities is information on ticketing systems, vehicle location (GPS) and cameras (used either for licence plate recognition or for security purposes). There are also some examples of crowdsourcing through mobile applications, as well as some cities who have extended their data collection beyond transport to include data on demographics and environment.

Two of the key challenges that were identified in data collection are ensuring the quality of data and the adoption of standardised ways of collecting and sharing data.

There is little evidence on the extent to which cities are effectively analysing the data collected for internal purposes. Data analytics capabilities in city authorities are limited and the extent to which data is used to inform city processes is not easily demonstrated.

Nonetheless, there are a few examples of cities that use data to inform their internal processes, such as in Singapore. Through Singapore's Common Fleet Management system, the LTA uses the real-time data collected to turn its traditional bus timetables into a flexible, live response system. By using predictive analytics, the system helps bus drivers adjust their speed , which maintains a gap between services to manage demand at bus stops.

Another interesting example is Transport for London's longstanding partnership with the Urban Mobility Lab at the Massachusetts Institute of Technology (MIT). MIT have developed a methodology to transform 20 million daily Oyster records (provided by TfL) into behavioural clusters, which can be used to inform the operation and design of the transport network through predictive analysis.

High-performing cities are finding ways to turn their data into smart data. For instance, some cities provide open access to their data in structured databases which can be accessed by external stakeholders through APIs. Similarly, other cities have established agreements with universities to promote their data for research purposes.

For example, Transport for London are simplifying the process for third parties to access their open data by providing a unified API. The API pulls data from different transport modes and translates them into common and reliable formats and structures, making it easier for others to develop multi-mode applications.

While there are many interesting examples of how cities are collecting data and promoting data-driven innovations, – for instance, in Hong Kong, Chicago and Geneva – evidence suggests an interesting paradigm. On the one hand, there is much untapped value in cities that are still relatively immature in using data to inform decision and policy making in the city. On the other hand, there is a risk of data overflow, as considerable investments are being made in the instrumentalisation of cities to collect diverse types of data, when the full potential of its value is yet to be established.

Although there are many cases where cities have encouraged data usage through communities of innovators, there are not yet many concrete examples of what value has been added by such services in the development of new urban mobility solutions by third parties.

REGULATION

How do cities approach regulation to influence innovation?

Non-financial market barriers to innovations, such as regulation, contractual rigidity or high set-up costs, hamper the development of new mobility solutions by increasing the burden and cost of innovation on SMEs and start-ups.

Research has revealed that most cities have a reactive and passive response to regulatory barriers – particularly towards more disruptive innovations, as these explore new and unknown ground, which city authorities are not familiar with. Moreover, this type of innovation tends to be undertaken primarily by new entrants with whom they do not have pre-established channels of communication.

Given that most regulatory frameworks are designed at a national or federal level, cities should also consider innovative ways to act within the boundaries of their institutional power.

Several cities have been working with central governments, advocating for change at a national level. For example, in the case of Dubai, RTA recently announced its agreement with the ridesharing platform, Careem, allowing people in the city to book public taxis online via their app.

Equally, cities have also been creative in adapting their own rigid and bureaucratic processes. Challenge or outcome-based procurement processes have started to emerge in smart-city related areas, but are not yet common practice. Developments in this area include the procurement of new innovation mechanisms, such as Helsinki's Pre-Commercial Procurement and Public Procurement of Innovative Solutions.

It is worth noting the difficulty of assessing the indicators under 'Regulation', as absence of information in this domain poses the question of how open and prepared cities are for disruptive innovations and the challenges that fast-paced innovation-age

cities face. There is a need for cities to develop a proactive approach for identifying these obstacles to innovation and responding to innovation challenges, as space must be made for new solutions to be rolled-out and thrive.

INVESTMENT

What capacity do cities have to invest and attract investment for innovative mobility projects?

R&D investments are crucial for addressing societal challenges and improving wellbeing. Thus, investment is necessary to boost excellence and support innovation.

High-performing cities, such as Milan have a combination of funding, specifically intended for internal investment, and grants for external stakeholders.

Ring fenced budgets for internal investment are often restricted to capital expenditure, as used for the expansion of the cycling network, bus fleet renovation and core transport infrastructure. Whereas other R&D investments are typically subject to funding on a project-by-project basis – either through a local, regional or national approval process or a competitive innovation grant, which also promotes collaboration with third parties.

Hong Kong's multimillion 'Pilot Green Transport Fund', 'Dubai's Future Accelerators' and the 'Land Transport Innovation Fund' in Singapore are all examples of successful programmes, which aim to encourage third-party innovation.

Budgets allocated to grants are usually channelled to local innovation competitions or used as kick-start money for start ups. Equally, some cities actively promote external innovation through the creation of innovation awards and other competitions, e.g., the Smart Cities & Accessibility Challenge in Sydney and Apps4Warsaw in Warsaw.

Cities' ability to attract private funding for innovative mobility projects also varies significantly. Establishing close partnerships between the public and private sectors to co-create innovative mobility solutions is a key principle of many cities' mobility strategies.

ENGAGEMENT

How do cities engage with and act upon user insight and experience?

User engagement has become an increasingly common practice among city planners, designers and many other professionals to harness the knowledge of communities by opening their processes to the different stakeholders. Governments, businesses, civil society and academia work together to tackle complex problems in a more effective way - though often a more resource intensive and time consuming process - insights are gathered from the concerned parties, besides building trust and gaining support in the solutions proposed.

The lifecycle of user engagement should begin at the development of the city's strategic mobility plan, engaging in meaningful dialogue with the users of the city to gather insights on their needs and preferences. However, achieving active citizen participation in cities is not yet standard practice as many restrict this engagement to information or consultation processes (usually done with community workshops). Lots of engagement is happening but it is very difficult to assess the quality of the dialogue. Equally, active participation in which planning and decision making responsibilities are shared with the users - for instance by calling for ideas, through collaborative design methods or deliberative campaigns - is still an unusual practice among the cities.

Transport NSW created the 'Future of Transport' platform that comprises a set of different ways of engaging with Sydney's users. For instance, through the 'Join the Discussion' portal, Transport NSW called for citizens' ideas for the city's 'Future Transport Roadmap' during its consultation period. Another innovative initiative is the 'Future Transport Simulation', a gamification tool which is expected to be released still in 2017. The game will allow users to simulate decisions on where certain mobility-related investments should be placed over a timeframe of 40 years, and assess the potential impacts of the interventions they have made. The information is then circled back to Transport NSW.

Regarding feedback on user experience, it is mostly collected through paper-based surveys as cities lack automated systems to capture this type of data. Nonetheless, there are some examples of cities using this intelligence to improve local services and drive local innovation, although fewer cases exist in which these insights are fed into the planning process, creating a feedback loop to update the city's course of action.

A dedicated customer feedback group at Transport New South Wales categorise customer complaints and feedback, and maps the data across Sydney, helping to identify problems and actions for services at a local level. For example, by visualising geospatial user feedback, Transport NSW managed to determine certain bus routes were receiving similar complaints about bus arrival times. Actions were then identified to improve the timetables and provision of the services.

Even more advanced cities still have a narrow conception of the user as the passenger or customer of the transport network, instead of looking at the 'user' in a city context as any person who benefits from any opportunity the city provides, user or non user of the mobility services available.

Most cities undertake some level of engagement, but there is lack of evidence of embedding user-centred design principles for innovation in urban mobility.

CONNECTIVITY

How do cities encourage seamless and integrated mobility?

In order to develop innovative transport systems, the city must take a holistic approach to joining up infrastructure across the city, but seamlessness includes developing both physical and digital connectedness.

Currently, most cities ensure physical integration through integrated, interoperable ticketing systems. Whilst it is common for cities to have contactless ticketing systems and intermodal transport facilities, there is no evidence of cities investing in deploying barrier-free systems in the near future.

As for digital integration, transport operators are using their data mainly to improve their operations, but integration of the different mobility solutions offered at the digital level (e.g. mobility-as-a-service, MaaS) is still at an early stage of trialling or small-scale piloting.

Similarly, in most cities wayfinding is a functional tool to ensure users reach their destinations rather than to actively promote an efficient and effective end-to-end journey.

In the MaaS market, Helsinki was one of the first cities in the world to offer its users a different model to use the local transport system by bundling mobility services from different service providers that better suit users' usual mobility profile. Due to the quick success and promising benefits of Whim, the company has started is expansion to other regions, namely the West Midlands (UK).

WELLBEING

How easy is it for users to choose healthy and responsible travel habits in cities?

A more liveable city invariably involves increasing the share of walking and cycling.

Most cities recognise the societal value of healthy modes of transport for urban mobility, but as cities have been privileging the car and to a certain degree shaping around them, efforts required to ensure the security of pedestrians and cyclists are quite considerable.

However, safety along with fairness are both key elements of city users' wellbeing and happiness.

Albeit in more advanced cities users have a relatively wide range of alternative mobility solutions at their disposal in addition to conventional public transportation such as shared and community based solutions like bike sharing (being Barcelona, London, Chicago and Warsaw the UMii cities with biggest bike fleets available to users), carsharing, carpooling and pedibus, coverage of such options is quite diverse among cities as well as the quality of the service provided (elements not covered by UMii).

On the other hand, the relatively good performance of some cities on indicators within the liveability dimension, such as quality of life and fairness, is likely to be as a result of the lack of options available to users (in particular in less developed economies), rather than a reflection of an effective and efficient mobility system.

Nonetheless, research showed there is a big gap in data collection, and accessibility and fairness are especially quite difficult to assess. Particularly for cities with a seemingly good performance in soundness and engagement, this finding raises the question on whether the data being used to inform the city strategy is sufficient.

Understanding the quality of life of the users is critical, and therefore the indicators in the wellbeing lever were left unchanged reflecting the absence of data in cities, although not necessarily expressing the city's overall underperformance in this lever.

ENVIRONMENT

How well are cities performing in regard to energy consumption and air quality?

Interestingly, although concerns with air quality is a common thread in most cities regardless of their economic development stage, research suggest there is a disconnection between the strategies cities are implementing to address poor levels of air quality and the assessment of such parameters.

Similarly to the lever "Wellbeing", there is a big gap in data collection and integration of indicators around energy consumption and air quality, suggesting cities do not have an integrated, inter-disciplinary, monitoring system that allows them to analyse the causality of the local interventions and their environmental impacts.
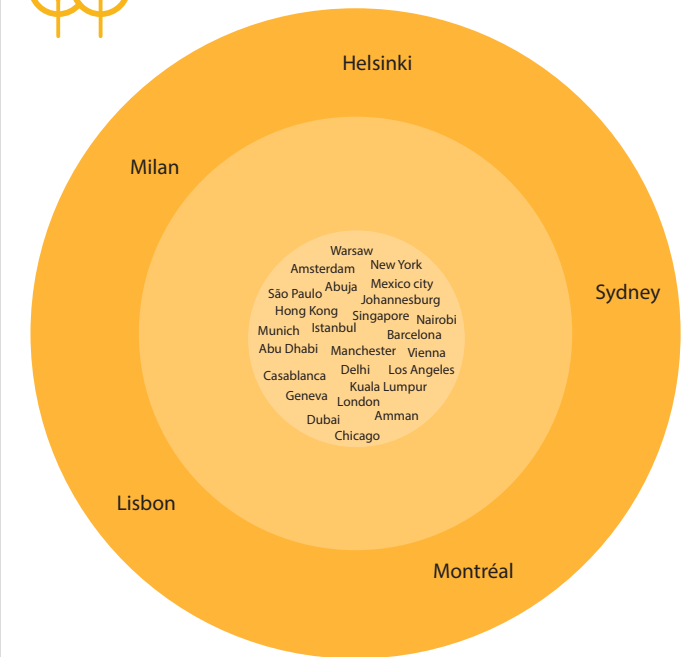
City profiles

This section is a collection of snapshots into the innovation ecosystem of the 30 UMii cities. Although not exhaustive, they uncover key insights captured during the research process to help identify opportunities for improvement while promoting knowledge sharing and intercity learning.

It is important to note that while UMii adopts a fairly sophisticated non-linear flow of input, process, output, outcome and impact components covering 52 different qualitative and quantitative indicators, the framework still has its limitations when considering the complexity of the innovation ecosystem and all the different domains it aims to assess. It should also be kept in perspective that the assessment of the different levers is subject to the best available evidence at the time of the report.

Singapore
Sidney
Vienna
Warsaw
Abu Dhabi
Abuja
Amman
Amsterdam
Barcelona
Casablanca
Chicago
Delhi
Dubai
Geneva
Helsinki
Hong Kong
Istanbul
Johannesburg
Kuala Lumpur
Lisbon
London
Los Angeles
Manchester
Mexico city
Milan
Montréal
Munich
Nairobi
New York
São Paulo

Abu Dhabi

Abu Dhabi's 'Capital Surface Transport Master Plan 2030' is guiding the city's strategic direction to deliver a transport system that contributes to economic growth, quality of life and environmental sustainability. The plan focuses on intelligent transport systems (ITS), active mobility and accessibility to drive a more connected and integrated system.

The Department of Transport (DoT) set up an innovation committee of representatives from mobility-related public bodies and other government departments, to help manage actions in the plan and monitor implementation of the strategy across the city.

Stakeholders from across the transport sector and community/citizen groups were invited to help shape the strategy through face-to-face consultation sessions and workshops. Engagement with these users followed a more consultative, than co-creative approach.

DoT have several methods for collecting mobility-related data across the city. For example, they work with mobile phone operators and use their data to help model and plan transport services. They also use a Bluetooth monitoring system, called 'BlueMAC, to gather real-time data on vehicle movements. However, open access for third parties to use this data to innovate is restricted. Most data is collected and managed by the DoT, and provision of data to third parties is subject to a case-by-case analysis of its commercial potential. There is no open data portal in Abu Dhabi, which could provide quick and easy access to mobility data.

The city recognises that regulatory barriers are limiting innovation in the city, and evidence suggests that there has been no strong push from policy makers to tackle these barriers. As a result, Abu Dhabi is considered a fairly regulated environment, making it challenging for spontaneous, private innovation from citizens or third-party developers. Innovation, therefore, is driven mostly by governmental priorities and ambitions through tendering processes.

The DoT has strong financial support for innovation in mobility. A dedicated funding line provides support for projects, whilst the DoT has access to funds from the annual budget to develop ideas into proposals. The DoT can also request funding that is often used to develop feasibility studies. Funding can still deploy innovations in

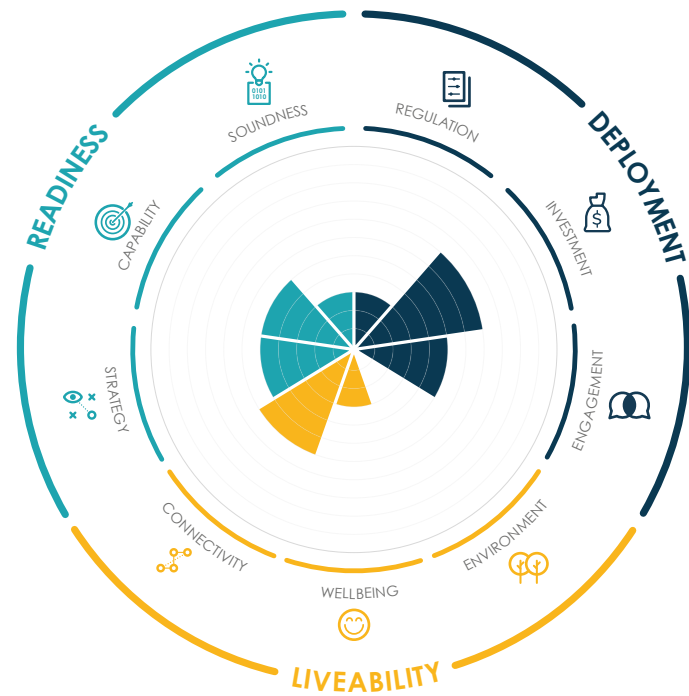**UAE GDP PER CAPITA** (2016)
£ 28,285

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
528
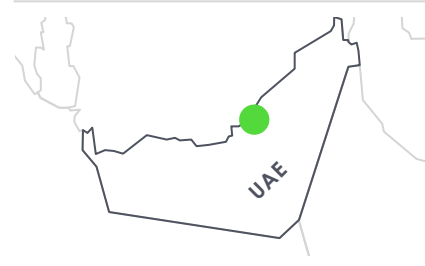
POPULATION (2015)
1,145,000

STRATEGY OWNER
Department of Transport

the city is sometimes perceived as high risk, but still can receive investment. The DoT can leverage additional funds by collaborating with private sector organisations and third parties to bid for R&D funds.

An example of the city's strong investment in innovation is the DoT's 'DARB' app. The application provides users with live data on traffic conditions, traffic incidents, road works, taxi services and on-street parking services. Users can save their favourite places and routes on the app and receive notifications on current traffic incidents along those routes during selected time periods.

As well as the DoT, third-party developers are also providing innovative mobility services across the city. 'Cycale' is the city's fully automated short-term bike sharing scheme, with over 300

bikes available across the city.

To reduce road congestion and promote public modes of transport, a Park and Ride scheme was recently launched in the city, with stations strategically located near bus stops and key interchange areas across Abu Dhabi.

Abu Dhabi's relatively low 'Environment' score does not necessarily reflect that the city is underperforming in this lever, but rather that there was an absence of data for key proxy indicators of air quality and energy consumption from the transport sector at the time that the score was calculated.

Abu Dhabi has an ambitious goal for 20% of vehicles in the city to be electric or powered by other alternative, sustainable fuels by 2030.

Abuja

Abuja's Transport Master Plan was last updated in 2001. Although the plan is reviewed on an ongoing basis, Abuja currently has no mobility or innovation strategy in place. However, there are several efforts by local authorities to improve the city's transport systems.

In Abuja, innovation is often not centred around high technology interventions, but rather, incremental improvements to the network. Thus, the city invests more in developing core transport infrastructure, such as their Bus Rapid Transport scheme and light rail systems.

The Transport Growth Initiative was also set up to support innovation in the city through promoting collaboration and partnerships, and organising advisory groups.

The city has a limited number of methods for collecting mobility data, which affects its ability to foster innovation. Despite government agencies collecting data on their various services, there is no central coordination of this data and it is often collected manually. Some agencies publish their data for users to access, whilst others store their data internally, meaning that users must write to the relevant departments to request the data. If the request is approved, data is provided to the user on a CD.

There is some evidence of innovation and solution-testing in the city; supported by both central government and the private sector. However, there is an absence of official coordination between the various public bodies involved in transport policy, and barriers exist for users who are developing innovations. For example, users are required to obtain ministerial permission to establish new transport projects or partnerships, and this is often a very slow process.

Abuja has several methods for engaging users. For instance, the Government has a radio and TV station, where it hosts shows on a range of topics, including transport. Similarly, town hall meetings are held periodically in the various districts and local councils across the city. Abuja's city administration has a website, where users can submit reviews, a public complaints office, and a 24-hour toll-free call centre, where users can share their views and report issues.

Abuja also uses innovative channels for providing users with transport information. For example, the Federal Road

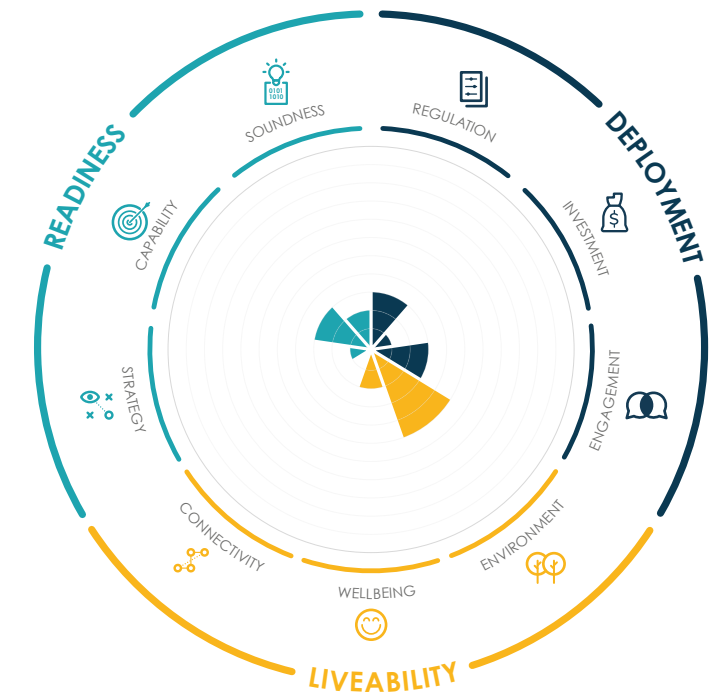**NIGERIA GDP PER CAPITA** (2016)
£ 1,636

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
61

POPULATION (2015)
2,440,200

STRATEGY OWNER
Federal Capital Territory (MFCT)

Safety Corps makes transport-related data available online. The site allows users to check the satisfaction levels and rankings of various transport services and operators across the city and, therefore, make more informed decisions about how they travel around the city.

High levels of congestion and a lack of integration across the transport network highlight the challenges the city is facing. Much of the system is underdeveloped and options for travel are limited and poorly connected. It is estimated that there are over 1,000 unofficial bus operators working in the city alongside official operators, making it difficult to coordinate and integrate public services.

Many of these challenges – such as informal mobility services and bureaucracy bottlenecks – impact users, who

have very few channels for receiving the information they need to navigate the city's transport system. In addition, there are no reliable timetables and limited information on bus routes in the city.

The relatively low score of Abuja in 'Wellbeing' does not necessarily express the city's overall underperformance in this lever but, rather, reflects the absence of data for key proxy indicators of quality of life and fairness, unavailable at the time the score was calculated.

In 2017, Nigeria's Federal Capital Territory (FCT) approved $950,000 funding grant for a pilot study of a Bus Rapid Transit (BRT) corridor in Abuja.

Amman

In December 2014, Amman joined the 100 Resilient Cities (100RC) network to develop and implement a 'City Resilience Strategy' – a process during which each city gains a better understanding of its challenges and reviews its ability to address these challenges.

Amman's strategy establishes a vision for a more resilient city and outlines the pillars, goals and actions to help achieve it. The plan explores how Amman can become a more integrated, smart, environmentally-proactive and innovative city.

Improving the mobility system is a key focus of the strategy. It is supported by a comprehensive plan for how to achieve it, with each action assigned an owner, status, timescale and project partners. The actions include:

- Develop an integrated mobility plan.
- Plan and construct an efficient BRT System.
- Build an urban mobility observatory (data store).

Another key ambition of the strategy is to promote participation and engagement throughout the city, bridging the gap between Amman's institutions and citizens. Nonetheless, engagement with users is currently still limited, and consultation events (or similar) aimed at shaping the city's strategic direction or major infrastructure projects is not common practice.

Following a lack of consultation on the recent BRT scheme, which resulted in an overall negative public opinion and protests towards the project during construction, the city is now working to develop its capability around user engagement. The council now recognise that early engagement could have addressed the concerns of citizens and avoided the protests. Following this experience, the municipality has now established a radio station and weekly open public meetings with the Mayor and top city management at the City Hall to communicate and discuss any complaints people may have.

Innovation in many cities is often limited by regulatory barriers. However, in Amman, there is little regulation hindering the introduction of new solutions in the market. As a result, Uber, Careem and unofficial shared taxis all operate within the city. Despite there being few barriers, the testing of innovations is not particularly encouraged, and it often occurs spontaneously.
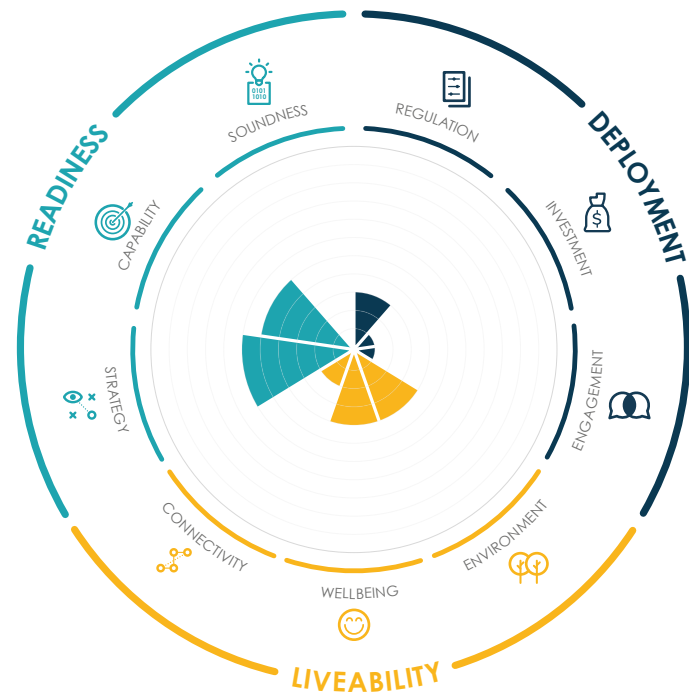
JORDAN GDP PER CAPITA (2016)
£ 3,467

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
90

STRATEGY OWNER
Greater Amman City Council

POPULATION (2015)
4,008,000

Amman is currently collecting basic statistics and data on the number of road vehicles in the city and some demographic data from surveys, but there is little data on transport or mobility. Data collection is often held internally by individual transport operators and is not made openly available.

An unofficial transport map, which integrates various routes across the city, was developed by a local NGO, Maan Nasel, in cooperation with the Greater Amman Municipality.

Amman's relatively good performance across the liveability dimension, 'Wellbeing' & 'Environment', can be attributed to the low final household expenditure on transport services (circa 2%) and the high share of walking in modal split (26% of total trips in Amman).

$160 million has been invested to develop a BRT system in Amman, which is currently under construction.

Amsterdam

Amsterdam is a leading city in regard to strategic thinking. They have adopted an approach of learning by doing, where a range of different measures are explored and tested, rather than a traditional strategy, which identifies specific measures that support one vision.

This experimental approach, enabled by the 'Amsterdam Smart City' community, creates space for stakeholders and innovators to come together and research potential solutions for common urban challenges. However, it is unclear how these experiments will contribute to a common goal, considering that there are no clear objectives in the strategy.

Nonetheless, Amsterdam is investing a significant amount in innovation across urban mobility. The city recently invested €50 million in creating the 'Amsterdam Institute for Advanced Metropolitan Solutions' (AMS) to attract and retain international students and strengthen technology. The AMS Institute brings together scientists, educators, government, business partners and societal organisations to work together to create solutions for the complex challenges the metropolitan region is facing across their various urban systems.

The institute develops research and innovation projects on active transport to generate real-time insights and predict pedestrian and bicycle movement around the city. For example, the 'Think Fast, Go Slow' research project aims to provide an accurate simulation tool to support better planning, design and management of urban mobility infrastructure for active modes of travelling. The project is driven by the ambition to better understand the interfaces between pedestrians and cyclists in shared spaces. The institute also looks at Mobility-as-a-Service, driverless cars and electric mobility.

Amsterdam embraces open innovation through an integrated datastore, managed by DataLab, which combines mobility and non-mobility data sets. Data can also be accessed through the Amsterdam Function Map: an interactive map, which visualises and exports open data from across the city into a variety of formats.

Data analysis allows the city to better understand how users are interacting with the transport network. 'Allegro' is a research project, which uses cycling and walking data to improve safety and infrastructure and gain insights for policy.
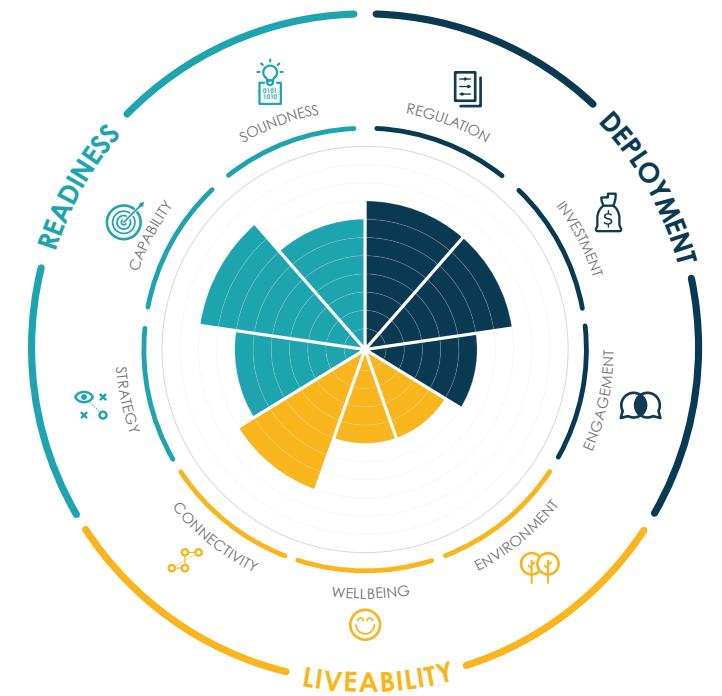
NETHERLANDS GDP PER CAPITA (2016)
£ 34,052

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
371

STRATEGY OWNER
Amsterdam City Council

POPULATION (2016)
821,752

As part of a nationwide fare-integration initiative in the Netherlands, Amsterdam offers citizens a multi-modal, contactless travel card, called the Amsterdam OV card. The card can be used on any mode of public transport and beyond the metropolitan area, making it easier for people to commute across the country. It is also expected that the Mobility-as-a-Service application, Whim, which provides information on routes, tickets, timetables and booking options, will be launched in late 2017.

Amsterdam is considered the world capital of cycling, with active modes of travel being very popular in the city: 32% of journeys in Amsterdam are by bike and 63% of citizens use their bike on daily basis. The number of registered electric car owners increased by 53% to 28,889 in 2016 compared to 2015.

The relatively low Wellbeing score of Amsterdam does not necessarily express the city's overall underperformance in this lever, but rather reflects the absence of data for key proxy indicators of quality of life and fairness, unavailable at the time the score was calculated.

Amsterdam is considered the world capital of cycling; 32% of traffic movement in the city is by bike and 63% of its inhabitants use their bike on daily basis.

Barcelona

Barcelona has a clear and established strategic focus on urban mobility and innovation. Urban mobility is planned at two-levels: the 'Urban Mobility Plan of Barcelona PMU 2013-2018' and the 'Regional Mobility Plan', which looks at all types of mobility, including freight and logistics.

Barcelona has developed a comprehensive baseline, which covers the supply and demand of mobility options available in the city. They have also produced a thorough plan of action, which considers multiple scenarios of mobility interventions and their impacts across various urban systems.

There is a strong understanding of the role the user can play in Barcelona. Third-party developers and users are actively engaged in using open data to innovate and develop solutions to the challenges identified by City Hall. One example of this engagement in-action is the annual three day 'Hackathon Mobility Barcelona'. This is an open hackathon for developers and third parties, which explores three key themes: Smart Mobility, Driving Experience Applications and Driving Experience Hardware.

The city has a very open approach towards data, encouraging its use. By providing access to several APIs, third parties have direct and reliable access to real-time data. This data platform also has a section that hosts visualisations created using data, highlighting potential use cases, supported by user guides.

The City Hall also collaborates with local universities – one of which has a department that focuses on urban mobility and innovation. They provide the universities with data to use on research projects and are currently working in partnership to develop a model, which combines mobility and air quality data, to gather insights for mitigating the impacts of vehicle pollution.

Whilst the city provides various initiatives to support third-party developers, regulatory barriers limit the development and deployment of innovative mobility solutions. The Spanish Competition Authority has recently intervened, urging the removal of certain restrictions, which block on-demand ride services – such as Uber – from entering the market.

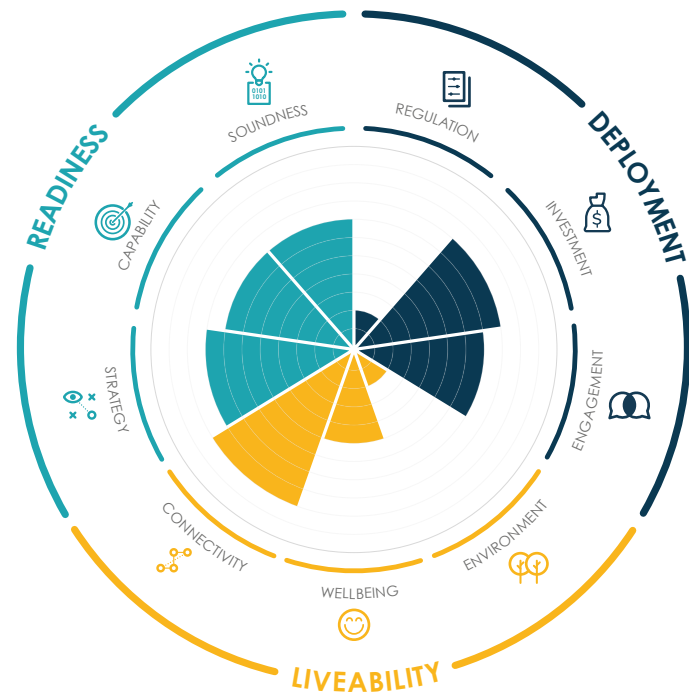**SPAIN GDP PER CAPITA** (2016)
£ 19,953

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
383

POPULATION (2016)
1,609,000

STRATEGY OWNER
Barcelona City Council, Department of Mobility

The mobility system is well integrated, with good infrastructures and interchange facilities between buses, trams and the metro. A single, integrated fare system has been developed across the city and the Metropolitan Region. Currently, the Metropolitan Transport Authority is developing a 'T-Mobility system', where users will be able to use contactless cards, NFC phones and devices, such as smartwatches, to access the city's transportation network, as well as other mobility services.

Bike sharing is widely available in Barcelona through the 'Bicing' scheme, which is managed by the city council. The platform has more than 420 stations across the city, with over 6,000 bikes available to users. The city also provides users with access to electric sharing bikes and motorbikes.

LIVE is a public-private platform which promotes sustainable mobility in Barcelona by developing projects, policies, strategies, new business models and creating a knowledge network.

Casablanca

In 2014, the '2020 Development Strategy of Casablanca' was published. The strategy outlines the city's future development ambitions around quality of life, connectivity, mobility and a creative economy – encouraging improvements in leisure and preservation of the city's heritage.

The strategy cascades into several key targets and goals to address these areas, supported by details of interventions, dates of completion and investment requirements. The outcomes of these interventions are also explored, focusing on their impact to society, the environment and the economy.

Mobility programmes benefit from half of the strategy's investment budget, which aims to provide users with a connected, seamless transport mobility system. The plan outlines a vision statement with actions that are based on a sound baseline of the city and supported by quantitative data.

The City of Casablanca is beginning to develop data collection methods to generate more data, such as vehicle detectors, which are being deployed across the road networks near traffic lights to provide valuable insights into traffic conditions. 'Casa Open Data Portal' is a data platform where users can openly access data collected from across the city. However, this is mostly static data and it is unclear how often the data is collected, refreshed and updated on the portal.

Internally, data has been used to create and adapt a comprehensive traffic forecasting model for the city. This is used to support and better understand users' responses during events in the city, such as Ramadan or severe weather events.

There is a dedicated fund for financing urban mobility initiatives in Casablanca, established in 2017. The Fund for Public Transport mainly supports the development of modern public transport systems in Casablanca, such as the implementation of a central control station for traffic regulation and security.

A separate investment budget of £3.1m is also available for mobility projects. The funds are intended to help achieve the ambitions outlined in the '2020 Development Strategy of Casablanca'. However, it can be challenging for innovators to access these funds, which are more frequently used for infrastructure projects. The city has no specific methods for supporting third-party innovation.

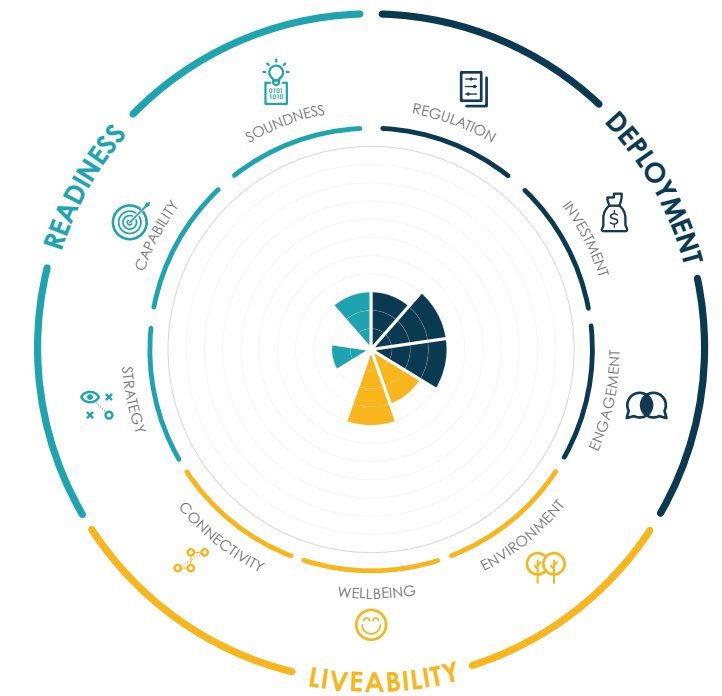**MOROCCO GDP PER CAPITA** (2016)
£ 2,129

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
369

POPULATION (2015)
4,055,000

STRATEGY OWNER
Casablanca City Hall

One of Casablanca's main challenges is to increase integration between the different services in the city. Tramways and buses – two major modes of transport in the city – are operated by separate organisations. There are many different operators and fare systems across the city, with no integration between the payment methods.

The relatively low score of Casablanca in 'Wellbeing' does not necessarily express the city's overall underperformance in this lever, but rather reflects the absence of data for key proxy indicators of fairness and quality of life unavailable at the time the score was calculated.

By 2022, Casablanca is aiming to develop 10 multi-modal transport interchanges in the city to create a more integrated network.

Chicago

'GO TO 2040' is Chicago's overarching regional plan. It was last updated in 2014 and sets out recommendations for its 284 municipalities.

There are multiple strategy and policy documents in the regional plan, which shape Chicago's strategic direction around urban mobility, (e.g. 'Chicago Forward Action Agenda' and 'Sustainable Chicago 2012-2015 Highlights & Look Ahead'), however it is unclear how these initiatives contribute to the overarching goals presented across the different documents that outline the strategic thinking.
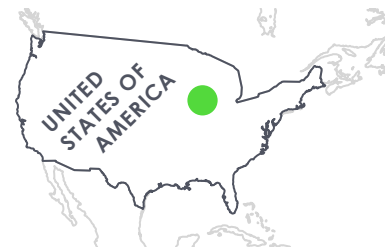
Nonetheless, there is a strong recognition by the Chicago Metropolitan Agency for Planning (CMAP) that transport, land use and housing are interconnected at a strategic level. For instance, when the Metropolitan Planning Council was researching options for the construction of a bus rapid transit corridor in the city, they consulted the 'Housing & Transportation Affordability Index'; a tool, which combines both the cost of housing and transportation to provide a comprehensive overview of affordability.

Moreover, the CMAP conducted an extensive engagement phase, called 'Invent the Future' to ensure that members of the public were involved in shaping Chicago's strategy. Users were invited to create their own alternative future scenarios through workshops, on the CMAP website, at multimedia kiosks or at community fairs and festivals. At the end of the phase, scenarios that best reflected the region's desired future were identified.

Third-parties are also encouraged to use data in innovative ways to develop innovations to the city's challenges. The CMAP and Chicago's Department of Transport (DoT) recognises that the availability of open data is central to fostering innovation, and so they have developed mechanisms to collect data from multiple, automated sources. 'Array of Things' is a project which has deployed over 500 sensors across the city. The project automates the collection of vehicle and pedestrian counts, but also collects data from areas that intersect with mobility, such as local air quality.

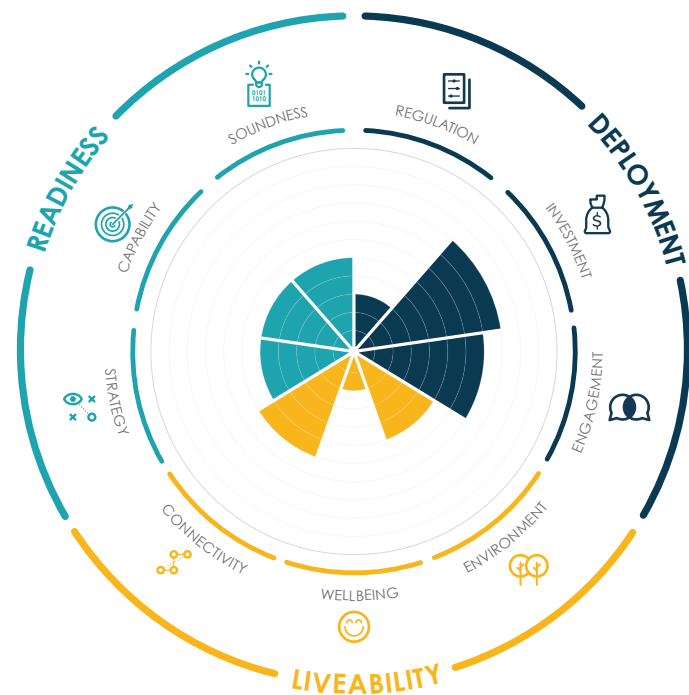To further promote innovation, the 'City Digital' initiative was established in 2015 as a test bed platform for

NORTH AMERICA GDP PER CAPITA (2016)
£ 42,045

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
391

POPULATION (2016)
2,705,000

STRATEGY OWNER
Chicago Metropolitan Agency for Planning (CMAP)

third-parties to develop solutions to real problems in the city and deploy new technologies across four key areas; one being mobility.

Investment in innovation has been a shared effort among local stakeholders. The University of Chicago's $20 million 'Innovation Fund' invests in proof-of-concepts and viable start-ups developed by its faculty and students. Funding cycles are held twice a year and, to date, the fund has invested $3.9 million in 54 start-ups. Each funding cycle produces more advanced projects from an ever-growing community of researchers, with many R&D initiatives coming out of the ideas submitted.

Various alternative mobility solutions are provided to users across the city. Implemented by DoT, 'Divvy' is a well-integrated, widespread bike

sharing system with nearly 6,000 bikes available across the city. The availability of bikes at docking stations can be viewed in real time and booked through a mobile application, which also provides feedback on user experience to the DoT. Other mobility services in the city can be purchased through 'Ventra', the cities smart, integrated ticketing system. Ventra can also be used to purchase goods and pay for bills.

Chicago is prioritising the maintenance and modernisation of services, which will account for more than 97 percent of the proposed transportation funding over the next three decades.

Delhi

In 2006, Delhi published the 'Delhi Master Plan MPD 2021: Future Transport Policy', which aims to develop more cost-effective and efficient modes of transport through a well-integrated multi-modal transport system. However, the plan focuses on enhancing the core transport network, without a plan for addressing incremental innovation beyond infrastructure.

Delhi Transport Authority (DTA) does not currently have a strong network of partners to support innovation, since partnerships with local stakeholders, such as the Indian Institute of Delhi, were put on hold due to a breakdown in the working relationship. However, the Unified Traffic and Transportation Infrastructure Centre (UTTIPEC), launched in 2009, is a step closer to bringing the city's stakeholders and agencies together to integrate urban transport and policy, and encourage community participation.

Whilst data collection is fragmented in the city, there are examples of automated collection systems, such as GPS in buses, taxis and rickshaws (tuk-tuks). For example, the DTA has access to real-time location data of over 85,000 tuk-tuks in the city. However, this data is not openly accessible. Citizen groups can request the release of specific data sets from the government, but it is difficult to identify who is responsible for releasing it, so this often does not happen.

There are also non-financial barriers in Delhi, which prevent new products and services from entering the market. For example, businesses are required to gain permission from various bodies before testing an innovative product or service in the city and this can be very difficult to obtain. In 2016, a Swedish company introduced Zbee (electric rickshaws) into the surrounding areas of Delhi. Unable to attain the relevant authorisation to deploy and operate Zbee across the city, the company decided to abandon the idea.

Delhi Metro and other public bodies are trying to develop new platforms for users to access transport information. The 'Pooch O' application, developed by Delhi Metro, helps users better navigate the transport network and make more informed mobility choices. Users can see the location of auto-rickshaws and taxis in real-time, receive estimated fares, distance and travel times, alternative routes and live traffic information. Users can also use the application to rate their experiences

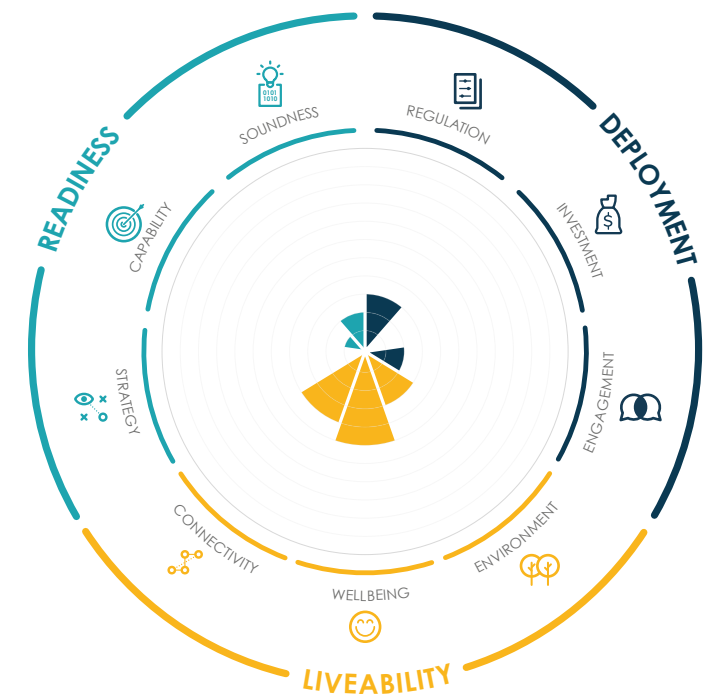**INDIA GDP PER CAPITA** (2016)
£ 1,284

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
147

POPULATION (2016)
18,600,000

STRATEGY OWNER
Delhi Transport Department

on various mobility services. The government also launched a project to install variable message signs on selected bus stops in the city, but it was not as successful as hoped, due to unreliable data quality.

To encourage the use of public transport in the city, the 'More Delhi' card was made available to users in 2012. The card can be managed online and can be used on both the Delhi Metro and Feeder Buses, with the card to soon be integrated with the Delhi Transport Corporation, who run many private bus services in the city.

There have been some attempts to introduce alternative mobility systems in the city. For instance, a bike sharing scheme was launched across the city. However, the system was abandoned due to low adoption levels. Despite Delhi being one of the first cities to

promote the concept of public bike sharing, they have not yet prepared a concrete plan of how to deploy these services across the city.

In keeping with India's ambitious goals to ensure every car sold in India will be powered by electricity by the year 2030, the National Thermal Power Corporation (NTPC) have started deploying charging infrastructure across the city.

Dubai

Dubai Roads & Transport Authority (RTA) recently updated the 'Strategic Plan 2016-2021', which focuses on how innovation in mobility can act as a catalyst for developing connectivity, integration, information management and smart solutions for public transport and traffic in the city. The plan also considers how mobility impacts other urban systems and looks at how transportation and urban planning could be better integrated.

RTA also created an 'Innovation Strategy', which aims to guide the city in becoming a leader in the field of mobility innovation.

10 different teams – including the 'Innovation' and 'Future Accelerator' teams – have been established by RTA to foster innovation in the city and deliver the strategy.

RTA have developed several partnerships with academic bodies who offer expertise and capabilities relevant to R&D and technology development projects. Other public agencies and private sector organisations attend idea generation sessions hosted by RTA, encouraging collaboration between stakeholders. An online portal is also available for employees to submit innovative ideas.

The large amounts of data collected by RTA are being used internally to perform analytics and enhance planning. For example, RTA use data collected from a taxi tracking system to calculate KPIs relating to average journey time, journey distance and speed. This data helps them improve transport planning, better understand journey origins and destinations, and estimate speeds along different roadway segments.

The 'Dubai Data Strategy', led by the Dubai Data Establishment (DDA) and decreed by the Dubai Data Law of 2015, outlines 11 key strategic objectives for how the city could better use data to drive innovation. A major principle underlying the initiative is that the Dubai Government establish a platform for the exchange of open data.

'Dubaipulse' provides open access to datasets across the city. RTA manages the data relating to transport on the portal, which includes static data on transport stations, routes and ridership levels. A data collection and sharing framework, called the Dubai Data Manual, is also publicly available and shares best practice to encourage public and private stakeholders to open and share data.

To support innovation from third parties and the private sector, RTA works closely with 'Dubai Future Foundation' to foster innovative ideas. RTA have signed four agreements in this programme, including Hyperloop,
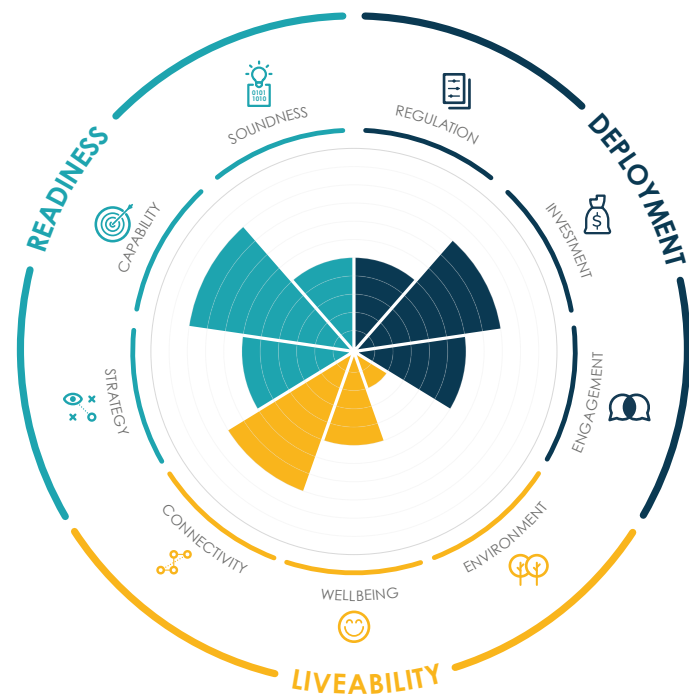
UAE GDP PER CAPITA (2016)
£ 28,285

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2016)
560
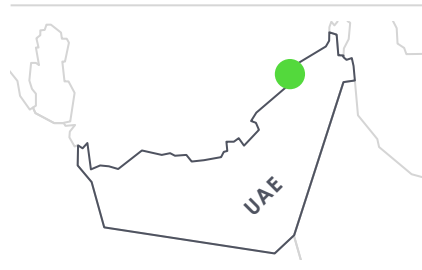
POPULATION (2017)
2,854,292

STRATEGY OWNER
Roads and Transport Authority (RTA)

driverless shuttles and autonomous demand responsive services, such as Uber and Careem.

Innovations, which are being developed and tested in Dubai, are supported by streamlined leadership and decision-making processes. Current regulations and contract conditions have been tailored to allow RTA to test and pilot innovations with innovative companies, start-ups and universities.

To enhance the connectivity and accessibility of public transport across the city, RTA have developed and deployed an integrated journey planner, called 'Wojhati'. The service enables customers to plan their trips using real-time information for various modes of transport.

RTA are preparing to launch an 'Integrated Mobility Platform', which will provide users with an integrated, single point of access to various mobility ser-

vices. RTA's multi-modal transit systems, such as the metro, trams, buses, marines and taxis, will be integrated with private transit services in the city, including e-hailing services, Palm monorail and Dubai Trolley. The platform will be provided through a mobile application, where users can book and pay for any of the services available.

Looking further ahead, RTA has prepared a comprehensive multi-modal 'Self Driving Vehicle Strategy', which aims to raise the share of self-driving trips in Dubai from the current 8.8% to 25% in 2030.

In November 2016, RTA signed an agreement with Hyperloop One to explore how technology can be used to connect Dubai to the greater United Arab Emirates, reducing journey times between Abu Dhabi to 12 minutes.

Geneva

In 2013, after wide consultation, Geneva set out its 'Mobility 2030 Vision'. The vision has a strong focus on improving multimodal transport in the city and identifies numerous targets, such as being 100% electric and 0% diesel by 2030. However, it is unclear how the city plans to execute these ambitions.

There are examples of mobility innovations being tested in Geneva by the public and private sector. The TOSA E-Bus is a fully electric bus, which uses 'Flash Charging Technology', enabling it to charge while in service, with enough energy to reach the next charging point. After a successful pilot demonstration in 2016, the Geneva Public Transport (TPG) agency confirmed it would add 12 more electric buses to the council's services and support the development of a 'flash-charging' network in the city.

In Geneva, various mechanisms are used to collect mobility-related data. The General Directorate of Transport has helped to provide open access to this data through an integrated data platform, which allows users to view and download data through four interactive city maps:

1. Simple: Users can access street maps, location of amenities and transport infrastructure.

2. Professional: Users have access to street maps and additional tools for understanding the data, such as data analytics.

3. Three Dimensional: Users can explore Geneva in three-dimensional maps.

4. SITG Mobile application: Users can navigate spatial data directly from a smartphone or tablet.

The city's Ministry for Transport is helping overcome regulatory barriers to third-party developers and support innovation by deregulating the environment. A recent example of this can be found in the development of a new mobile phone application, which allowed users to find available car parking spaces in the city. Regulatory barriers were threatening further deployment of the sensors, which were required to map the available parking spaces, however conversations with policy makers enabled these regulations to be amended.

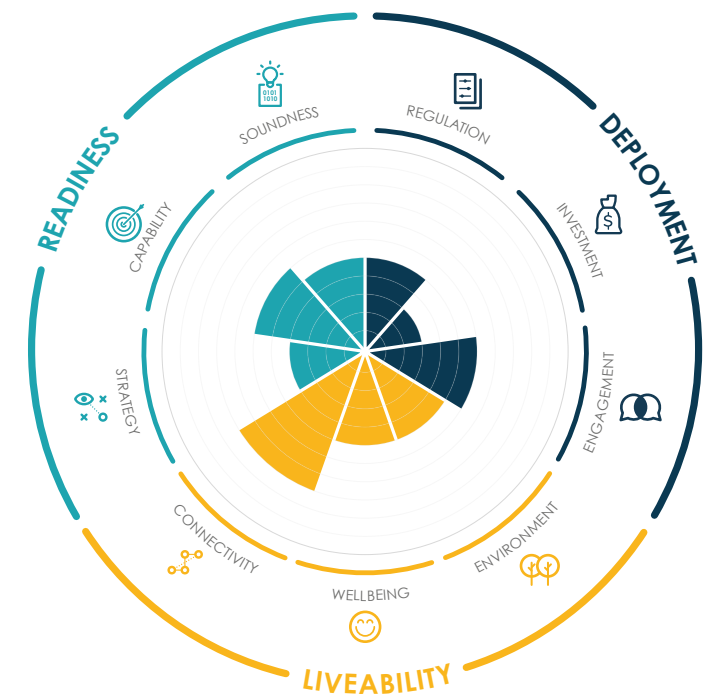Geneva also engages with users to gather insights on their needs. Whilst

SWITZERLAND GDP PER CAPITA (2016)
£ 59,250

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
467

POPULATION (2015)
470,000

STRATEGY OWNER
Department of Environment, Transport & Agriculture

it is common practice to hold project consultation events with users and collect information from traditional surveys, the General Directorate of Transport is developing a more innovative approach to collecting data. Origin-destination data is now captured automatically from users' mobile phone connections to the 3G and 4G networks.

Although these users benefit from the real-time data collected across the city for different modes of transport, there is currently no multimodal journey planning application, which provides this information to users in a unified way.

The fare community in Geneva, UNIRESO, aims to offer users a seamless fare system for transport across different operators. A smart card integrates fares across seven

public transport operators into a single tariff community, covering all modes of public transport.

Access to public transport in Geneva is very good, with 98.9% of the population living within 500 meters of a public transport service. Access to alternative mobility solutions is also widely available. Car, bike and e-bike sharing services, whether private or public, are available to users, but limited to certain areas.

Geneva has set itself the ambitious target of having 100% electric and 0% petroleum vehicles by 2030.

Helsinki

Helsinki's Regional Transport Authority aims to increase technology across the urban mobility arena and help create a safe and sustainable transport network, which encourages the use of public transport.

The 'Helsinki City Plan – Vision 2050', published by the City of Helsinki Planning Department in 2013, provides a more detailed, goal-oriented future view of urban issues, including the development of a sustainable mobility system.

However, there is little evidence for how the strategy will be executed and monitored. There is no detailed roadmap outlining the resources or responsibilities needed to achieve the plan, and there are no innovation metrics through which to measure its success.

The city has a strong tradition of being open to testing innovations from third parties. Processes have been established to promote user-driven methods, and tools have been created to improve the development of products and services in real-world conditions. For example, the 'Helsinki Living Lab', established by the local innovation agency, Forum Virium, acts as both a communications hub and a brand – enabling companies and the public to cooperate with the various living labs in Helsinki's metropolitan area.

Helsinki exhibits several advanced mechanisms for collecting mobility data from across the city. This is reflected in their movement towards IoT systems and the deployment of sensors across the city, where they monitor things, such as air quality, traffic, pedestrians and cyclists. By combining these sensors, the city generates rich and valuable data, which is then made open to encourage prospective third-party developers to innovate. APIs are also available to users to provide them with real-time access to mobility data; such as the location and departure times of buses and trains on the metro.

An example of how this open approach helps third party developers innovate, is 'Digitransit'. 'Digitransit' is a journey planning app, which is built around the user and shows routes, stops and live arrival/departure times – all of which can be customised by the users.

Helsinki's innovative approach to data also helped to develop one of the first Mobility-as-a-Service solutions to be deployed across a city. 'Whim' is a mobility application that offers users a range of monthly bundles of mobility
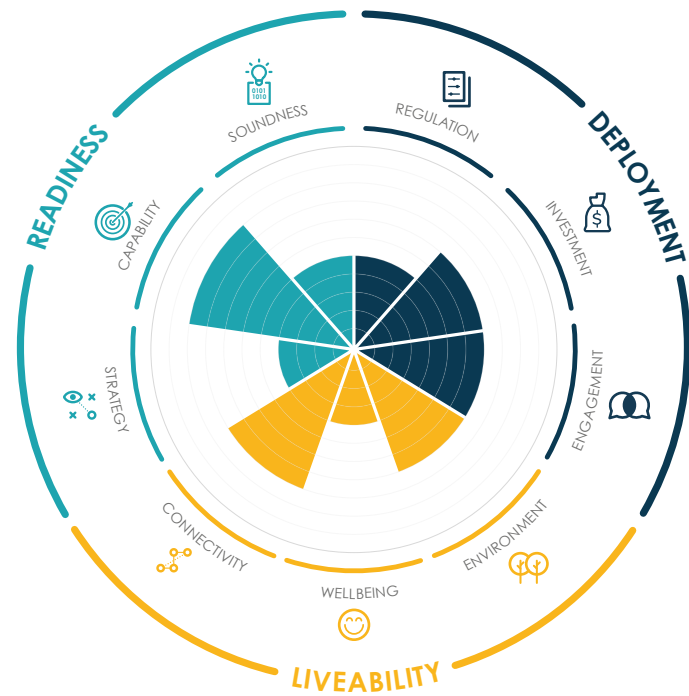
FINLAND GDP PER CAPITA (2016)
£ 32,395

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
391

POPULATION (2015)
629,512

STRATEGY OWNER
Helsinki Regional Transport Authority

services to be purchased by the user, provided by different operators which are typically not integrated (public transport, taxis, car rental) to better suit their usual mobility profile. This is creating a more seamless commuting experience for the user (who can also opt for a pay as you go variant).

Helsinki's ability to support and foster innovation has also been boosted by the Finnish Transport Code, which introduces more flexibility to the regulatory environment. The Code achieves this by removing barriers and bottlenecks, helping to accelerate the development of mobility innovation in Helsinki. City representatives were part of the Transport Code working groups.

Third parties are further encouraged to innovate through competitions and hackathons, such as 'Apps4Finland' and 'Open Helsinki'.

Helsinki is actively identifying urban challenges in the city to help guide third-party solutions. The challenges are identified by engaging users from across the city to understand their experience of using transport in the city. This is traditionally completed through open face-to-face sessions, consultation events and surveys.

The relatively low score of Helsinki in 'Wellbeing' does not necessarily express the city's overall underperformance in this lever, but rather reflects the absence of data for key proxy indicators of quality of life and fairness, unavailable at the time the score was calculated.

The world's first ever Mobility as a Service solution, Whim, was launched in Helsinki Region at the end of 2016.

Hong Kong

Hong Kong's strategic direction is outlined in 'Hong Kong 2030: Towards a Planning Vision and Strategy Transcending 2030', which was published in 2016.

The vision is built around social, economic and environmental sustainability and has three key aims:

- Planning for a liveable, high-density city;
- Embracing new economic challenges and opportunities;
- Creating capacity for sustainable growth.

Although the strategy presents actions for how to achieve the aspirations, it is unclear how they will be effectively delivered or who is responsible for the implementation of individual actions.

An expert advisory panel was tasked with supporting the development of the strategy to provide professional third-party input to the strategy. The panel was identified through a stakeholder mapping exercise and includes academics, professionals and representatives from various sectors such as economics, planning, and environment.

In Hong Kong, the Office of the Government Chief Information Officer maintains an open, integrated data platform, which provides users with access to a wide variety of live and static transport data from government departments and other public and private organisations. 'Open Data Hong Kong' is a separate initiative, which supports open data in the city. It is a volunteer-run group of analysts, programmers and researchers who advocate for increased availability and quality of data. They liaise with the Government and other sectors to facilitate the release of data, whilst raising awareness and sharing knowledge about open data.

This open approach to data has encouraged developers to build various mobility solutions. 'HK Drivers' is an all-in-one mobile application, which provides drivers with access to real-time traffic information, as well as the location of various amenities across the city. Built using open data, the application also allows vehicle owners to record and manage mileage and the expenses of their vehicles, including fuel consumption and operational costs.

To encourage third-party innovation in the city, the government has set up the $300 million 'Pilot Green Transport Fund'. The fund, launched in 2011, aims to support the testing of green innovations to improve roadside air quality and reduce carbon emissions from the transport sector. By mid-2017, 101 projects had been support-
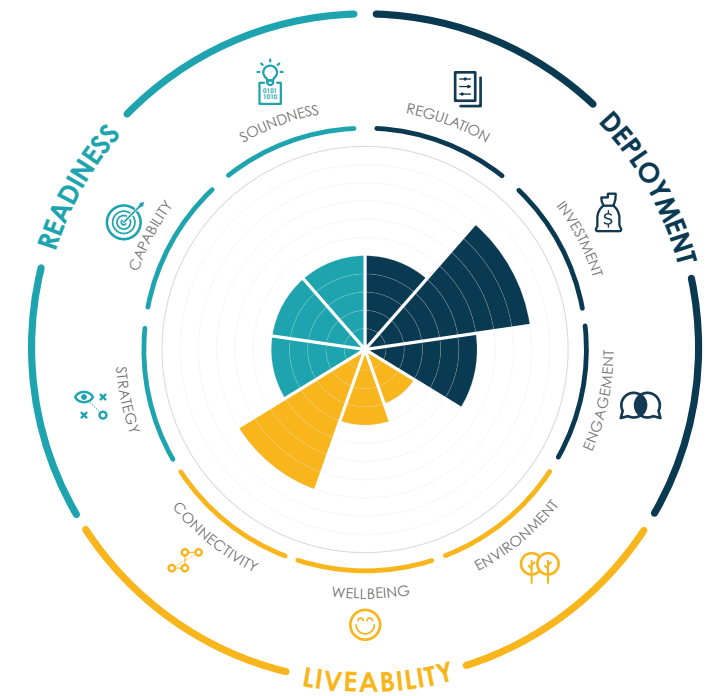
HONG KONG GDP PER CAPITA (2016)
£ 32,839

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
70
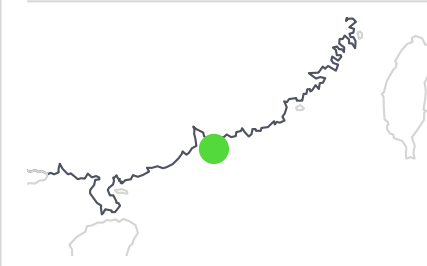
POPULATION (2016)
7,347,000

STRATEGY OWNER
Hong Kong Planning Department

ed by the fund, amounting to a total investment of roughly $86 million; applications for funding will be open until the budget is fully utilised.

The Hong Kong Transport Department has different engagement models for capturing feedback from different user groups and an expert advisory panel for consultation. When developing a new strategy, feedback is often collected through an online portal, which is used to capture information from the various user and community groups. Other mechanisms used to collect feedback include public forum meetings, exhibitions, seminars and guided visits.

The city has developed innovative ways of leveraging funds to pay for many of the innovations and high-quality services available to users. For example, MTR, Hong Kong's Public transport operator, receives a share of the retail profits or a percentage of property development fees in return for transporting customers to retail units and shopping malls.

The city council also has the world's highest 'farebox recovery ratio' – the percentage of operational costs covered by fares – at 185%. These additional funds go towards improving the integration and connectivity of the network. For example, providing infrastructure investments creates additional and better transport interchanges. An example of this is the integration between several underground routes, which have been planned and designed to provide seamless transfer between lines. When connecting to a different underground line.

Hong Kong's integrated ticketing system, the Octopus Card, can be used across all modes of public transport and provides users with a single fare system. The card can also be used to purchase goods from retail stores.

In Hong Kong, just under 90% of all trips are made via public transport.

Istanbul

Istanbul Metropolitan Authority published the '2015-2019 Strategic Plan' which guides innovation across urban mobility. The plan is not solely dedicated to mobility, rather it is just one of eight urban systems which considers several different urban aspects like governance and land use.

Although the Strategic Plan presents several actions and goals, it does not provide details on how they will be delivered, for instance the funding available and who is responsible for delivering specific actions. However, within the Metropolitan Authority, a dedicated team is responsible for the implementation of the strategic plan which is monitored and reported on every five years.
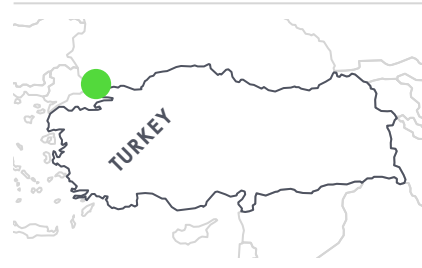
Aiming to create a network of capabilities, the Istanbul Metropolitan Authority is bringing together multi-disciplinary competencies to help with different research needs through established networks with universities, private sector organisations and third-parties. This network is helping to shape how an open data store in Istanbul would function.

In 2017, the Istanbul Metropolitan Municipality also signed a smart city partnership with 'Ericsson' to achieve the city's smart city vision and 2024 targets, with mobility identified as one of seven focus domains.

Although there are a wide range of mechanisms to collect data across the city (integrated ticketing, surveys, sensors), there is instead no integrated data platform in Istanbul to provide open access for third-party developers to the data. Nonetheless, there is high-quality level of data collection following the adoption of 'Telehouse Data Centre Standards' and through membership to the International Benchmarking Group.

Despite the absence of a data platform, the Istanbul Municipality recognises the value of its data to external users and allows stakeholders to directly request the release of data, which is helping to create partnerships with interested third parties. These partners are invited to workshops hosted by the City Council to better understand their needs. A key finding from these conversations is the need for open data in a standardised data structure. Academics have access to the data collected from the 'Istanbul Card' to inform studies and academic literature.
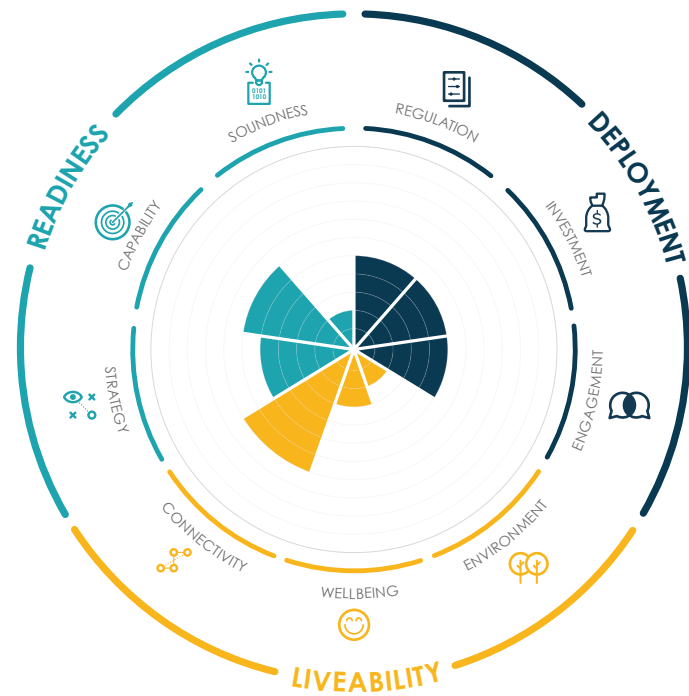
TURKEY GDP PER CAPITA (2015)
£ 8,109

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
150

POPULATION (2016)
14,800,000

STRATEGY OWNER
Istanbul Metropolitan Authority

Istanbul Municipality is also making efforts to adapt its regulatory environment to become a more innovation friendly city. By hosting workshops with developers, they are understanding which regulatory barriers third-parties are currently facing and anticipating for those in the future. These insights are then used to inform the Istanbul Transport Coordination Committee, the body responsible for coordinating transport across Istanbul.

The Metropolitan Authority has invested in the integration of its transport infrastructure and there are interchange services around main transport nodes in the city (e.g. airport). Accessibility to public transport in Istanbul is high, with almost all of the population (97%) living within 500 meters from public transport services.

The Istanbul Card helps users access the public transport by being an integrated ticketing system that covers a significant part of the transport services in the city as well as other public services and basic amenities.

The share of the population in Istanbul that lives within 500 meters from a public transport service in Istanbul is very high at 97.33%.

Johannesburg

Embedded within the city's Integrated Development Plan is Johannesburg's 'Transport Sector Plan', which was last updated in 2017. The plan includes a comprehensive analysis and assessment of mobility patterns, pinpoints challenges and establishes a vision, goals and key projects according to the challenges in the city.

To assess the delivery of actions and help achieve the goals, innovations are measured by scorecards under a performance management system and through KPIs which are reviewed on an annual basis. Reports and reviews, also produced annually, act as a monitoring tool for the delivery of the strategy.

There is no dedicated role or department specifically tasked with fostering innovation across urban mobility; innovation is embedded into everyday activities and processes to address the many challenges the city faces, in particular the high levels of inequality in the city.

To cope with its limited internal capacity to support innovations, the municipality often seeks external partnerships on a project-by-project basis, collaborating with universities and research bodies including the Council of Scientific and Industrial Research, and the South African National Energy Development Institute.

City authorities and transport operators collect transport and mobility data across the city, the main sources being the public transport ticketing system, traffic counts and household satisfaction surveys. With the help of their academic partners, the council built a model that uses data to forecast changes in transport demand. This is used to inform infrastructure design and planning of transport services and infrastructure (e.g. sidewalk design, bus timetables). Third-parties can access this data by writing a request to the municipality who can provide it via a memory stick or a CD. There is currently no online data platform providing open access to the data.

SOUTH AFRICA GDP PER CAPITA (2016)
£ 3,964

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
171

POPULATION (2016)
4,434,000

STRATEGY OWNER
Johannesburg City Council

The council often partners with and provides financial support to third-party and academic bodies, highlighted by the 'Green Innovation Fund' for external innovators. The fund is a competition for third-party developers to secure funding for the development of solutions and ideas, particularly around mobility. For example, an app providing on-trip travel information was developed from this fund.
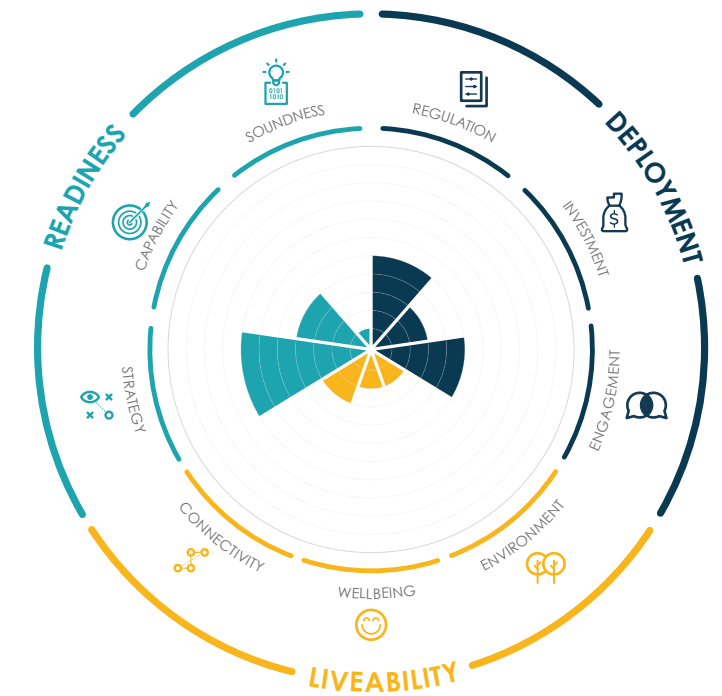
The council is also trying to leverage additional funds from the national innovation fund to promote the development of eco-friendly vehicles in the city.

High levels of inequality in the city often make it difficult to collect representative feedback from users. A large proportion of the population has limited access to smart phones and can only be engaged through traditional in-person surveys. Moreover, a significant proportion of the population lives in gated communities, making them harder to reach through paper-based surveys. However, through consultation events and public meetings, the city council still tries to collect feedback from users.

Another challenge is the lack of integration between services in the city, both at a physical and operational level. Ticketing systems are not integrated and neither is the infrastructure between different transport modes. However, the BRT systems already use smart payment cards which have the capability to be integrated with other systems in the future. Users also do not have good access to alternative modes of transport such as bike or car sharing services as of yet, and 31% of total trips are made by foot.

The relatively low score of Johannesburg in 'Wellbeing' does not necessarily express the city's overall underperformance in this lever but rather reflects the absence of data for key proxy indicators of 'Fairness' and 'Quality of Life' unavailable at the time the score was calculated.

The City of Johannesburg measure the successful deployment of innovations by using scorecards and performance management systems.

Kuala Lumpur

Public transport infrastructure in Kuala Lumpur is undergoing major transformation and development, being one of the seven critical National Key Results Areas (NKRA) under the 'Government Transformation' programme.

In response to this status, 'Kuala Lumpur's Transport Strategic Plan' is heavily focused on the development of core infrastructure and integration rather than fostering innovation across the city.

However, the Kuala Lumpur Centre for Sustainable Innovation (KLCSI) was set up as a collaborative hub to develop innovative and sustainable solutions to improve Kuala Lumpur's living environment.

Through a joint venture with Yayasan Wilayah Persekutuan and AECOM, KLCSI is helping to provide living laboratory services to fast track the research, test-bedding, and deployment of projects, all with the aim of improving liveability in the Klang Valley, whilst creating commercial opportunities across Greater Kuala Lumpur.

Currently, the city council is trying to collect transport data across the city; sensors have been deployed to monitor vehicle numbers and GPS devices installed on buses provide real-time data on locations. Social and environmental data such as air quality levels and demographics is also collected. For third-parties to access this data, they must request access from the council who assess requests on a case-by-case basis. There is no open access through an online data platform.

Typically, innovations in Kuala Lumpur often face regulatory barriers that limit the options to scale-up innovations. The Land Public Transport Commission (SPAD) helped overcome barriers to sharing platforms by amending the 'Land Public Transport Act' to help these platforms integrate with traditional modes of transport. The city authority also helped in the process. Services such as Uber and Grab were not previously heavily regulated in the city, however drivers can now freely operate but are required to have a 'Drivers Card' license which must be renewed annually after the Land Public Transport Act 2010 was amended in August 2017.

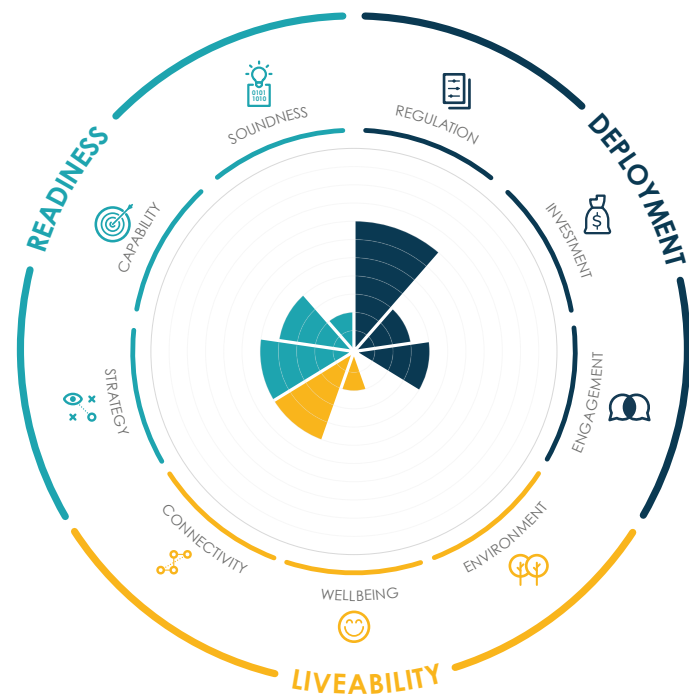**MALAYSIA GDP PER CAPITA** (2016)
£ 7,143

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
361

POPULATION (2016)
1,760,000

STRATEGY OWNER
Kuala Lumpur City Council

Whilst the city is focused on developing core infrastructure, there are several innovations across the mobility landscape that are being developed in line with the new infrastructure, in particular ride sharing platforms such as bike sharing platforms whose location can be strategically planned alongside the new infrastructure and transport services.

The city is taking advantage of this upgrade and expansion to services by also using it as an opportunity to integrate new and existing networks. Many of the new bus and rail stations are being developed as integrated transport hubs. Mobility services are becoming more seamless through the design of taxi-hailing applications, journey planners and an integrated ticketing platform in collaboration with a company called 'Touch & Go'.

There are several car sharing services available in Kuala Lumpur including GoCar, Liftshare and Grab. Bike sharing platforms such as 'Melaka' are just starting to emerge, however do not yet have a wide coverage across the city.

The relatively low score of Kuala Lumpur in 'Environment' does not necessarily express the city's overall underperformance in this lever but rather reflects the absence of data for key proxy indicators of 'Air Quality' and 'Energy Consumption' unavailable at the time the score was calculated.

The Kuala Lumpur Structure Plan 2020 outlines the city's goal to reverse the decline in public transport usage and to achieve a targeted public: private transport split increasing the use of public transport by the year 2020.

Lisbon

In 2016 Lisbon city council published the 'Strategic Plan for Urban Development 2014-2020 (PEDU)' supported by 3 separate action plans for the cities prioritised investment areas:

- Action Plan for sustainable urban mobility (PAMUS)
- Urban regeneration action plan (PARU)
- Integrated Action Plan for disadvantaged communities (PAICD)

The importance of innovation in these action plans is captured and the deployment of innovation is recognised as a key success factor to foster smart growth and business development in Lisbon.

The 3 action plans and the PEDU support each other to provide a wide scope that approaches mobility as one of the multiple domains of the city. Consideration is given to the interactions of different urban systems; urban planning, regeneration and other social aspects are explored.

The city has different organisations sharing the powers over the mobility system in the city, namely the city council, Transport of Lisbon and the Parking and Mobility Municipal Company of Lisbon (EMEL), all supporting and driving mobility innovation in Lisbon.

Whilst not exclusive to urban mobility, the 'Knowledge and Innovation Map of Lisbon' is a digital platform provided by Lisbon City Hall. Through an interactive map, users can identify, locate, contact and better know the capabilities in the city from university and academic bodies, R&D sector and the more general innovation ecosystem of Lisbon.

Lisbon council is working to provide open access to an increasing amount of data, helping third-party developers to create products and services. The 'Open Data Portal of Lisbon' contains a wide variety of data from the city, with a dedicated section for mobility data.

Further support is provided to third-parties through 'Smart Open Lisboa', an implementation programme supported by the council. The programme provides participants with support & direct access to key partners, helping to validate solutions or projects using real data in a live environment. Mobility is one of four key themes and highlights of the program include Hackathons, 'Experimentation Phase' and a Bootcamp composed of workshops, talks & mentoring sessions for developers.
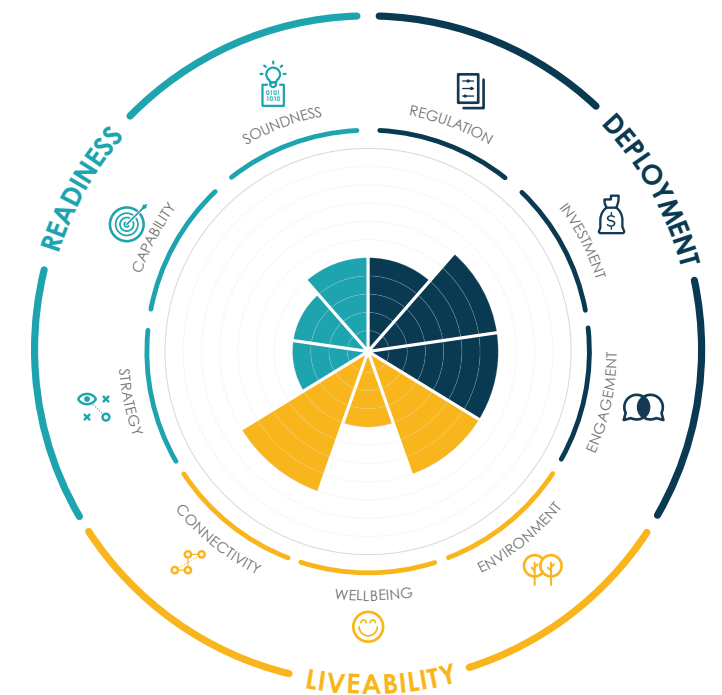
PORTUGAL GDP PER CAPITA (2016)
£ 14,895

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
433

POPULATION (2016)
2,800,000

STRATEGY OWNER
Lisbon City Council

There are several mechanisms to provide financial support to third-party innovators in Lisbon, with the city co-financing programmes and projects with third-parties around innovation and new thinking. For instance, the 'Let Us Move You' competition focused on developing innovative sustainable mobility solutions. This competition was financed through the EU CIVITAS Initiative (an EU funded project).

The city has been quite active in leveraging investment through funds such as Horizon 2020, having a dedicated team in the City Council to better support this work. A successful example of this investment is the Sharing Cities program, a 'Lighthouse' project funded by the EU, that seeks to develop affordable smart city solutions and offers a framework for user engagement and collaboration at local level.

The city also provides a platform to involve users in the allocation of funding for ideas through the 'Participatory Budget', which first kicked off in 2008. Any organisation or user can submit ideas for funding which are pre-screened by the city council to ensure they align with the vision and objectives for the city. Following this, users can vote for the most relevant or interesting idea or project to receive funding.

The transport sector also demonstrates good environmental performance in Lisbon. Annual mean PM2.5 concentration in Lisbon is 11 ug/m3 and the energy consumption from transport sector is 0.508 toe per inhabitant or 31% of total consumption.

Lisbon's Action Plan for Sustainable Development presents the city's aim to deliver 20km of dedicated roads to active mobility modes of transport by 2023.

London

Innovation is embedded throughout Transport for London's (TfL) operations and projects. In June 2017, the latest version of the mayor's Transport Strategy was published for public consultation in its draft form. It places citizen health and quality of life at the heart of the city's transport plan, and has the ambitious aim that 80% of all Londoners' trips will be made on foot, by bicycle or using public transport, by 2041.

In 2016, TfL introduced its first technology and data strategy, which focused on harnessing technology and data to foster innovation in the city's mobility system. There are also specific roles within TfL, which are responsible for fostering innovation in the city.
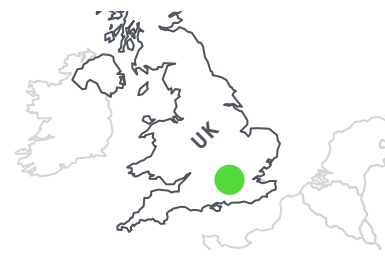
Moreover, TfL developed a unified API, which provides access to real-time data for various modes of transport. This encourages third parties to develop innovative transport applications, such as City Mapper.

Third-party developers have also been encouraged to innovate through TfL's 'Future Streets Incubator' fund, which ran until early 2017. The initiative funded several innovation projects, which encouraged the effective use of London's limited road space. One of the funded projects, BEE Midtown Daily Essentials, has created a service for users to order groceries. Deliveries are consolidated and then distributed by an electric vehicle in their last-mile.

TfL collects data through various mechanisms in an effort to better understand their users' behaviours. In 2016, they conducted a trial, collecting anonymised Wi-Fi connection data from London Underground passengers to understand how they move through stations and interchange between lines. The pilot project allowed TfL to test how they could use the data to improve services, provide better travel information and prioritise investment. TfL currently collect origin and destination data from commuters' Oyster travel cards, but the route taken remains anonymous. The pilot demonstrated that WiFi connection data could help fill the gaps in journey patterns and reveal insights that could not have been detected from current ticketing data or paper-based surveys.

Aside from data, TfL and the GLA has developed several engagement mechanisms for collecting user feedback from across the city. 'Talk London' and 'Consultation Hub' are two examples of active consultation platforms. 'Consultation Hub' makes it easier for users to attend consultation events, which are taking place throughout the city – events can be located by proximity to address, keywords or status.
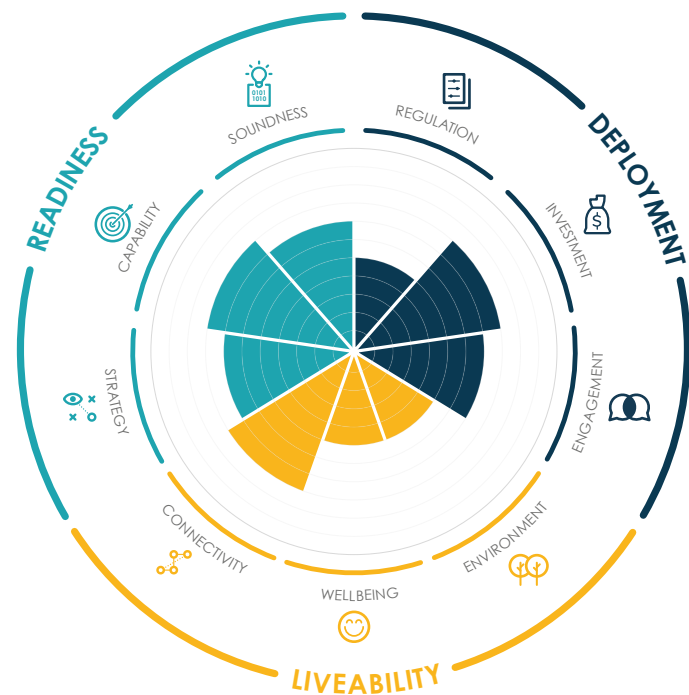
UNITED KINGDOM GDP PER CAPITA (2016)
£ 29,996

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
307

POPULATION (2015)
8,674,000

STRATEGY OWNER
Transport for London (TfL)

In London, users have a variety of integrated ticketing options available to them: London's Oyster card, mobile wallets and contactless bank cards can all be used to pay for public transport services in the city. Several free journey planning apps integrate travel information from all the various services in the city, whilst users can receive customised information on disruptions and planned closures by email or text message, provided directly by TfL. In 2017, TfL also launched a new application, which allows Oyster card users to check their pay-as-you-go balance and top-up their card with their smartphone. In addition, over 2,500 bus stops are now equipped with variable message signs, which countdown the arrival of the next service.

There are several alternative mobility options available across London. The 'Santander Cycles' scheme is an extensive and popular bike sharing platform in London, with over 750 docking stations and 11,500 bikes – although the service is not yet available to outer London boroughs. The city also has also two private car sharing services, which operate across the boroughs.

More than 40 per cent of Londoners use some of the 600 apps powered by TfL data and 80 per cent of Londoners now use the TfL website for journey planning information and to make payments.

Los Angeles

Los Angeles Department of Transportation (LA DoT) set out their mobility plan in the 'Transport Technology Strategy', published in 2016. The strategy outlines how LA DOT aim to foster innovation by focusing on data, mobility and infrastructure as a service.

Teams within LA DoT are provided with capability and funding to support:

• Complex data analytics

• The piloting and testing of innovations

• Connected infrastructure

• Integration of new mobility services

• Social matters within the city – specifically how to expand services to low-income neighbourhoods

LA's Office of Extraordinary Innovation (OEI), created by the county's Metropolitan Transportation Authority (Metro), is also helping to drive mobility innovation in Los Angeles by identifying and testing ideas that have the potential to improve mobility for users across the county. Kicked-off in 2015, the OEI now has a staff of 14.

Projects such as 'Mobility on Demand' and 'MicroTransit' demonstrate this innovative mind-set in practice. The two initiatives aim to test technology-enabled, demand-responsive services, which are fully accessible to users. Both projects aim to develop open data and encourage its use across the county. They require the sharing of data between Metro and technology firms to continuously improve the concepts deployed through these projects. Currently, although both LA DoT and Metro make efforts to acquire data from different stakeholders, this does not seem to be materialising within a clear strategic framework.

The OEI is exploring new ways to engage with users. For example, 'Off Peak' is Metro's new audio podcast, which examines the history and future of rail, bus, cycling and walking in and around LA. Innovative methods of engagement such as this, in addition to the city's and county's active consultation events and face-to-face interviews, demonstrate how the region values input from users. By developing further mechanisms to improve the way it processes and acts upon feedback, information can be better used to inform decision making, improve services and drive local innovation.

As part of its recent strategic planning effort, Metro administered a comprehensive satisfaction survey for users and non-users of the transit system. Through this process, they will establish benchmarks in hope of improving the use of data to support decision-making.
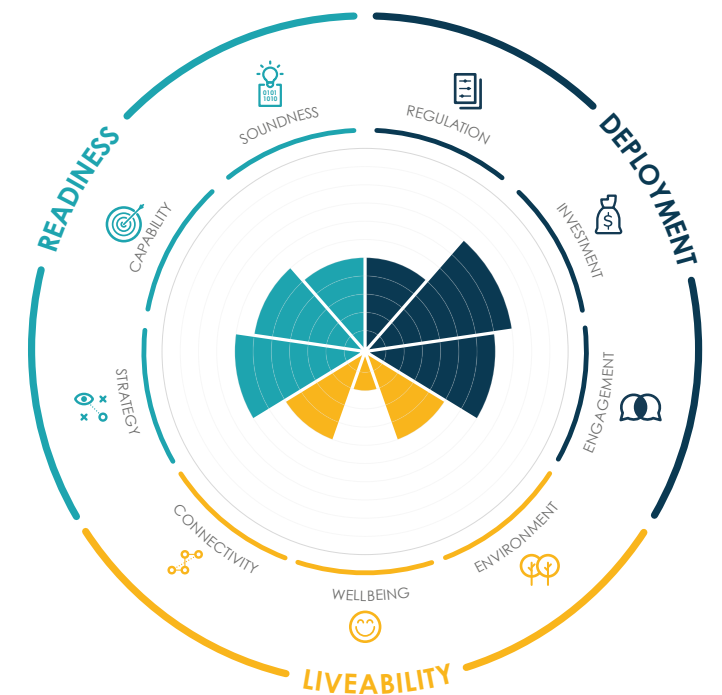
NORTH AMERICA GDP PER CAPITA (2016)
£ 42,045

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
540

POPULATION (2014)
3,929,000

STRATEGY OWNER
Los Angeles Department of Transportation (LA DoT)

Again, with users in mind, the city developed several channels that gather pre-and on-trip information. Real-time and static data is open to developers and citizens to encourage the mobility innovations. To ensure they are providing the most accurate customer information, Metro has begun a substantial upgrade of its entire bus fleet to enable more frequent sampling of vehicle locations through cellular data.

From a user perspective, the transport system can be hard to navigate in LA. LA DoT is currently considering how they can better integrate services, fare structures and jurisdictions. Metro is also developing a guidance manual to improve wayfinding and customer information around bus and train stations.

Los Angeles DoT are aiming to implement the concept of Mobility as a Service, convert the public transit vehicle fleet to fully automated and create a universal fare system for LA.

Manchester

Published by Transport for Greater Manchester (TfGM), the 'Greater Manchester 2040 Transport Strategy' guides the city's policies and measures in regard to innovation in the mobility arena. The strategy's main objectives are focused on developing infrastructure and active mobility to support an integrated, sustainable and well-co-ordinated transport system. Technology and innovation are identified as the means to help achieve these goals and to tackle city challenges – forming a core pillar of delivery.

The strategy is supported by a 'Delivery Plan', which provides a detailed breakdown of how actions outlined in the strategy will be achieved and resourced. The 'Delivery Plan Schemes 2016-2020' provides information on the delivery agency, delivery data and funding for those schemes identified in the 2040 Transport Strategy.

TfGM have a dedicated team who help drive and foster innovation in urban mobility. The team work on projects with a variety of national and international partners, including projects funded through EU Horizon 2020 funds.

The innovation agenda outlined by TfGM also establishes processes for developing a network of partners who could help secure capabilities and knowledge around urban mobility. It also identifies several private-public collaboration agreements that are in place with SMEs and larger private sector organisations, which could help achieve the strategy.

Outside of TfGM, there are other projects that are developing open data to encourage innovation in the city. Future Everything, an innovation lab, Open Data Manchester and Manchester City Council are working in collaboration to foster relationships between different parties. They bring different stakeholders together by hosting events, such as hackathons, and facilitate the release of open data.

Data is openly available to third-party developers and citizens through the TfGM 'Developer Portal', which provides access to data from across the region's transport network. Users can also access various data feeds, including a variety of APIs, which provide real-time data for bus locations and car parking availability. By supporting the use of open data, TfGM are encouraging third parties in the city to build applications and develop future mobility services. This, and other data that is not published through the portal, is also used by academics at the University of Manchester for R&D projects,
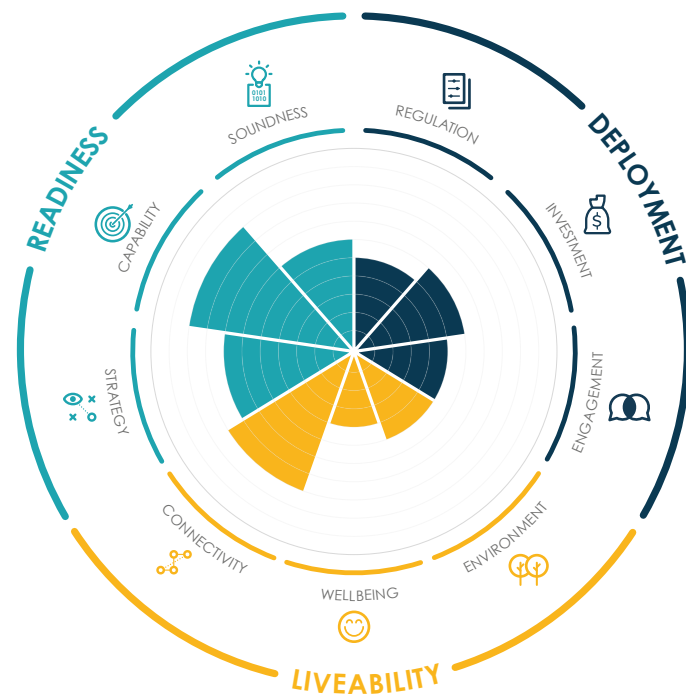
UNITED KINGDOM GDP PER CAPITA (2016)
£ 29,996

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
365

POPULATION (2015)
2,550,000

STRATEGY OWNER
Transport for Greater Manchester (TfGM)

academic literature and for analysis purposes.

The 'Greater Manchester 2040 Strategy' also identifies the need for improved integration of services, both at a physical and digital level. It highlights difficulties that customers face in understanding what travel options are available to them, how they can access and pay for these services and how to move between different transport modes for more complex journeys.

Manchester's integrated smart ticket is working towards offering seamless travel opportunities for people moving through the city's network. The 'Get Me There' card can be used on all modes of public transport, including bus and tram. Developing the integration of the network is outlined as a key objective in the strategic plan. The ground-breaking 'Greater Manchester Agreement',

which devolves more power to the Mayor of Manchester for transport and planning, aims to support this work.

Users also have access to alternative modes of transport in Manchester. Bike sharing service 'Mobike' is launching a six-month pilot scheme in 2017, which will make 1,000 bikes available for public hire in central Manchester. The system allows cyclists to pick-up and drop-off hire bikes at any convenient and legal cycle parking location, rather than having to return bikes to a dedicated docking station.

Manchester is committed to a 48% reduction in carbon emissions by 2020 (from 1990). Transport currently accounts for 30% of these emissions of which 95% are from road vehicles.

Mexico City

Mexico City's strategy is focused on transit-oriented development, aiming to integrate mobility and other urban issues to improve accessibility in the city. Innovation is identified as a means to achieve this goal. A new department, tasked with fostering innovation in the city, is directly responsible for elements of the strategy that focus on innovation.

This department helped to establish the 'Laboratorio para la Ciudad': – Mexico City's experimental office for civic innovation and urban creativity. This office provides users with a platform to test and experiment innovations, which focus on urban issues, including mobility. 'CDMX Mapatón', a gamification tool, is a Laboratorio initiative that aims to encourage citizens to co-create maps of the various transport networks in the city.

Transport and mobility data is collected across Mexico City by various transport operators and agencies, including passenger counts and the real-time location of some buses. However, data collection between organisations is fragmented. To unify the data between different operators and modes of transport, representatives from each transit agency were enrolled onto a project to gather data on the capital's transport system using 'TransitWand'. 'Transit-Wand' is an open-source mobile application, which collects real-time data on route, speed, location of bus stops and frequency of train departures. The data collected was then fed into a data management portal and converted into General Transit Feed Specification (GTFS) – a common format for public transportation schedules and associated geographic information.

GTFS data provides Mexico City's urban planners with comparable data on mobility services in the city. This helps visualise routes to determine where best to add or eliminate services, how to plan for integration with more structured transit services, how to regulate or improve services, and where to plan for the long-term future. Access to the GTFS data has also been made open to third-party developers to encourage new innovations. Trip-planners and interactive timetables have also been created with this data.

In 2015, the city made further advancements, as the Mayor of Mexico City signed the 'Open City Law', an initiative obliging local government entities and agencies to facilitate user involvement in the discussion of public issues. This is not only achieved through open data, but also through broader civic involvement in policy-making processes. As a result, users now have the legal right to participate in the design of a user centred, government portal for open data.
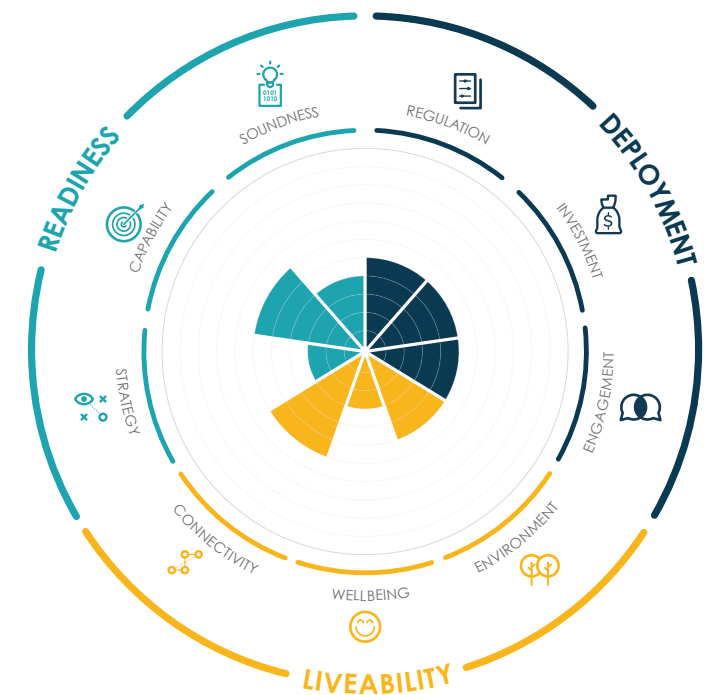
MEXICO GDP PER CAPITA (2016)
£ 6,165

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
267

POPULATION (2016)
8,918,653

STRATEGY OWNER
Institute for Transportation & Development Policy

In the same year, a new mobility law was passed to support the expansion, integration and management of active and public modes of transport. The law aimed to improve quality of life for residents and expand access to mobility, helping to combat a long history of urban sprawl.

Although full integration of mobility services is difficult in a city the size of Mexico, the city Government offers a unique prepaid fare card or 'stored-value' card called 'Tarjeta DF'. Users can pay with their 'Tarjeta DF' for all public transport modes in all three municipalities.

An extended bike sharing system, Ecobici, has been running since 2010, with stations in 42 neighbourhoods. £110 million was recently invested in supporting these initiatives, helping to expand and modernise sustainable, public transport services in the city.

The relatively low score of Mexico City in 'Wellbeing' does not necessarily express the city's overall underperformance in this lever, but rather reflects the absence of data for key proxy indicators of fairness and quality of life unavailable at the time the score was calculated.

In 2016, Mexico City expanded their public transport system to include a new cable car service. Used by 30,000 people per day, the cable-car glides over the dense urban canopy below to provide better accessibility to the disconnect, outer communities.

Milan

Milan's 'Sustainable Mobility Plan' was first published in 2015 and guides the strategy for mobility innovation in Milan. It prioritises innovation as a key strategic objective for delivering more efficient mobility in the city, such as automated public transport and ride sharing systems.

The strategy focuses on four main objectives:

1. Sustainable mobility.
2. Fairness, security and social inclusion.
3. Environmental quality.
4. Innovation and economic efficiency.

A participatory engagement process was undertaken when developing the strategy. Citizens, public bodies and institutions, the civil society and a scientific committee all contributed to the mobility plan to help draft the future of sustainable transport in the city.

Through the City of the Future Living Lab, SMEs, researchers, academics and other third parties can co-design, implement, experiment and evaluate their innovations. 'Mobility and transportation' is one of the six main innovation areas of the lab.

The city council is very active in collaborative projects with other stakeholders. They actively leverage investment through the allocation of their own funds, as well as fostering external (public or private) investment through public-private partnerships or collaborative agreements, which encourage third-party innovation.

Milan has an established process for collecting user feedback and recognises the benefits of this engagement. Public consultation and face-to-face interviews (with both users and non-users of the transport system) were organised specifically to provide input into the strategy's scope. These insights are also used internally to assess how the initiatives outlined in the plan are viewed by stakeholders.

Users in Milan have access to a variety of alternative mobility services, including bike, scooter and car sharing schemes, and 700 electric cars. There is a high number of independent car-sharing platforms, which run different payment and operating structures. Trips on foot and by public transport account for 63% of total trips in the city, while 99% of the total population live within 500 meters of a public transport service.
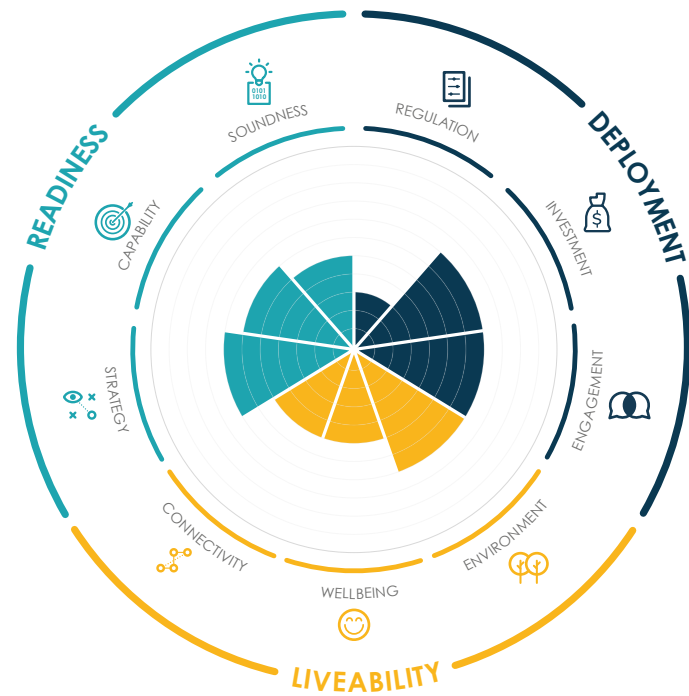
ITALY GDP PER CAPITA (2016)
£ 22,950

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
570

POPULATION (2016)
1,368,590

STRATEGY OWNER
Mobility Agency Environment and Territory (AMAT)

Milan is working towards the integration of their ticketing system. Their goal is to have one ticket for all transport services and modes – including sharing systems – and a mobility-as-a-service solution. Today, although the integration of ticketing is not yet covering all transport modes, a mobile ticketing application can be used across all public transport modes and a separate one can be used across all sharing platforms.

Milan has identified poor air quality as a major challenge for the city. However, they monitor air quality levels on a regular basis and the city registered a 1.2% reduction on annual exposure to PM2.5 as an average of the two latest counts.

The annual energy consumption from transport per capita is approximately 0.223 ton per capital. Milan was one of the few UMii cities who provided quantitative data for most of the 'Wellbeing' and 'Environmental' performance indicators.

Milan is very well connected; the average walking distance from households to access the nearest public transport node is 150 meters.

Montréal

The development of mobility services in Montreal is addressed through the 'Sustainable Development' report which was last updated in 2015.

The city, however, does not have a dedicated, published strategy to primarily foster innovation in urban mobility. To guide the strategic work around innovation in mobility, the city has an Executive Director for Information Technology and Innovation. A Smart City department was also created with the ambition to foster innovation in urban mobility.

To secure the capability and technical knowledge to meet this ambition, the city has negotiated agreements with several private agencies and operators to collect and share their data. The city council is promoting, across all stakeholders, the 'Open Data Policy' which requires services around mobility to publish their data.

The 'Montreal Open Data Portal' is the platform currently being used in the city to share data with users across several topics, mobility included. The platform provides help and support documents to help encourage the use of the data. Forums and discussion groups are also available for each dataset. Discussions are grouped at the end of the metadata records, ensuring it is easy to locate.

The Société de transport de Montréal (STM) developed the 'iBus program' in 2017 which tracks all buses across the city in real-time. Their location data is used to help make decision and manage the provision of bus services, helping to improve the regularity and distribution of services, provide more precise user information before trips and while on the move and integrate the 'bus priority system' at traffic lights. This data is also made openly accessible through STM's website to encourage third-party developers to build applications and tools that can help commuters.

Whilst providing open data is encouraging third-parties to innovate in the city, regulatory barriers are limiting the experimentation and testing of innovations on the streets of Montreal. Higher levels of government permission are required to overcome these barriers to ensure the city can foster innovation. Neighbouring cities and towns have sufficiently developed their regulations to allow autonomous vehicles to be tested on the streets which has helped to establish multiple start-ups.

Notwithstanding, the city is trying to encourage innovation through the 'Capital Intelligent initiative', a $100 million fund aimed at supporting both start-ups and established businesses which are offering solutions to urban challenges, including transport. It launched in partnership with 23 ven-
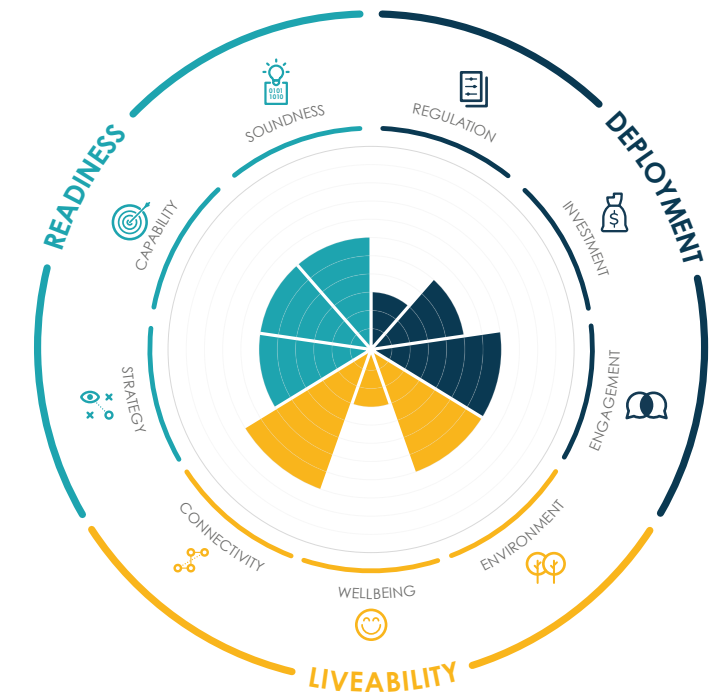
CANADA GDP PER CAPITA (2016)
£ 31,693

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
573

POPULATION (2016)
4,098,927

STRATEGY OWNER
Montreal City Council

ture capital firms, financial institutions and corporations to support collaboration between all parties.

In Montreal, STM is actively engaging with users to better understand their opinions and experiences using public transport services. 'My Voice, My STM' is one example of the mechanisms used to collect user feedback. The platform is an online consulting community comprised of 10,000 customers across the city who can answer short surveys every month to win cash awards for participating. Users can provide feedback on:

• Pilot and major transport;
• Quality of service;
• Expectations regarding public transport.

STM is also working to develop an integrated network and aims to become a trusted integrator of transport ser-

vices in the city through various mobility management initiatives. These initiatives are ongoing in the city and include the integration of fares and information, the development of on-demand ride sharing platforms and the provision of alternative mobility options. Bike-sharing and car-pooling services are common across the city and have been strategically located near public transport hubs.

The OPUS smart card is a very integrated system, valid for all modes of public transport in the Greater Montreal area. The card can also be used in Quebec City and alternative mobility options can be purchased with the OPUS card, such as bike sharing.

By achieving a modal shift of 5% to public transport by 2020, road congestion can be alleviated on the currently over-capacity network, saving 760,000 tonnes in net GHG emissions.

Munich

'Future Perspective - Strategies, Guidelines, Projects' outlines Munich's ambitions to improve mobility. It considers other urban systems such as housing and is very much an integrated strategy, although innovation is not outlined as a specific focus and is rather embedded in the different topics.

The city of Munich is also working on a new transport development plan as an integrated part of the urban development plan.

Despite the absence of a defined, strategic direction to foster innovation in Munich, new developments and innovative solutions such as autonomous driving and e-mobility are being tested across the city. Driven by the City Council, the 'City2Share' initiative has established networks with the likes of Siemens, BMW, IBM, mobile providers and start-ups to investigate the feasibility and potential of new concepts based on e-mobility in selected inner-city areas of Munich and Hamburg. The plan is to test two concepts:

1. New Sharing System: a car sharing system using autonomous electric vehicles and inductive charging stations.

2. E-delivery concept: a new inner-city delivery concept with electric bikes and small distribution stations.

To encourage the use of data, Munich City Hall has an open data platform for external access to the static transport and mobility data collected across the city whilst developing more advanced data provision though APIs which can help to share accurate, real-time data with third-parties.

The 'Digital Hub of Mobility' is another initiative ran by the city to foster innovation from academics in Munich. The Hub funds several PhDs and other students researching mobility and innovation, helping to develop technical capabilities and ideas within the city.

The City Hall recognises that small changes in regulations could help foster mobility innovation, however, the Ministry of Transport hold the authority at a national level to make the necessary changes, which limits the impact the city can have on removing these regulatory barriers.

They have also been leveraging additional investment for innovation through collaborative funds. For instance, in 2015, Munich was awarded €4 million from the 'EU Smarter
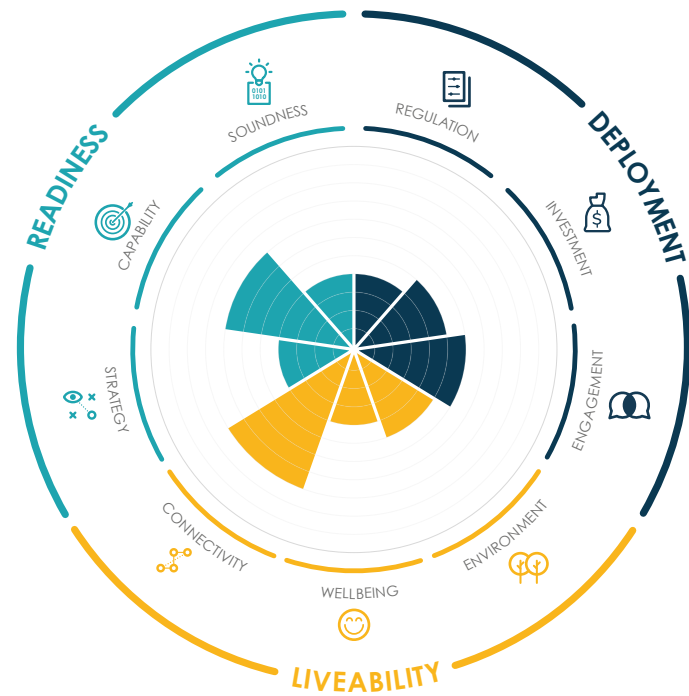
GERMANY GDP PER CAPITA (2016)
£ 31,527

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
452

POPULATION (2016)
1,521,678

STRATEGY OWNER
Munich City Council

Together' project to test solutions to further develop sustainable mobility in Munich.

A main source of feedback collected across Munich comes from the national 'Mobility Survey of Germany'. A dedicated data analytics team within the City of Munich helps process the information collected from the survey. The insights developed from the feedback are used to inform operational activities and the future planning of transport services.

The City Hall also seeks to engage users on projects, for example the 'City2Share' initiative has a separate investment process to involve local residents in the project to discuss the concepts and solutions. The insights gathered were used to produce user acceptance studies and guide certain local projects; users can propose ideas

for the design of the public space around the mobility stations and can put forward ideas to improve the quality of life in their neighbourhoods.

Munich has a well-connected and seamless network that integrates various mobility services. 'Mobility Stations' are strategically located by major transport nodes and interchange hubs across the city to provide users with a single place to access alternative mobility services, such as car and bike sharing, aiming to provide a last-mile solution.

Munich will soon become a testing ground for the development of autonomous cars, with BMW testing its self-driving vehicles in the city in 2017.

Nairobi

Nairobi's 'Integrated Urban Development Master Plan' outlines the city's transport development policies which focus on expanding its infrastructure. Specifically, the plan establishes Nairobi's ambitions to develop an intelligent transport system to better manage road transport in the city.

The creation of the Nairobi Metropolitan Area Transport Authority was recently approved in the city, tasked with the goal of reducing the capital's congestion levels and unlocking its economic potential. The authority will be responsible for developing a coherent transport policy supportive of the development of the Nairobi Metropolitan Area.

It will oversee the implementation of an integrated transport master plan and will also manage the development of a sustainable, integrated Mass Rapid Transit System strategy.

In Nairobi, it can be challenging to manage the mobility system given the high number of competing official and unofficial transport operators in the city, which presents several challenges. One being the fragmentation of data collection mechanisms. As data is not collected across many of these operators, the data collected does not provide a representative view of all transport services. There is no open access to this data and therefore no evidence that the city is actively encouraging the external use of data.

On the other hand, road data (safety, vehicle numbers, congestion hotspots) is one dataset that is widely collected and shared across the city among several public bodies (police, planning, etc.) who use the data to inform safety and legal matters.

The University of Nairobi is helping to progress innovation at national level through the annual 'Nairobi Innovation Week' which aims to showcase and recognise innovations by researchers, private companies and public agencies, helping to engage policy makers and stakeholders on the growth and support of innovation in Nairobi and Kenya. Two of the main topics covered during the 2016 event were 'Commercialization of Research & Innovations' and 'Data Science', in which mobility featured as an important topic.

Whilst the city is trying to develop its innovation capability, the mobility system lacks services to provide information to their users in a consistent manner. Buses do not run on fixed

KENYA GDP PER CAPITA (2016)
£ 1,093

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
72
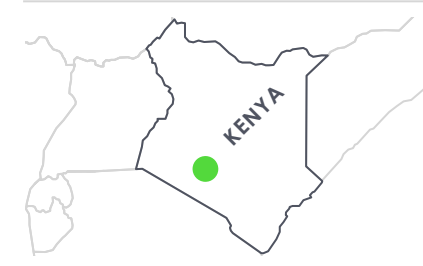
POPULATION (2015)
4,500,000

STRATEGY OWNER
Metropolitan Area Transport Authority

timetables and commuters often rely on word of mouth to find out arrival times, which often makes private vehicles a more attractive option rather than public transport with services poorly integrated. There is no single fare or integrated ticketing system and no interchange facilities or applications to improve seamlessness of journeys.

Electric buses are going to be tested in Nairobi in 2017 with the backing of the City Council and a private consultancy based in China.

New York

There are two strategic documents guiding mobility innovation in New York: 'OneNYC' is the overarching plan for the city, published by the mayor's office. Published by NYC DOT, the 'Strategic Plan 2016' relates to 'OneNYC' but expands upon it and provides a deeper focus on mobility issues.

In order to build up its internal capability, the New York State Department of Transportation (NYSDOT) set up a transport research council, which includes academics from the state, who assist the NYSDOT in developing and delivering research projects – many of which focus on fostering innovation in mobility. The NYSDOT also established the Technology and Innovation Deployment Program (TIDP), which includes a key initiative to accelerate the deployment of innovation at a state level but including New York City.

The city welcomes experimentation of innovations. In 2015, the U.S. Secretary of Transportation announced that New York City would be the main testing ground for a pilot project, which would develop connected vehicle technologies. The project, which received investment of up to $20 million from the federal government, aims to install smart devices in vehicles to alert motorists of impending dangers and congestion. The plan is to retrofit 10,000 cars, taxis, buses and trucks with the devices by 2017, allowing anonymous vehicle-to-vehicle communication.

New York encourages innovation by making data available to third parties through the NYC Open Data platform, who own both real-time and static data sets across several urban systems. However, there is no integrated method for consolidating the collection of data between operators and public or private bodies across the city.

Whilst the city encourages innovation by opening its data, the New York City Department of Transport (NYC DOT) recognises that non-financial barriers exist and can limit the deployment of some mobility innovations, as testing innovations in the city requires permission at a state level. As a result, DoT is lobbying for more devolved powers from the state government to allow them to address some of these barriers to innovation.

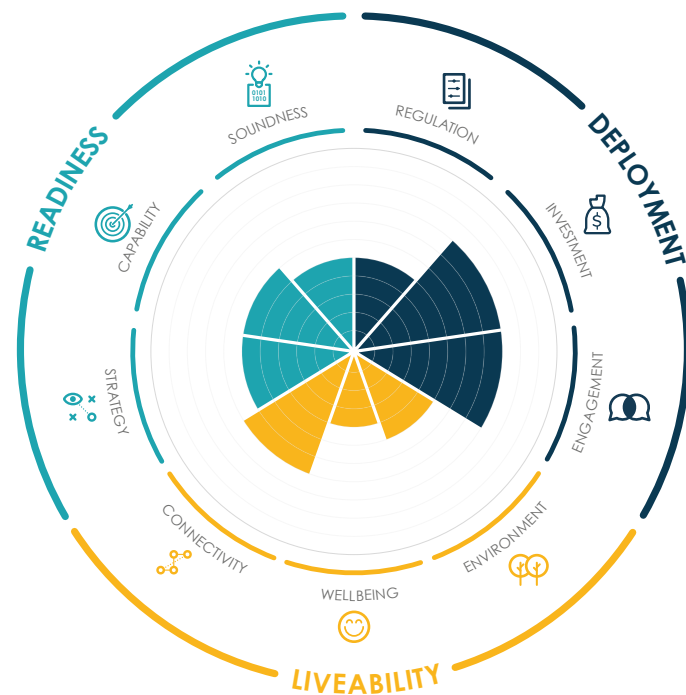New York has an advanced user engagement approach, which ensures that users are actively consulted on

NORTH AMERICA GDP PER CAPITA (2016)
£ 42,045

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
539

POPULATION (2016)
8,537,673

STRATEGY OWNER
New York City Department of Transport

future decisions. The DoT developed an online portal where users can submit feedback and ideas. For instance, feedback collected for the 'Citi Bike Project' was directly used to decide where bike stations should be located. 'Street Teams' also go out into the city to actively engage with users and collect data on their experiences with the transport network. This helps support the city's strategy and guides improvements in the mobility systems.

MetroCard is New York's smart ticketing system, which can be used on the subway, buses, tramways and in some retail stores. However, there are still several services that have not been integrated into the MetroCard network.

In 2016, the Metropolitan Transport Authority (MTA) solicited proposals for a new fare payment system, which would be a contactless system using bank cards, smartphones and MTA-issued smart cards. MTA expects to spend at least $419 million over six years to roll out the system, with the MetroCard being retired by 2022.

In 2015, the City expanded the primary bike sharing service, 'Citi Bike' which now has nearly 12,000 bikes and 750 stations. The city is exploring further expansion through smart, bike sharing docking stations.

São Paulo

The 'São Paulo Mobility Plan' was published in 2015 to help guide the city's strategic thinking and foster improvements in the mobility system.

The scope of the plan describes how mobility can impact and interact with other disciplines, such as planning and the built environment.

Through São Paulo's MobiLab and the Mobility Plan, the Council enables innovation to be tested in the city. The Residency Program is aimed at start-ups who already have solutions under development. The program offers access to a co-working space, mentoring, monitored testing (in a less regulated environment), the support of city technicians and access to mobility data.

MobiLab is located in the heart of the city and occupies a 340m2 space, which contains physical and technological tools that help developers build innovative solutions.

In 2017, the Metropolitan Urban Transport Company integrated into the Metropolitan Transport Department, who are now responsible for managing public transportation in the metropolitan regions of Sao Paulo. Following this, the 'E LAB – Experiments in Transportation' was launched; the first metropolitan lab of innovation in Latin America. The new department has the ambition of becoming a facilitator of innovations across urban mobility, whilst also connecting the city's academic institutions.

To further encourage innovation, data is made openly available through a centralised platform. The municipality has opened much of its transport operations data. Other initiatives, such as São Paulo's 'Open Transport Hackathon', have brought together experts, software developers and technologists to ideate, design and develop prototypes for the most pressing transport challenges in São Paulo. The top three proposals developed during the 'Open Transport Hackathon' are awarded with access to raw transport data in the city. 'Cadê o ônibus' ('Where is the bus') was developed during the 2013 Hackathon. The application shows the real-time location of buses in the city and provides an integrated route planner for buses, trains and the city subway. The application has over 1 million downloads in the city.

Despite this open approach, agencies in the city struggle to release a wider range of data sets due to either strict privacy policies or concerns of potential negative consequences of oversharing and transparency.

Another challenge in São Paulo is regulating and integrating new mobility services, such as Uber and Lyft. The Municipal Government of Sao Paulo

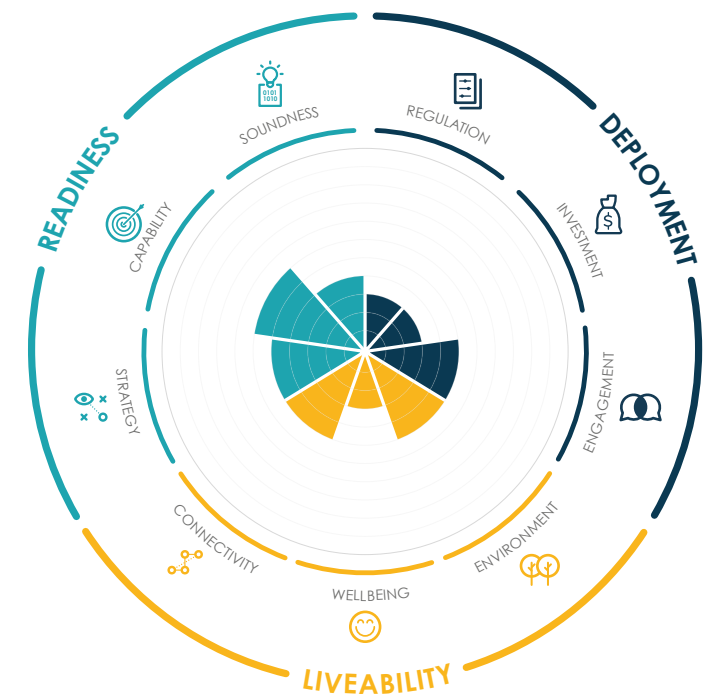**BRAZIL GDP PER CAPITA** (2016)
£ 6,502

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
212

POPULATION (2016)
12,004,000

STRATEGY OWNER
São Paulo City COuncil

recently published a draft decree to charge platforms such as Uber an upfront fee based on an estimate of vehicle-kilometres, also referred to as 'credits'. Such a system offers São Paulo a degree of flexibility; the city could raise the fee during rush-hour, or reward drivers who operate during off-peak hours and venture into areas that are not well connected by public transport.

Sao Paulo is increasingly looking at how it integrates its existing and new services. For example, planners are strategically trying to integrate bus services with bike sharing infrastructure and taxis. The municipality is also supporting digital integration through journey planning apps, reflected in the hackathons mentioned above.

The city is trying to improve the political and operational integration of the various municipalities in the city. By federal law, public transportation is the responsibility of each municipality, but one aim is to integrate the different tariffs between those buses which face political barriers, as opposed to technical ones.

From 2012, Federal Law was revised to enforce all municipalities above 20,000 inhabitants to publish an urban mobility plan.

Singapore

Published in 2014, the 'Smart Mobility 2030 ITS Strategic Plan' outlines how Singapore is moving towards a more connected and interactive land transport community. Driven by the Land Transport Authority (LTA), the aim of the plan is to shape Singapore into a highly integrated, lively, and more inclusive community, where people enjoy a high quality-of-life, by 2030.

The scope of this strategy is far-reaching and explores diverse topics, such as the development of ITS standards, behavioural change and the use of big data analytics to give quick insights into mobility trends. However, it does not consider the interaction of mobility with other urban systems or wider urban policy in any depth.

To ensure there is enough internal capacity to deliver innovation in the city, the LTA provides support to local universities through several collaborative partnerships with academic institutions. The research arm of the LTA works closely with Singapore Universities Technology and Design departments, providing funding for projects and access to data that is not publicly open. Recent projects have focused on the development of data visualisations and city dashboards, which show real-time events in the city.

The city also encourages innovation from third-party developers and citizens through the 'LTA Innovation Fund': an open call for innovative ideas, with a fund of $50 million. As well as this financial support, third-party developers also have excellent, open access to transport related data.

The LTA uses DataMall, an integrated open data platform, to publish almost all of its live and static transport data to encourage third parties and citizens to develop innovative solutions to urban challenges – particularly around mobility issues. Developed by the LTA, DataMall is hosted on 'MyTransportSG', which is a portal where users can find eServices for all modes of transport in the city, such as interactive maps, real-time information and applications built with open data. Through the 'My-Concierge' service, users can personalise services offered through the portal to suit their needs.

Singapore uses their data internally to develop various mobility innovations, such as their Common Fleet Management system. The LTA uses the vast amounts of data they have collected on the real-time location of buses in the network to turn traditional bus timetables into a flexible, live-response
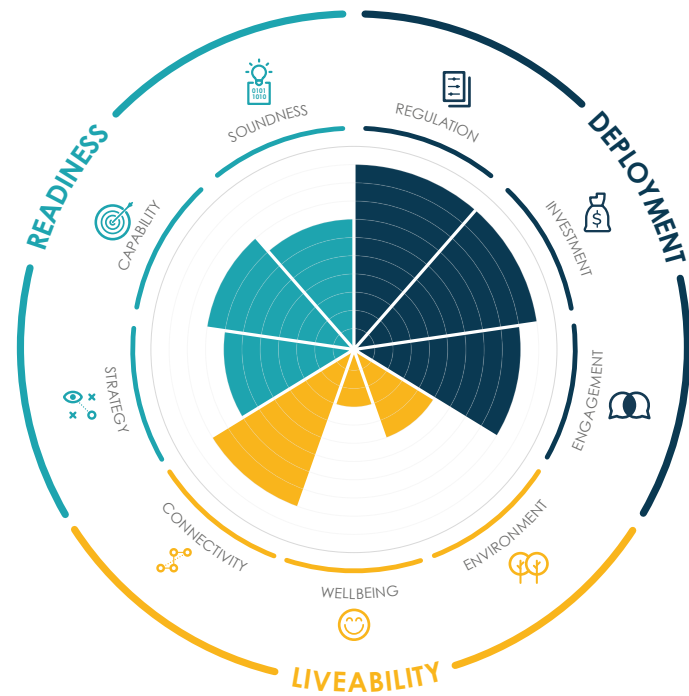
SINGAPORE GDP PER CAPITA (2016)
£ 39,815

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
116
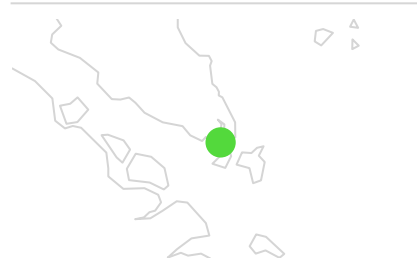
POPULATION (2015)
5,312,000

STRATEGY OWNER
Land Transport Authority (LTA)

system, which uses predictive analytics to help bus drivers adjust their speed to better manage demand at bus stops.

Singapore's approach of actively encouraging innovation in the city is also supported by informal processes that the LTA have in place for identifying barriers to innovation – particularly regulatory barriers. The LTA has established channels with policy makers to ensure that policy supports innovation. For example, previously, small start-ups, developers and citizens were struggling to enter the market due to high set-up costs. As a result, policy was amended to significantly reduce set-up costs and provide new lines of seed funding for those struggling to establish themselves.

The LTA manage most of the transport services and infrastructure in Singapore, which enables them to support and deploy innovation and integrate

services across the city.

The relatively low score of Singapore in 'Wellbeing' does not necessarily express the city's overall underperformance in this lever, but rather reflects the absence of data for key proxy indicators of quality of life and fairness, unavailable at the time the score was computed.

Singapore is working towards the vision of being a car-lite society by 2030, where they are targeting 75% of all journeys undertaken by public transport.

Sydney

The 'Future Transport Technology Roadmap', developed by Transport for New South Wales (NSW) and published in 2016, is the overarching regional plan setting out recommendations for key technologies that will shape the future of Sydney's transport system.

Whilst the strategy's key outcomes are not investigated, nor measurable targets for its achievement set, a roadmap identifies five key technology strategies to personalise transport and foster innovation:

1. Personalise customer interactions;

2. Transform mass transit networks by using automation and dynamic; management systems

3. Foster shared-use, on-demand services;

4. Enable connected automated vehicle platforms;

5. Create intelligent transport networks managed by data.

These five strategies have been shaped by an extensive process to gather input from users across the city.

Transport NSW place user engagement high on their priorities. The 'Join the Discussion' portal aims to function as a non-traditional engagement tool to give users a platform to share their views. Users can openly propose new ideas, feedback and provide recommendations on the cities 'Future Transport Roadmap'.

Another innovative engagement tool driven by Transport for NSW is the 'Future Transport Simulation' gamification tool which will be released in 2017. The simulation allows users to make decisions and test development scenarios of the transport network over the next 40 years. The results from the simulation will be used by Transport NSW to understand what issues users prioritise, helping to guide investment.

Transport for NSW can support innovative engagement tools such as these through a dedicated fund for urban mobility innovation initiatives and activities. The fund and investment from the capital budget provides support to third-party developers across the city by supporting open calls for innovation by providing funding to encourage the development of solutions. The 'Smart Cities & Accessibility Challenge' awarded $150,000 of investment to ideas that could make the region more accessible.

The organisations in the city also try to further support third party developers by following an open approach to data. Transport for NSW's sophis-

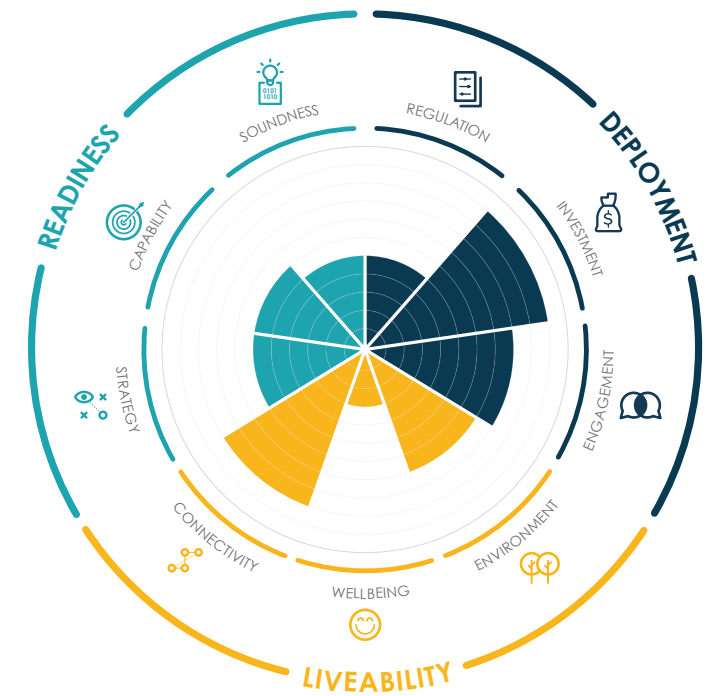**AUSTRALIA GDP PER CAPITA** (2016)
£ 37,535

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
500

POPULATION (2015)
4,767,358

STRATEGY OWNER
Transport for New South Wales

ticated open data portal combines mobility and non-mobility datasets and provides APIs to encourage the use of real-time data, supported by helpful documentation. The open data portal also stipulates the innovation challenges in the city and upcoming events or hackathons. Within the portal, there are 25 examples of tools developed using the open data provided available.

In Sydney, the Opal Smartcard can be used to pay for travel on all modes of public transport in the city, including train, light-rail, bus and ferry services. The Opal card is not just confined for use in Sydney; it can be used across the New South Wales region, given that by owning most public transport assets, Transport for NSW have the power to integrate many of the services across this large geographical area.

Transport for NSW are also delivering a new integrated approach to wayfinding and signage for the Sydney transport network. The new signage

provides consistent and easy-to-follow visual messages to make public transport easier, particularly when changing modes and taking unfamiliar journeys.

Users also have a variety of alternative mobility options available in the city, including several car-sharing and car-pooling platforms. The first bike-sharing platform, 'Ready Go', was launched in July 2017. As yet, the platform does not have a wide coverage across the city and is currently limited to 160 bicycles.

Sydney Science Park is a $5bn project, set over 280ha that will create an internationally recognised epicentre for R&D. The park will be a fully integrated community that will create more than 12,000 knowledge based jobs, cater to over 10,000 students and be home to over 10,000 residents.

Vienna

Vienna comprehensively outlines its approach to innovation in urban mobility through three complementary strategic documents: 'Step 2025', 'Smart City Wien' and 'Innovative Vienna 2020'. All policy documents were developed within the last three years, with 'Step 2025' acting as the umbrella strategy to link each document.

To work towards the strategic direction outlined in the documents, the council established the 'Team for Mobility' – a technical working group setup to foster collaboration and build a local network of capabilities. The group consists of representatives from industry, academic institutes and the public sector.

The Smart City Wein initiative by the City of Vienna also supports the capability and technical expertise to foster innovation and build an intelligent and sustainable city. The initiative has helped to develop research projects and deploy several innovations across the city. 'Mobility Lab' was developed through the initiative with the aim of developing, testing and evaluating innovative forms of mobility under real conditions. Local citizens are also involved in the testing of solutions and are recognised as 'co-creators'.

Vienna has committed to the concept of 'Open Government Data' – an open and transparent system, which makes city data available to the public for use. Despite this, the data that is available through the open data platform is limited to static data, and live data, which can be accessed through APIs, is not available through the platform. To integrate the vast number of data sources collected in the city, 'ITS Vienna Region' cooperates with numerous data partners with long-term data agreements. The municipality of Vienna also gathers qualitative information from users by periodically collecting feedback on their experiences of using transport and mobility services in the city. A dedicated department for 'City Surveys' processes and analyses the feedback collected to identify trends and draw out insights.

Quantitative data and feedback from citizens is often collected in the city through consultation events. To help provide insights on the movements and behaviours of commuters, users are involved in research projects and collect information and data from their smart phones to monitor their location and see what modes of transport they are using.

Mobility information is made available to users through multiple channels to encourage the seamless use of public transport services in the city. 'Qando' provides real-time information for various modes of transport and

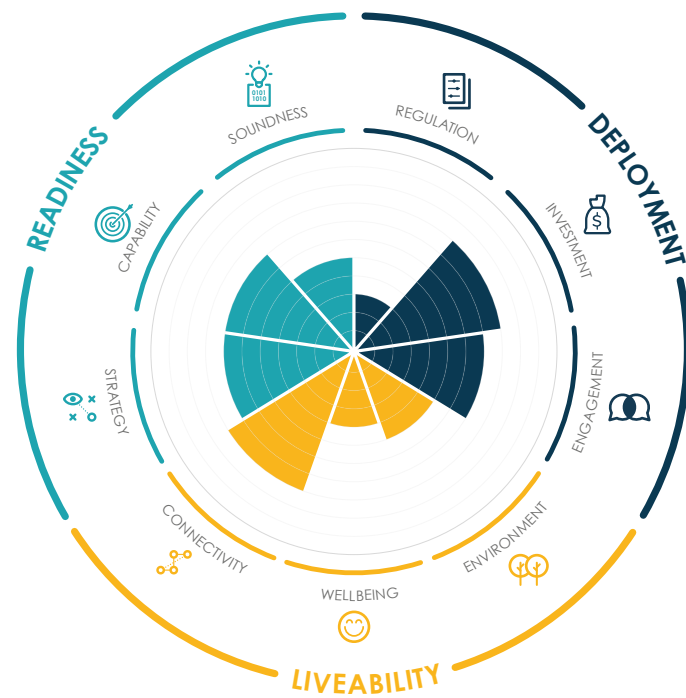**AUSTRIA GDP PER CAPITA** (2016)
£ 33,211

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
390

POPULATION (2015)
1,741,000

STRATEGY OWNER
Vienna City Council

an integrated map and timetable for services in the city.

The 'Smile Project' in Vienna has helped further Vienna's ambitious goals to provide Mobility-as-a-Service. A prototype of an integrated mobillustrility platform with a smartphone application was developed and tested in 2015. The mobility platform integrates information, bookings and payments for various modes of transport through a single access point.

As well as providing information, the city offers several alternative mobility services to users, including bike and car sharing, park and ride services, e-mobility and carpooling with extensive coverage across the city.

These alternative mobility services, in particular the CityBike Wein bike-sharing scheme, have been strategically located close to important transport nodes in the city to improve connec-

tivity and provide a last-mile solution for commuters. The live capacity of the next 'Citybike Wien' station is displayed in info-screens on board buses and tramways in the inner urban area of the city.

The relatively low score of Vienna in 'Wellbeing' does not necessarily express the city's overall underperformance in this lever, but rather reflects the absence of data for key proxy indicators of fairness and quality of life, unavailable at the time the score was calculated.

Vienna's STEP 2025 strategy outlines an ambitious goal to increase the share of public transport, walking and cycling to 80% by 2025, a 7% increase from 2015.

Warsaw

Warsaw's 'Mobility Plan' highlights the importance of creating an intelligent transport system to improve accessibility of public transport in the city – with innovation being a central instrument to achieving that goal.

A wide stakeholder engagement campaign helped to shape the strategy. Through workshops and consultation events, stakeholders from different departments in the city council, private organisations and users were invited to share their views on the proposed documents. The plan provides a high-level view of actions, but it is unclear who is responsible for successfully delivering the actions.

There are various mechanisms for collecting mobility data across Warsaw. To encourage the use of this data by third-party developers, the Warsaw City Council has developed a data platform to provide open access to valuable information on mobility services in the city.

The platform has some innovative functions and users are provided with robust and reliable access to APIs. Static data can be exported in various formats, including as raster and vector maps, whilst real-time web services data – which is updated every 1 minute – is also openly available, e.g., trams locations. To ensure the data is reliable and consistent, internal standards have been designed to support the collection of data across all modes of public transport.

This platform was initially created to provide access to data for the 'AppsforWarsaw' competition, which aimed to encourage third parties to create applications to tackle urban challenges using publically available open data. In 2016, the first place prize was awarded to 'Warsaw Ninja' – an application for public transport users to share real-time information about problems in the network and any delays they were experiencing, allowing other users to make more informed decisions during their commute.

To support third parties and fund projects in collaboration with the local innovators' community, the council seeks investment for R&D through bidding for European grants, such as Horizon 2020. To further encourage innovation, Warsaw also launched a service that provides third parties with a place to obtain legal, accounting and business advice, conducted by high quality experts and business practitioners.
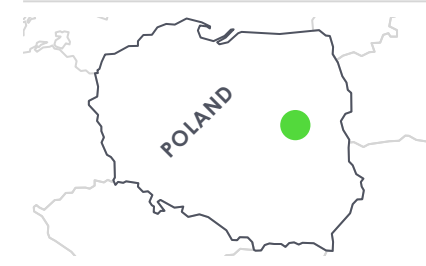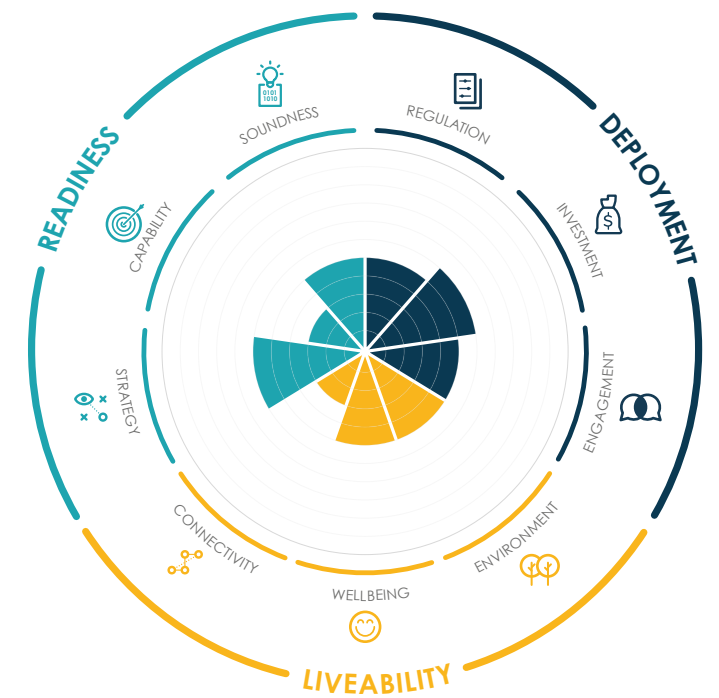
POLAND GDP PER CAPITA (2016)
£ 9,301

AVAILABLE MOBILITY SOLUTIONS

CARS/1,000 CITIZENS (2012)
575

POPULATION (2016)
1,715,000

STRATEGY OWNER
Warsaw City Council

The Warsaw City Council recognises the importance of user engagement to ensure continuous improvement in the quality of the services offered and customer satisfaction levels. Representatives from public transport authorities meet regularly with passengers and hold consultation sessions to collect feedback on user preferences.

However, the main form of feedback collection is through traditional paper-based surveys, and although a significant amount of insights are gathered from users, many of the surveys do not include non-users of services in the city. There are several other channels to provide information to users, including the CityApp, Warsaw City Contact Centre and social media platforms.

Users have several alternative mobility services available in the city, including bike and car sharing. They also have access to a multi-modal application, which utilises the city's open data APIs to provide users with real-time, in-trip information to help them better navigate the city and benefit from a more seamless experience. The public bike sharing service, Veturilo, is offered to both adults and children through a network of 300 docking stations and around 5,000 bikes, bookable in real-time through a mobile application.

In 2009 transport tariffs became integrated in Warsaw, releasing the city to start introducing a fully intermodal public transport system consisting of buses, trams, metro and urban rail.

Conclusions

Whilst there is a contextual dimension, which requires consideration when drawing conclusions from such a diverse group of cities, evidence points to the existence of common threads in the urban mobility innovation arena. The research journey conducted in UMii enabled us to identify current practices and uncover gaps that – despite cross-site differences, such as governance models, stage of economic development, phase in the political cycle, etc. – we recognise as key enablers of innovation, namely:
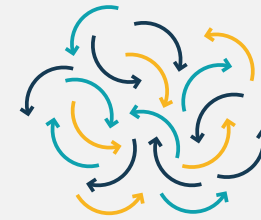
1. Share the load

Bring stakeholders together from both traditional and non-traditional domains to create an ecosystem and embrace co-design approaches. Innovation should be a shared process and you will gain from sharing the ownership of your city strategy with the ones that will benefit from it.

2. Break the silos

Look at urban mobility in the wider context of sustainable urban planning as it is not just a transport challenge. A multi-disciplinary approach is key to work towards more liveable cities. Cities should consider combined strategies to improve accessibility to jobs, services and facilities, which might not necessarily mean improving mobility levels.

3. Embed user-centred innovation and expand your crowd

Take the user as any person who benefits from any opportunity the city provides and focus on user needs and preferences.

4. Focus on challenges rather than prescribing solutions

Innovation comes from very different places and you don't always have to know the answer to your problems. Enable the community of innovators to help you by creating an open innovation environment.
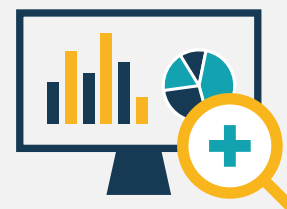
5. Recognise the value of data-driven innovation

There is an incredible value that data can bring to support your decisions and development of new solutions, but don't fall into the trap of big data. There is a difference between big and rich data.
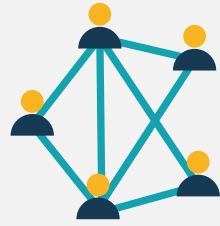
6. Build up your community skills

Establish networks of capabilities you can draw upon as you can't do it all by yourself.

7. Create a more flexible regulatory environment

It is important for cities to develop a proportionate and well measured response given innovations are quite often hindered by the existing regulatory environments.

8. Keep track of the progress and evaluate impacts

Be specific with your targets, monitor and follow-up. Consider assessing how mobility influences the wider factors that make your city liveable, rather than restricting the analysis to transport-specific data.

We started the research with a set of 52 indicators, which capture key policy features that shape the innovation ecosystem for urban mobility. However, while we remain confident in advocating for a multi-dimensional approach, there is still a long way to go until cities globally adopt a common set of indicators, which will enable their journey in the innovation process to be assessed in a context-independent, comprehensive manner.

Whilst UMii aims to guide city leaders to improve innovation in the urban mobility arena by exploring a variety of policy features, it also aims to be a catalyst for greater cooperation between city leaders and mobility providers, practitioners and innovators from traditional and non traditional mobility sectors.

During the research process, we have come across significant gaps in the collection of certain indicators – namely, in the capability, regulation, investment and wellness levers. Hence, UMii also wants to raise attention to the needs of cities having a more sophisticated approach to innovation in urban mobility; one that it is better suited to address the increasingly dynamic changes in cities and the future needs of their users.

Future Cities Catapult, the International Association for Public Transport, and Roads and Transport Authority of Dubai will promote UMii's findings and recommendations through their networks and will continue developing knowledge on urban mobility innovation.

References

Department of Transport (2015) Abu Dhabi Transportation Mobility Management Strategy

Department of Transport (2009) Abu Dhabi Travel Patterns

Department of Transport (2009) Surface Transport Masterplan: A Vision for Connecting Abu Dhabi

Emmanuel John (2016) Urban Mobility in Abuja

Greater Amman Municipality (2010) Transport and Mobility Masterplan for Amman

Resilient Amman (2017) Amman Resilience Strategy

City of Amsterdam (2016) ICT Industry, Amsterdam

City of Amsterdam (2016) Smart Mobility Action Plan 2016-2018

Amsterdam Smart City (2017) Mobility, Available at: www.amsterdamsmartcity.com

Municipality of Amsterdam (2015) City data portal, Available at: www.data.amsterdam.nl

City Hall of Barcelona (2013) Urban Mobility Plan of Barcelona PMU 2013-2018

Metropolitan Area of Barcelona (2010) Metropolitan Urban Mobility Plan PMMU

Metropolitan Transport Authority (2013) The Mobility Master Plan of the Barcelona Metropolitan Region MMP 2013-2018

Casa Transport (2007) The Urban Travel Plan, Casablanca

City of Casablanca (2014) 2020 development strategy of Casablanca

Mohamed Bourrahim, Casablanca: Strategy & Connectivity, Casablanca: WeCasablanca.

Director of Transport City of Casablanca (2007) Public-Private Partnership for public transport in Casablanca

Urban Mobility Lab, MIT (2015), 'Chicago Transit Authority - MIT Partnership', Available at: www.mobility.mit.edu

Chicago Metropolitan Agency for Planning (CMAP) (2014) Go To 2040

Chicago Department of Transportation (2017), 'About Divvy' Available at: www.divvybikes.com

CMAP (2015), ' Mobility: engine of our regional economy' www.cmap.illinois.gov, Chicago

Chicago Metropolitan Agency for Planning (CMAP) (2017) ON TO 2050, Available at: http://www.cmap.illinois.gov

Department of Transport (2013) Chicago Forward Action Agenda

Smart Dubai (2016) Vision and Missions, Available at: http://www.smartdubai.ae/

Roads and Transport Authority (2014) RTA Strategic Plan 2014-2018, Dubai

Roads and Transport Authority (2016) Transport Planning in Dubai

City of Geneva (2013) Mobility 2030, Geneva

Society of Motor Manufacturers and Traders (2017) 'Electric buses that 'flash-charge' in 15 seconds due in 2018' Available at:www.smmt.co.uk, Geneva

Helsinki Region Transport (2016) Vision 2025, Available at: https://www.hsl.fi

Helsinki City Authority (2016) Transport Planning and Research, Available at: https://www.hsl.fi

City of Helsinki (2015), 'Helsinki City Group ', Available at: www.hel.fi

Sami Salah (2016) Case: Helsinki, Forum Virium

Helsinki City Planning Department (2013), Urban plan - the new Helsinki city plan Vision 2050

Hong Kong Planning Department (2016) A Smart, Green and Resilient City Strategy

Hong Kong Government (2016) Hong Kong 2030: Towards a planning vision and strategy transcending 2030

Istanbul Metropolitan Municipality (2016) Strategic Plan 2015-2019

City of Johannesburg (2013) Strategic Integrated Transport Plan Framework for the City of Johannesburg

UMii Team

Lisa Seftel (2016) Developing a transport strategy towards seamless and integrated urban mobility, Johannesburg

ASEAN (2015) Kuala Lumpur Transport Strategic Plan 2016-2025

Lisbon Metropolitan Authority (2016) Strategic Plan for Urban Development 2014-2020 (PEDU)

Lisbon City Hall (2016) Vision and Strategy, Available at: http://www.cm-lisboa.pt

Los Angeles Department of City Planning (2016) Mobility Plan 2035 An Element of the General Plan

Los Angeles Department of City Planning (2016) Urban Mobility in a Digital Age: A Transportation technology strategy for LA

Metro (2016) Los Angeles Office of Extraordinary Innovation, Available at: https://www.metro.net

Greater London Authority (2017) Mayor's Transport Strategy

Transport for London (2017) Open data users, Available at: www.tfl.gov.uk

Transport for London (2017), 'Future Streets Incubator' Available at: www.tfl.gov.uk

Urban Mobility Lab, MIT (2015), 'Transport for London' Available at: www.mobility.mit.edu/london

Transport for Greater Manchester (2017) Greater Manchester Transport Strategy 2040

Transport for Greater Manchester (2015), 'Real-Time Open Data Portal' Available at: www.developer.tfgm.com

Eco Mobility (2016) City Summary - Mexico City, Available at: https://ecomobility.org

Municipality of Milan (2015) Urban Plan of Mobility

Montreal Transit Corporation (STM) (2012) Strategic Plan 2020

Montreal Transport Directorate (2008) Transport Plan

Société de transport de Montréal (2017), 'iBus: Benefits for all' Abvailable at: www.stm.info

City of Munich Department of Urban Planning and Building Regulation (2006) Transport Development Plan

Smarter Together, 'Club of Cities' Available at: www.smarter-together.eu, Munich

Munich City Hall (2017), 'EU project 'Smarter Together' Available at: www.muenchen.de

City of Nairobi (2014) Urban Development Masterplan

New York Department of Transport (2008) Sustainable Streets

New York Department of Transport (2016) Mobility Report

New York Department of Transport (2016) Strategic Plan

Municipality of Sao Paulo (2015) Sao Paulo Mobility Plan

Land Transport Authority (2013) Land Transport Masterplan, Singapore

Land Transport Authority (2014) Smart Mobility 2030: ITS Strategic Plan for Singapore

Transport New South Wales (2016) Future Transport Technology Roadmap, Sydney

Celistino (2017) Sydney Science Park, Available at: http://www.celestino.net.au

Transport NSW (2017) Technology enabled strategies, Available at: http://www.celestino.net.au

City of Vienna (2015) STEP 2025: Sustainable Urban Mobility Plan

Transform (2016) SMILE Project in Vienna, Available at: www.urbantransform.eu

Citybike, 'Citybike Vienna' Available at: www.citybikewien.at

Apps4Warsaw (2016) App Contests, Available at: http://www.apps4warsaw.org

Public Transport Authority of Warsaw (2012) Integration Witout Regulation

UITP (2015) Mobility In Cities Database

Future Cities Catapult Research Team:

Sofia Taborda,
Urban Mobility Theme Lead

Greg Yiangou,
Urban Mobility Researcher

Christina Georgouli,
Urban Mobility Researcher

Dr. Ana Vasconcelos,
Urban Mobility Researcher

Abigail Matthews,
Project Manager

Thanos Bantis,
Data Scientist

Desi Hristova,
Data Scientist

Rimaljit Likhari,
Market Analyst

Bin Guan,
Integrated Urban Planning Researcher

Gemma Ginty,
Urban Futures Lead

Jimmy Paquet,
Design Researcher

Future Cities Catapult Production Team:

Felipe Caro,
Illustrator & Visual Communications Designer

Naomi Moore,
Communications Manager

Sérgio Cameira,
Graphic Designer

Giulia Fiorista,
Graphic Designer

Laura Pye
Writer-Producer

UITP Project Management Team:

Karine Sbirrazzuoli,
Project Manager

Jérôme Pourbaix,
Director Regional Offices & Services

Umberto Guida,
Director Research & Innovation

Sylvain Haon,
Director Knowledge & Membership Services

UITP Network and Support Team:

Mircea Steriu,
Statistics Manager

Cynthia Bonsignore,
Communication Manager

Marie Ost,
Communications Officer, Marketing

Andrew Bata,
Regional Manager, North America Office

Sue Chan,
Head of Asia-Pacific Office

Gayang Ho,
Manager, *Asia-Pacific Office*

Karen Au,
Events Officer, Asia-Pacific Office

Kaan Yildizgöz,
Director Training & Head of Turkey Regional Office

Yasin Basar,
Turkey Office

Yssoufou Cisse,
Secretary General, UATP

Ayman Smadi,
Director of MENA office and Centre of Transport Excellence

Anju Gomes,
Head of Events, Finance & Administration, MENA Office

Aline Delatte,
Senior Research Manager, MENA Centre of Transport Excellence

Farida Moawad,
Junior Researcher, MENA Centre of Transport Excellence

Dounia Gourram,
Head of Maghreb Office

Eleonora Pazos,
Head of Latin America Office

Jaspal Singh,
Head of India Office

Yasha Vojdani,
Executive Director of UITP ANZ

Acknowledgments

The UMii team would like to express their gratitude to the following people who kindly spared their time for the purposes of this project:

Abuja:
•   Eng. Emmanuel John, Head of Administration & Strategy, Transportation Growth Initiative

Amman:
•   Fawzi Masad, Chief Resilience Officer & Mayor's Assistant, Greater Amman Municipality
•   Jane Raqqad, Modelling and data specialist, Greater Amman Municipality

Amsterdam:
•   Tijs Roelofs, Chief Technology Officer, Gemeente Amsterdam Smart Mobility Manager
•   Lizann Tjon, Policy advisor, Gemeente Amsterdam

Barcelona:
•   Jordi Martin, GIS and Innovations expert, Metropolitan Transport Authority
•   Lluís Alegre Valls, Technical Director, Metropolitan Transport Authority

Casablanca:
•   Mohammed Bourrahim, Vice Mayor in charge of Urban Transportation, City of Casablanca
•   Youssef Draiss, General Director, CasaTransports

Chicago:
•   Jeffrey Sriver, Director of Transportation Planning and Programming, Chicago Department of Transportation

Dubai:
•   Laila Faridoon, Executive Director, DG Office, RTA Team Chairperson
•   Dr. Abdelmalek Abu Alsheikh, Manager of Transport Policies and Planning
•   Dr. Sara Ishaq, Manager of Sustainability & Future
•   Saeed Ishaq, Engineer in Planning and Business Development

Geneva:
•   Nicolas Simond, Direction Des Transports Collectifs, City of Geneva

Helsinki:
•   Sami Sahala, ITS Chief Advisor & Project Manager, Forum Virium

Istanbul:
•   Keskin Suheybi, Directorate General of Strategic Development, IETT
•   Hakan Yardim, Sustainability Representative, Strategy Development Department, IETT

Istanbul:
- Keskin Suheybi, Directorate General of Strategic Development, IETT
- Hakan Yardim, Sustainability Representative, Strategy Development Department, IETT

Johannesburg:
- Lisa Seftel, Head of Transport, Municipality of Johannesburg

Kuala Lumpur:
- Natasha Mohd Zulkifli, Executive Vice President Group Managing Director's Office, Prasarana Malaysia Berhad

Lisbon:
- Carlos Gaivoto, Head of Department of Network Planning, Carris
- Pedro Machado, Project Manager, Lisboa Envova

London:
- Michael Hurwitz, Director of Transport Innovation, Transport for London
- Michele Dix, Managing Director Planning at Transport for London
- Ben Plowden, Director of Surface Strategy and Planning, Transport for London
- Steve Newsome, Head of International and European Affairs, Transport for London
- Matthew Hudson, Head of Strategy, Transport for London

Los Angeles:
- Nadine Lee, Deputy Chief Innovation Officer, Los Angeles County Metropolitan Transportation Authority
- Seleta Reynolds, General Manager, Los Angeles Department of Transportation
- Manchester:
- Raphael Cuesta, Head of Innovation, Transport for Greater Manchester

Milan:
- Andrea Carobene, Department of mobility, Municipality of Milan
- Valentino Sevino, Direttore Area Planificazione Mobilità, Municipality of Milan
- Montreal:
- Hugues Bessette, Direction des transports, Ville de Montréal
- Eng. Claude Carette, Service des infrastructures, de la voirie et des transports, Directeur de Service, Ville de Montréal

Munich:
- Georg Dunkel, Planning Department, Head of Transportation Planning, City of Munich
- Kurt Kapp, Head of Economic Development, City of Munich
- Gunnar Heipp, Director Strategic Planning Department, SWM/MVG

Nairobi:
- Edwins Mukabanah, Managing Director of Kenya Bus, Vice President of UATP East Africa, Kenya Bus & UATP

New York:
- Adam Giambrone, Director of the Brooklyn-Queens Connector project, New York City Hall
- Ann McGrane, Policy Analyst, New York City Department of Transportation
- William Carry, Senior Director for Special Projects, New York City Department of Transportation

São Paulo:
- Renata Verissimo, Strategic Communications Advisor to the Presidency, Empresa Metropolitana De Transportes Urbanos De São Paulo SA (EMTU)
- Fernando de Caires Barbosa, Sao Paulo Assessor, São Paulo Transporte (SPTrans)

Singapore:
- Rosina Howe-Teo, Group Director of Innovation, Land Transport Authority
- Nolan Kam, Land Transport Authority
- Shao Fei Huang, Director, Innovation & Smart Mobility Office, Land Transport Authority

Sydney:
- Robert Ramsay, Director Innovation Department, Transport for New South Wales
- Tony Braxton-Smith, Lead Future Transport programs, Transport for New South Wales

Vienna:
- Anna Mayerthaler, Head of Innovation & Science, Wiener Stadtwerke

Warsaw:
- Monika Rybczynska –Ejchorszt, Chief Specialist in Roads & Public Transport Department, Warsaw City Hall
- Halina Rakowska, Public Transport Authority, Coordinator of European Affairs, Warsaw City Hall
- Piotr Zalecki, Public Transport Authority, Department of European Funds and Media, Warsaw City Hall

Transport Systems Catapult
- Aditya Thirunavukkarasu, Technologist-Intelligent Mobility, Transport Systems Catapult
- Steve Close, Senior Technologist, Transport Systems Catapult
- Vasileios Vyzas, Data Scientist, Transport Systems Catapult