1.1.1 Overview of Existing and Upcoming MaaS Deployments in 100 Cities (1/2)

Global Mass Transit Research has analysed existing and upcoming Mobility-as-a-Service (MaaS) deployments in 100 cities. Of these 100 cities, **xx** are in North America, **xx** in Latin America, **xx** in Asia Pacific, **xx** in Europe and **xx** in the Middle East. These cities have either already deployed or have plans to deploy MaaS in the near future.

North America

xxx

Europe

xxx

Asia Pacific

xxx

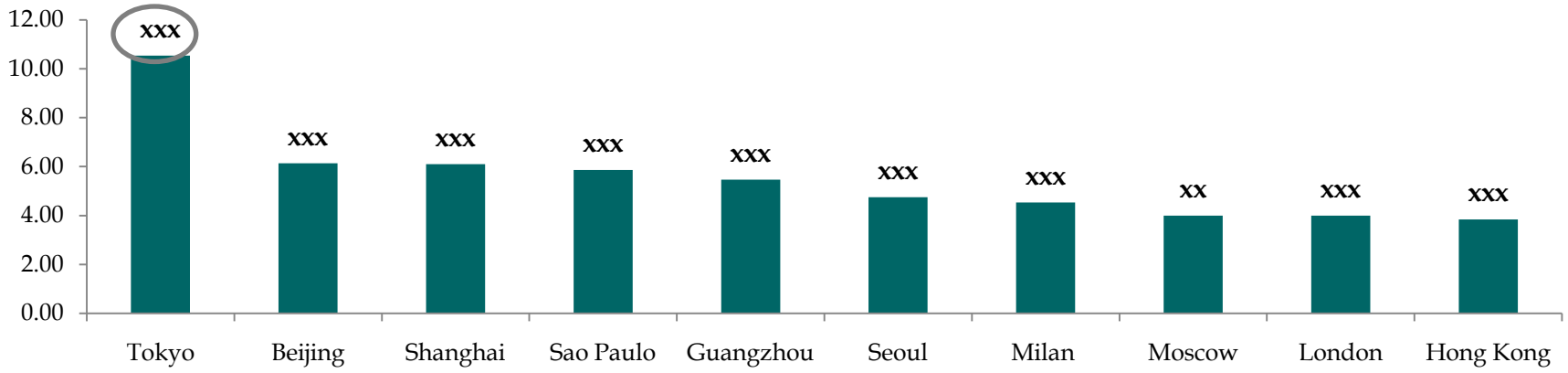
Latin America, Middle East

xxx

1.1.3 Trends in Ridership

Majority of the cities with highest public transport ridership are in Asia Pacific. In fact, four of the top 10 cities are in China, account for about xx% of the total ridership of the top 10 cities.

Top 10 cities with the highest public transport ridership (billion passengers)



Key takeaways

Integration

- The level of public transport integration has a direct impact on public transport ridership.
- Transport systems in all the 10 cities are integrated at the city and regional level.
- Fare system in Tokyo, Japan is integrated at the national level.

ABT deployment

- By automatically calculating and charging the fare after the completion of the trip, ABT makes commuting convenient for passengers.
- ABT has been deployed in xx out of the top 10 cities (*except for xx*).

Advanced fare media

- Deployment of advanced fare media is one of the major contributors to in increasing public transport ridership.
- Mobile ticketing has been deployed in xx of the top 10 cities (except in xx), while bank cards have been deployed in xx of the top 10 cities (xxx).

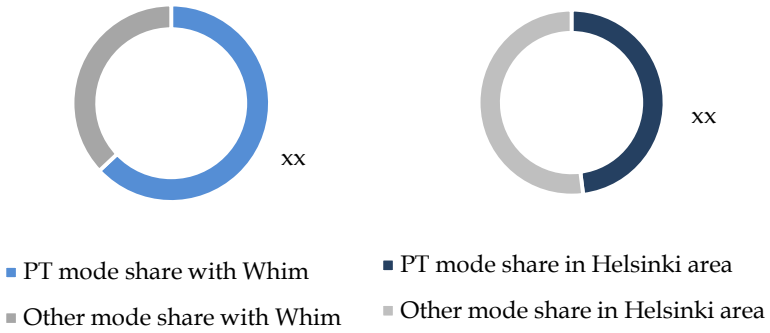
Plans to deploy MaaS

- Of these cities, xxx cities have either undertaken MaaS pilots or have plans to deploy MaaS in the future.
- For instance, in Tokyo, 3 MaaS pilots have already been completed and in the future MaaS level 3 deployment is planned. Beijing deployed MaaS in 2019, and aims to use the MaaS app The city already deployed MaaS in November 2019. In future, the app will enable all closed-loop facilities in all aspects of transportation, payment, finance, and cloud computing.

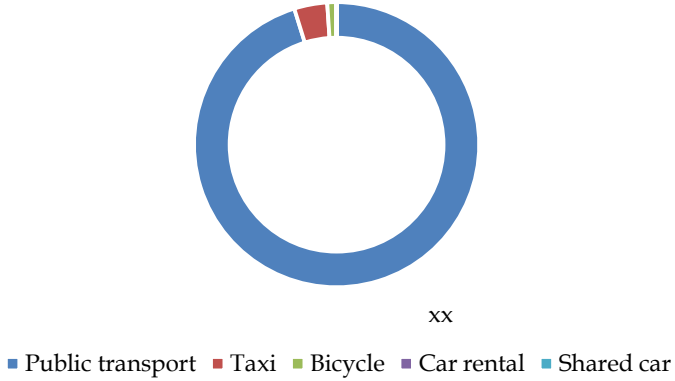
1.1.12 Impact on Transit Ridership due to MaaS

Outcomes of MaaS – Whim, Helsinki

MaaS users ride public transportation more than other residents in Helsinki metropolitan area counterparts.



- Public transport is the backbone of Whim. 95.2%trips are made on public transport.



MaaS users use xx times more public transport as compared to typical Helsinki resident

- Whim grew along public transport corridors. xx% of all MaaS trips occur in area with highest public transport access.

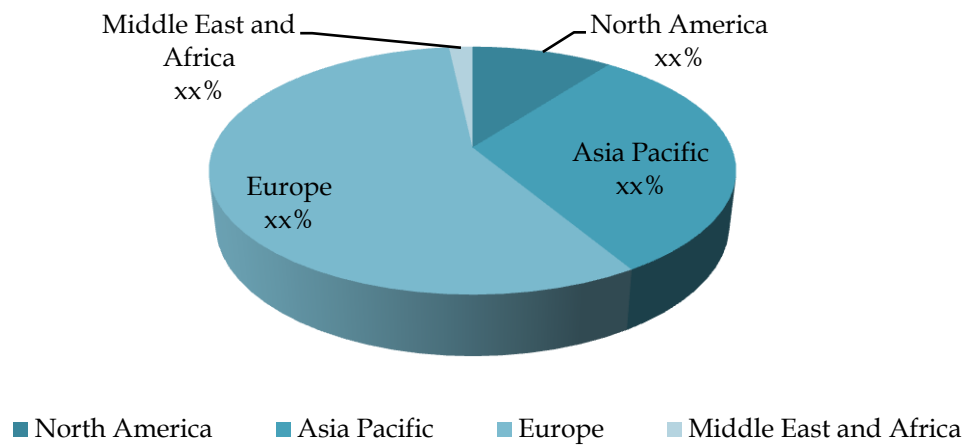
- MaaS is solving first and last mile problem for public transport. xx% of total bike trips in Whim are taken within 30 mins before PT trip

- Average Sustainable Transportation Modal share of Whim users compared to the Helsinki city sub-set of the National Travel Survey

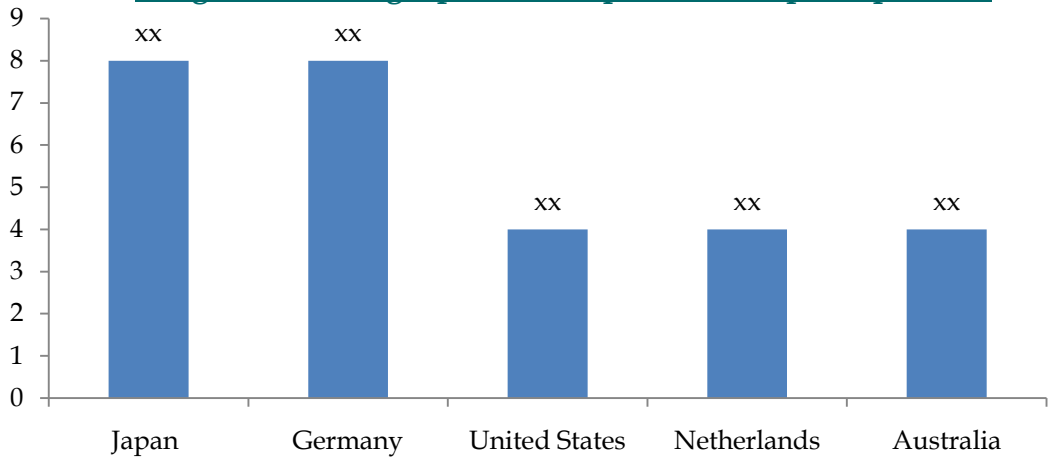
1.5.4 Integration Amongst Public and Private Transport Operators

- Of the 100 cities covered in the report, xx cities in xx countries have ticketing integration across public and private transport operators. Of these, majority lie in xx (xx%), followed by Asia Pacific (xx%) *(This is also because the sample set of cities is skewed towards Europe and Asia Pacific. The reason for this is that majority of the cities in these two regions are heavily inclined towards MaaS and are actively integrating ticketing between public and private transport operators).*
- A total of xx cities are yet to establish ticketing integration across public and private transport modes for smoother implementation of MaaS.

Integration across public transport modes



Countries with maximum number of cities that have integration amongst public and private transport operators



Key takeaways

- Of the cities covered in the report, majority of the cities in Japan, Germany, the US, Netherlands and Australia have integration amongst public and private transport operators.
- Cities in these top 5 countries account for about **xx**% of the total (xx) cities having integrated public transport ticketing across public and private operators.

1.6.2 Market Outlook for MaaS (1/2)

Outlook of readiness for MaaS for each region towards 2025

	North America	Latin America	East Asia	South and South East Asia	Oceania	Europe	Middle East	Africa
Overall MaaS Opportunities								
Deployment of advanced fare media								
Single payment channel								
ICT infrastructure								

High potential market | Average potential market | Low/No potential market

Europe holds high potential for MaaS. In Europe, the market size of MaaS is expected to increase at a compound annual growth rate (CAGR) of xx% by 2025. Nearly three-fourths of this growth will be driven by cities in Western Europe. It is expected that MaaS will include not only public transport and private mobility service providers but also parking, electric vehicle charging, road toll collection, services at stations and other value-added services.

The CAGR of the deployment of MaaS across the world was projected to be xx% in the pre-COVID-19 period. However, the deployment of MaaS is expected to be adversely affected due to major disruptions caused by the pandemic. Europe, which has the maximum number of current and planned MaaS deployments, has been the worst hit.

The deployment of MaaS, especially post COVID, is predicted to make commuting easier. For e.g.: Iomob has developed a features to enhance its core MaaS solution to embrace social distancing. Through this feature the passenger can filter intermodal journeys that meet social-distancing criteria. Further, Transit experts have predicted that if the authorities agree to hand over the deployment and operation of MaaS to private players, technology companies will have a 50% market share of the access-to-mobility sector within three to five years.

1.6.4 Plans of Cities to Deploy MaaS (1/7)

Of the 100 cities analysed by *Global Mass Transit*, MaaS has been deployed in around xx cities. Of these, nearly xx% of the cities plan to expand their MaaS services and offerings. Key MaaS projects are being undertaken in the Netherlands, Spain, and Sweden in the European region, and in Japan, Singapore and Taiwan in Asia.

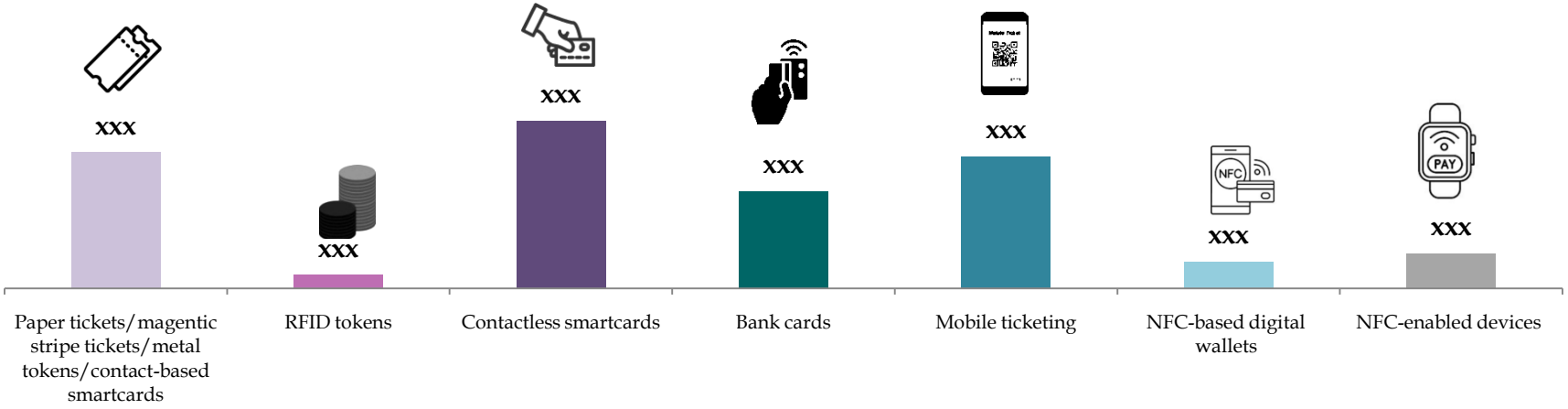
Key plans of cities to deploy MaaS

Country	City	City plans to deploy MaaS
North America		
Canada	Montreal	xxx
	xxx	The 2041 Regional Transportation Plan(RTP) provides a blueprint for an integrated multimodal regional transportation system in the Greater Toronto and Hamilton Area (GTHA). 2041 RTP's priority actions for strategy 3 outline plans to advance the integration of transit services and fares; and develop and implement a MaaS strategy.
United States	Chicago	xxx
	xxx	DART plans to expand the capabilities of the GoPass mobile app to include full integration of trip planning and payment with transportation network companies (TNCs) including Uber and Lyft as well as with taxi services, microtransit providers and on-demand paratransit service.
	Louisville	xxx

1.6.5 Plans for Deployment of Advanced Fare Media (1/2)

Global Mass Transit has analysed existing and upcoming fare collection systems in 500 cities in 112 countries across the world.

Distribution of fare media planned to be deployed across 500 cities by 2030



Contactless smartcards continue to be the most popular fare media and are planned to deployed by transit agencies across xxx cities, of which xxx cities will be deploying the media for the first time. Majority of the new deployments will be part of new systems coming up.

Of the 500 cities covered, more than xx% have plans to deploy mobile ticketing. This includes xx cities that will deploy the fare media for the first time.

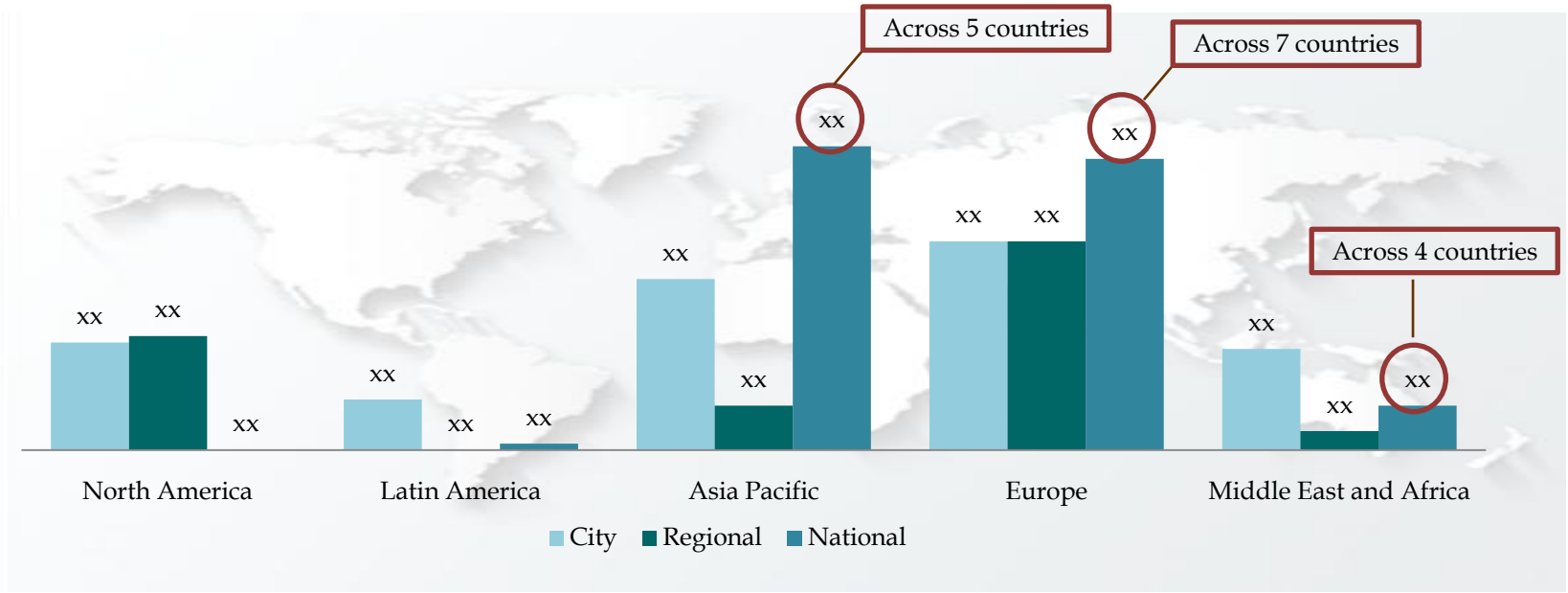
Interestingly, xxx cities will deploy bank cards for the first time, with most of the deployments planned in Europe. This level of deployment is being by the financial payment institutions who are partnering with transit agencies and sharing expertise and best practices to increase the uptake.

Although xxx cities have plans to deploy traditional fare media, only xxx cities will be deploying them for the first time. None of the cities are planning to deploy RFID tokens for transit payments for the first time reflecting the decline of this traditional fare media.

1.6.6 Plans for Establishment of a Single Payment Channel (2/2)

Global Mass Transit has analysed existing and upcoming transit fare collection systems in 500 cities. To develop an efficient public transport system, several initiatives are being undertaken by city/national governments, transit agencies and operators to integrate ticketing system across modes, operators, cities, regions, retail, banking, value added services, etc.

Region-wise public transport fare integration plans at various levels



City-wide	Region-wide	Nation-wide
Public transport fare integration at city-level is planned in **xx cities,** with majority in Asia Pacific and Europe.	Public transport fare integration at regional-level is planned in more than **xx cities,** with majority in Europe and North America.	Public transport fare integration at national-level is planned in **xx countries,** with majority in Europe.

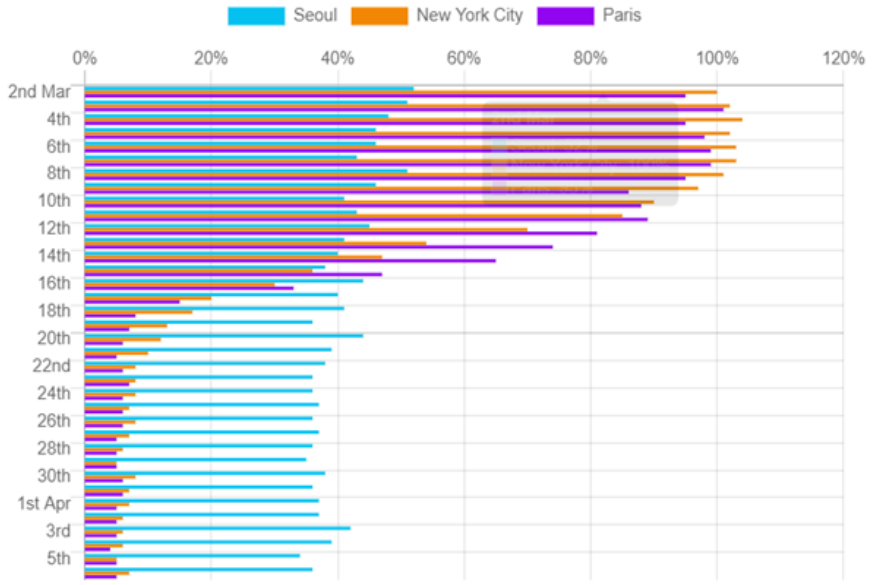
Inter-country integration is planned in two cities; one between Tallinn (Estonia) and Helsinki (Finland) and another one between Limburg (Netherlands) and it's neigbouring countries (Belgium and Germany) .

1.6.9 Impact of COVID-19 on MaaS (2/5)

Impact on public transport providers

Declining ridership

- Cities across Europe and the United States (US) have recorded substantial decline in public transit ridership during January-May 2020.
- A key factor in the plummeting public transit ridership globally was reduced mobility in most cities across the world. During March 2020, the percentage of people in transit fell on an average from xx to xx% to less than xx%. Only in a few cities like Stockholm, Hong Kong, Seoul, and Singapore city mobility increased by up to xx%.
- In most European countries, the decline in ridership was gradual between January and February, but fell steeply thereafter. For example, in Spain, Italy and France, ridership declined by almost xx%.
- In the US, ridership started falling steeply in the beginning of March 2020. Major cities observed a fall in ridership between xx and xx%.
- In South America, ridership in Argentina, Brazil, Chile, Colombia, Peru, and Uruguay fell from mid-March onwards. Most cities observed a rise in ridership until mid-March and a rapid fall of up to xx% in the last two weeks of March
- In Asia, ridership decline has varied as countries imposed lockdowns at different times. For instance, in Hong Kong, ridership fell steeply in January and stabilised at xx to xx% in February. It improved slightly in March before again dipping in mid-March.
- The image represents the city mobility index of New York, Paris, and Seoul from March to April.



Source: Data from Citymapper

Financial impact

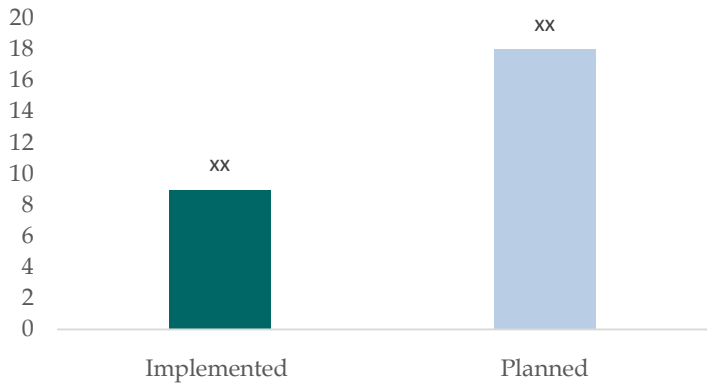
- Fall in ridership levels is having a huge financial impact. It is anticipated that the impact on transit agencies in these countries will have ripple effects without intervention and financial support from their respective governments.
- For instance, in the US, fares contribute to an average of 32% of transit operations according to the USDOT. In the case of New York, MTA has estimated USDxx billion in fares for the year 2020 from the total allocated budget of USDxx billion. A fall of even xx% in ridership (fares) would lead to a shortfall of USDxx million.

1.7.3 Asia Pacific: Current Trends (1/2)

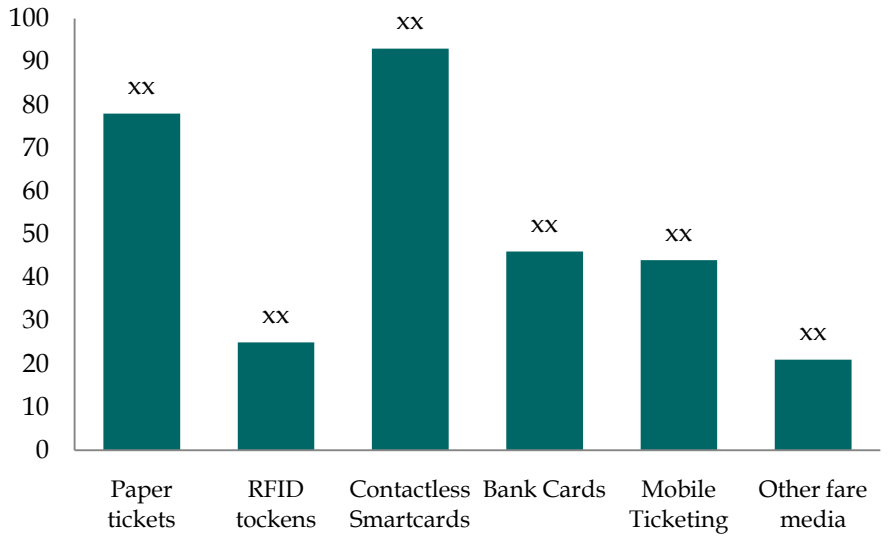
Current status of MaaS

- The current report covers xx cities in Asia Pacific. Out of these, MaaS has been implemented in a total of xx cities.
- These include xx city in China (xx), xx cities in Japan (xx), Singapore, xx cities in South Korea (xx) and xx city in Taiwan (xx).
- Out of the xx cities where MaaS has been implemented, xx cities have level 1 MaaS, xx cities have level 2 MaaS (with integrated ticketing and payment options) and xx city (xx) has level 3 MaaS.
- Within Asia Pacific, there has been significant focus on MaaS in Japan, Taiwan, Australia, New Zealand, Singapore, South Korea, China, etc. The other countries are yet to make any progress.

Current status of MaaS deployment in Asia Pacific



Current fare media spread in 120 cities in Asia Pacific



Key Takeaways

- ***Global Mass Transit Research*** has analysed **fare systems in xx cities in Asia Pacific**. Transit ticketing plays a key role in initiating MaaS and as such, the type of fare media deployed is crucial to understand the scope for MaaS in the region.
- **Focus on ABT:** Account based ticketing (ABT) has been deployed across xx cities in the Asia Pacific region. China is the most dominant country in terms of ABT deployment with ABT adopted in xx cities. Beijing has already deployed MaaS at level 1. A focus on ABT is expected to pave the way for fare integration on shared mobility apps, which is why the future planned MaaS initiatives in China are planned at level 2. An example of this is the planned level 2 MaaS in xx.
- **High bank card usage:** Bank cards (either physical or through mobile applications) have been used to pay for transit in the region. Several cities in Australia, New Zealand, and Taiwan have plans to deploy open-payment systems in transit.
- **Fare integration:** xx out of 120 cities in the Asia Pacific region have adopted an entirely integrated ticketing system across transport modes and operators (within in city).

1.7.3 Asia Pacific: Opportunities

MaaS pilot programmes

- Xx has recently completed a month-long MaaS pilot at level 1.
- Xx and xx City in Japan have MaaS pilots underway, both at level 2.
- **MaaS platform suppliers:** Aizu Samurai MaaS Project Council (developed the Samurai MaaS app for Aizuwakamatsu) and JR East is the MaaS platform supplier for Sendai City.
- Xx has recently completed three pilots (MaaS pilot in xx), and has plans to deploy MaaS at Level xx.

MaaS Plans and Outlook

- Out of the xx cities covered in the report, MaaS is planned to be deployed in xx cities in Asia Pacific.
- Within Asia Pacific, MaaS deployment is expected to progress in countries in East Asia. In South Asia, MaaS deployment is unlikely although countries such as India are expected to focus on deployment of a single payment channel. In South East Asia, so far progress has been made in Singapore and it is expected that this city-state will lead the way in MaaS deployment in this sub-region. Within Oceania, Australia is expected to make more progress in MaaS as the government of New Zealand is currently unclear on the way forward for MaaS.

Cities with plans for fare media procurement

Fare media	No. of cities
Contactless smartcards	xx
Bank cards	Xx
Mobile ticketing	Xx
NFC-based digital wallets	Xx
NFC-enabled devices	Xx

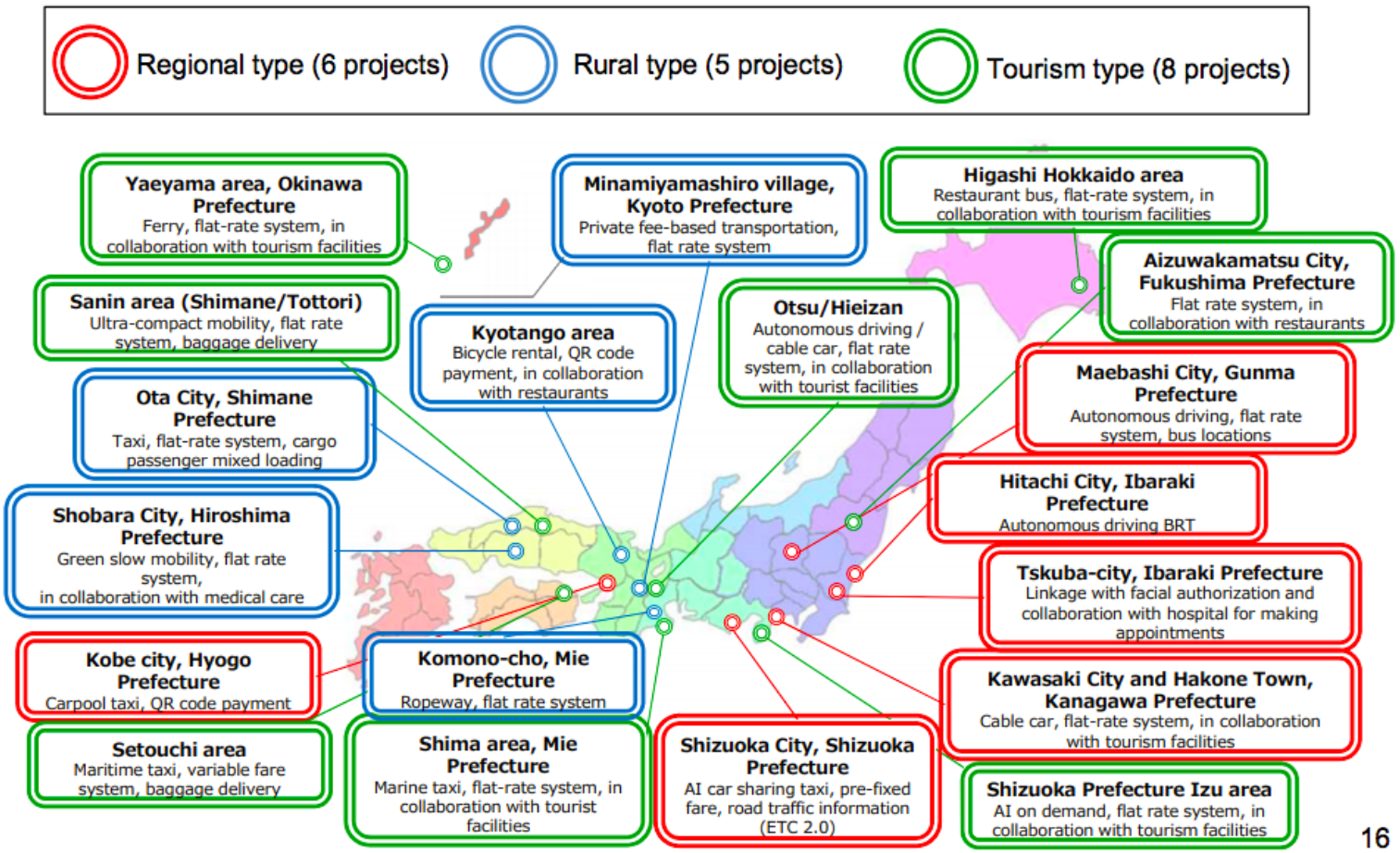
Key future plans for fare payments

- Of the xx cities analysed by Global Mass Transit research, transit ticketing plans for deployment of mobile ticketing, bank cards for transit payments and plans for integration of public transit are crucial.
- **Spotlight on mobile ticketing and bank cards:** A total of xx cities have plans to deploy bank cards for fare payments in the region. In addition, xx cities have plans to deploy mobile ticketing. Interestingly, xx cities have unveiled plans to deploy banks cards for the first time and xx cities are looking to deploy mobile ticketing for the first time. Deployments of bank cards is expected to accelerate the deployment of MaaS in the region, at level 2 and 3.
- **Increased passenger experience:** Agencies are making efforts to improve the passenger experience using bank cards. For instance, as taps from payment cards linked to smart phones increased, Transport for NSW revealed that it had extended weekly and daily fare caps to payments made by bank cards, mobile payments, and wearables. This was a part of the agency's attempt to promote fare payments through open-payment methods and to issue fewer travel cards. Austraia has plans to deploy MaaS in four cities: Barossa, Mount Barker, Newcastle, Sydney.
- **Plans to integrate public transport ticketing:** xx cities and xx regions in Asia Pacific plan on integrating their public transport ticketing in the future.

1.9.6 Japan (2/3)

19 pilot projects of MaaS in Japan by MLIT

19 MaaS projects in 2019 (government subsidized projects, 300million yen)



1.9.6 Japan (3/3)

Case studies: Key cities with plans to deploy MaaS

City	Scope of MaaS deployment plan	MaaS platform supplier
Aizuwakamatsu	The fourth and final stage of the Aizu Samurai MaaS project is expected to include integration of car sharing services into the MaaS app with plans to offer bundled fare and discount packages. The start date for this project is yet to be announced.	xx
Hitachi City	xx	Navitime Japan Co., Ltd.
Otsu City	The city plans to launch a second MaaS demonstration test later in 2020 which will integrate the autonomous bus service with the MaaS app. A full-scale MaaS scheme is planned to be launched in 2021.	Keihan Electric Railway Co.
Sendai City	JR East, Miyagi Prefecture, and Sendai City plan to launch the second stage of the "Tohoku MaaS Sendai trial" by end 2020. This stage will integrate more service providers and provide information on more restaurants and bars to form a comprehensive tourism-type MaaS app.	xx
Tokyo	xxx	MaaS Tech Japan, Microsoft Japan
Yokosuka	The city's model development plan aims to launch a preliminary MaaS service by 2020 and a full model by 2022. The first phase of the planned "Universal MaaS" app will offer barrier-free and easy wheelchair-access transit between the airport and various destinations in the city.	xxx

1.9.7 The Netherlands (1/2)

MaaS Readiness Index

Nation-wide plans to pilot MaaS

The Ministry of Infrastructure and Water Management (I&W) launched seven regional MaaS-pilots that can be scaled to a national level and allocated EUR20-million grant for the project, which is effective for 2-3 years. Under a framework agreement 24 companies were selected. The framework agreement will remain in force until the time of renewal (until 31 December 2022), with one time option to extend by two years. The regions have selected MaaS service provider(s) from among the 24 companies in the framework agreement.

Amsterdam	xx	Rotterdam-Den Haag	xx	Twente	xx	Limburg
xxx	Through the MaaS app, the authority plans to stimulate people to **use alternative forms of transport** to cars.	xx	Create an affordable, future-proof, innovative and integrated **mobility system that meets the needs of travellers** in the provinces of Groningen and Drenthe.	xx	The pilot will specifically focus on the use of the MaaS service for all **business mobility movements of employees**.	xxx
Over Morgen, Amber, Radiuz and Transdev	Innovactory	Pon, Deloitte, Huub, CGI, Reisinformatiegroep, Tranzer, & Shuttel	ICT Group	Tranzer, Qarin, Ideate and MaaS-Portal	ICT Group	Arriva, Tranzer and ICT Group