DATA-DRIVEN TRANSPORTATION SYSTEMS

POLICY FRAMEWORK

Smart City
MISSION TRANSFORM-NATION

सत्यमेव जयते

Ministry of Housing and Urban Affairs
Government of India

ROCKY MOUNTAIN INSTITUTE

Ministry of Housing and Urban Affairs
Government of India

ABOUT MINISTRY OF HOUSING AND URBAN AFFAIRS (MoHUA)

The Ministry of Housing and Urban Affairs is the apex authority of Government of India to formulate policies, coordinate the activities of various central ministries, state governments and other nodal authorities and monitor programs related to issues of housing and urban affairs in the country. The Smart Cities Mission was launched by the Ministry in 2015 to promote sustainable and inclusive cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions.

ABOUT ROCKY MOUNTAIN INSTITUTE (RMI)

Rocky Mountain Institute (RMI)—an independent nonprofit founded in 1982—transforms global energy use to create a clean, prosperous, and secure low-carbon future. It engages businesses, communities, institutions, and entrepreneurs to accelerate the adoption of market-based solutions that cost-effectively shift from fossil fuels to efficiency and renewables. RMI has offices in Basalt and Boulder, Colorado; New York City; Washington, D.C.; and Beijing. RMI has been supporting India's mobility and energy transformation since 2016.

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Document outline

This document aims at providing a basic understanding of mobility data, to serve as a foundation for exploring ways to support its use in the passenger transportation sector.

1.0 What is data?

Data is any sort of information, both qualitative and quantitative. Data can be measured, collected and reported by a number of means and then analyzed to provide insight into a situation. The Government of India's Personal Data Protection Bill (2018) defines data as "representation of information, facts, concepts, opinions, or instructions in a manner suitable for communication, interpretation, or processing by humans or by automated means".[1]

1.1 What is mobility data?

Mobility data includes a wide range of information about or related to the interactions and movement of people, goods and vehicles in the transportation system. Mobility data is collected and generated in a number of different manners by a number of different parties. For example, data can be collected using physical infrastructure such as sensors and cameras, mobile applications and surveys. This data is often generated by the movement of vehicles or individual travelers. It may be created and collected by public transit agencies, private companies and individual citizens.

Examples of types of mobility data

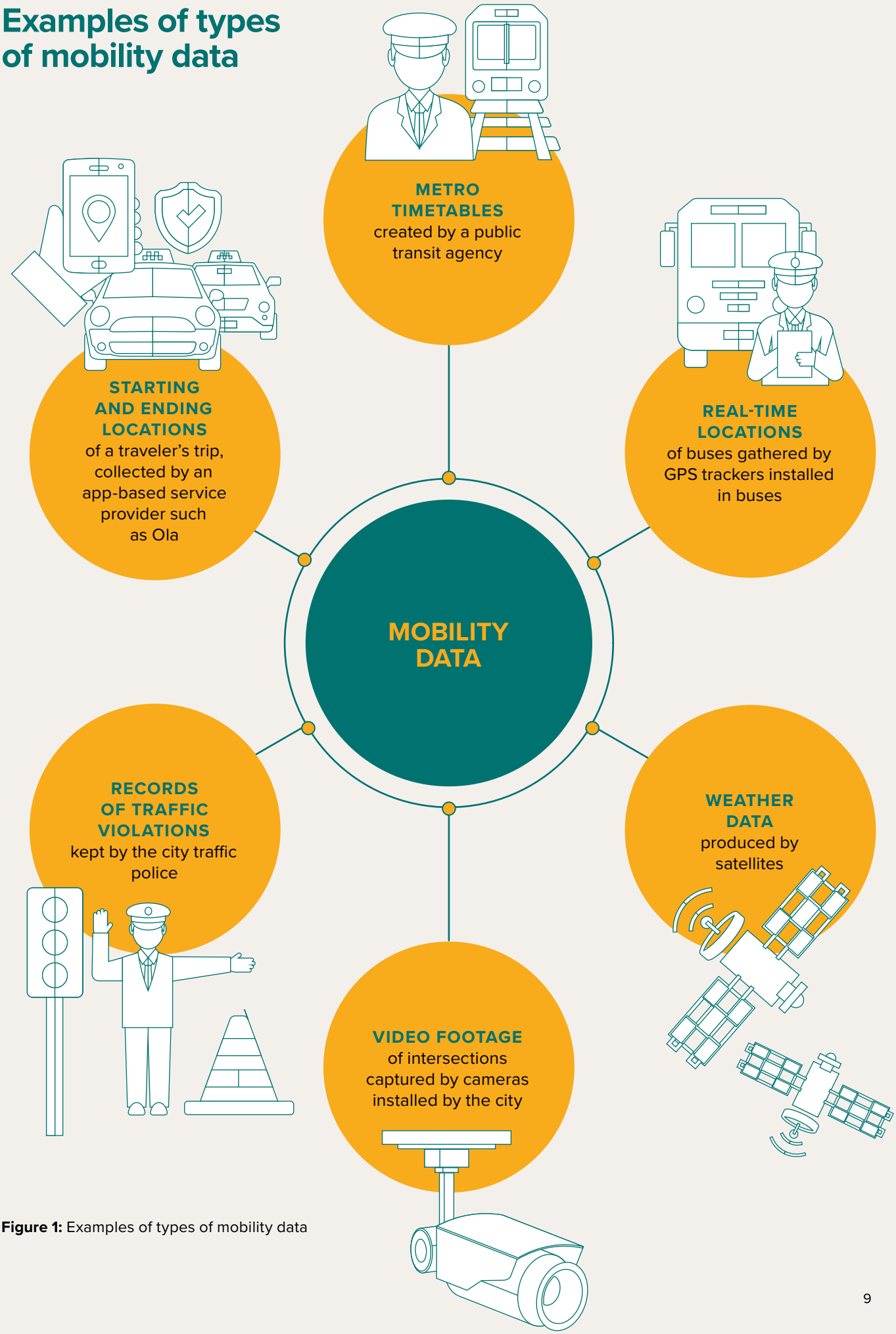


Figure 1: Examples of types of mobility data

1.2 Who owns, uses and regulates mobility data?

Three categories critical to the stakeholder landscape for mobility data are data owners, beneficiaries and government.[2] Data can flow from owners to beneficiaries but it can also flow within each category. Many organizations and individuals function as both data owners and beneficiaries.

» **Data owners:** Data ownership can typically be divided between two categories: public data, which is freely available (though not always accessible) and private data, which is generally kept within an organization. A single data owner may have both private and public datasets. Another key distinction is that of open data—this falls under the category of public data because it is freely available to the public. But the term specifically refers to data that is typically well-structured, maintained and published on portal to make it easier to access and use. According to Ministry of Electronics and Information Centre, "a dataset is said to be open if anyone is free to use, reuse, and redistribute it—open data shall be machine readable and it should also be easily accessible".[3]

» **Data owners:** Within the category of data beneficiaries for passenger mobility, there are three primary sub-groups: cities and governments, travelers, and researchers. Each of these beneficiary groups correlates with a set of use cases (i.e. end goals of collecting and analyzing mobility data), which are outlined in more detail in the Policy Workbook document.

Data owners

Companies, organizations and individuals that produce and own datasets

» Public Data:
Freely available (though not always accessible)

» Private Data:
Generally kept within an organisation

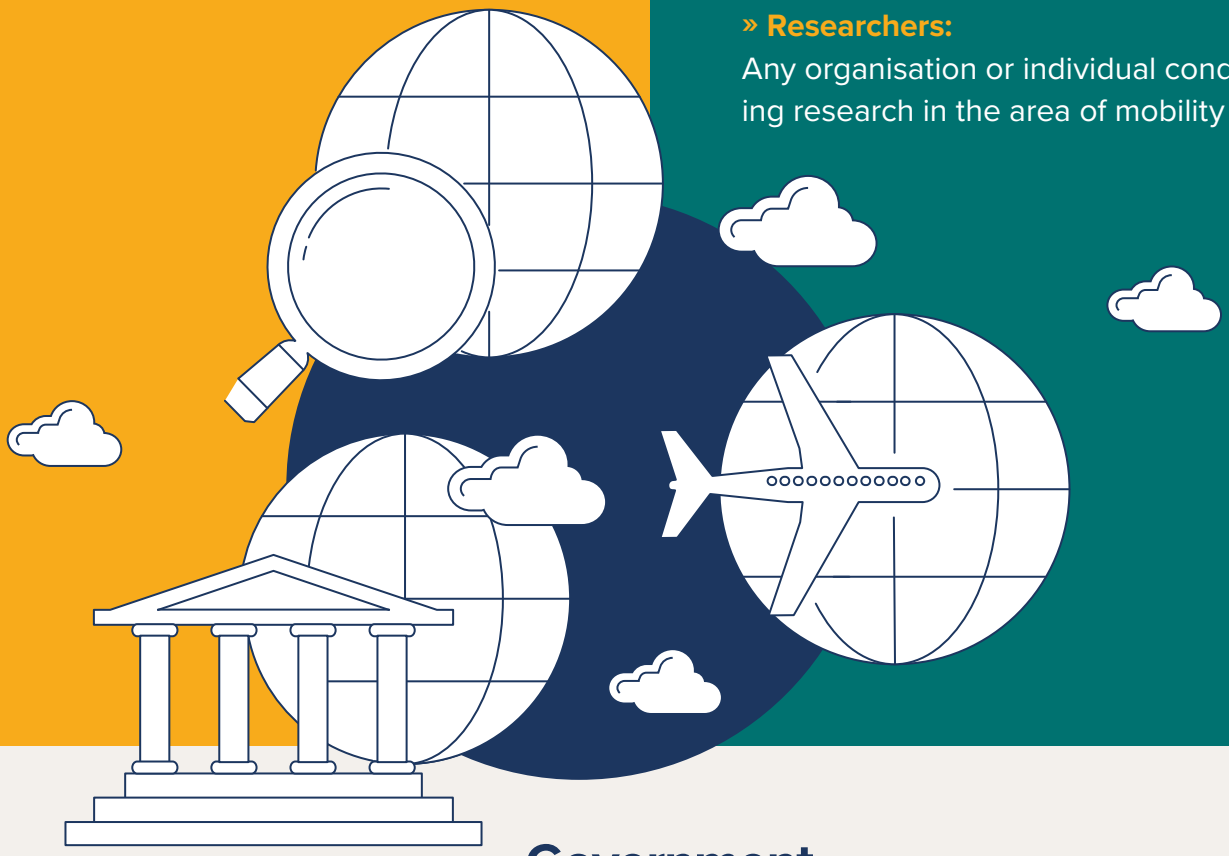
Beneficiaries

Any group or individual that benefits from using mobility data

» Cities & Governments:
Includes regulators, planners and operators responsible for system-level design, operations and policy

» Travelers:
Any individual moving from one location to another

» Researchers:
Any organisation or individual conducting research in the area of mobility



Government

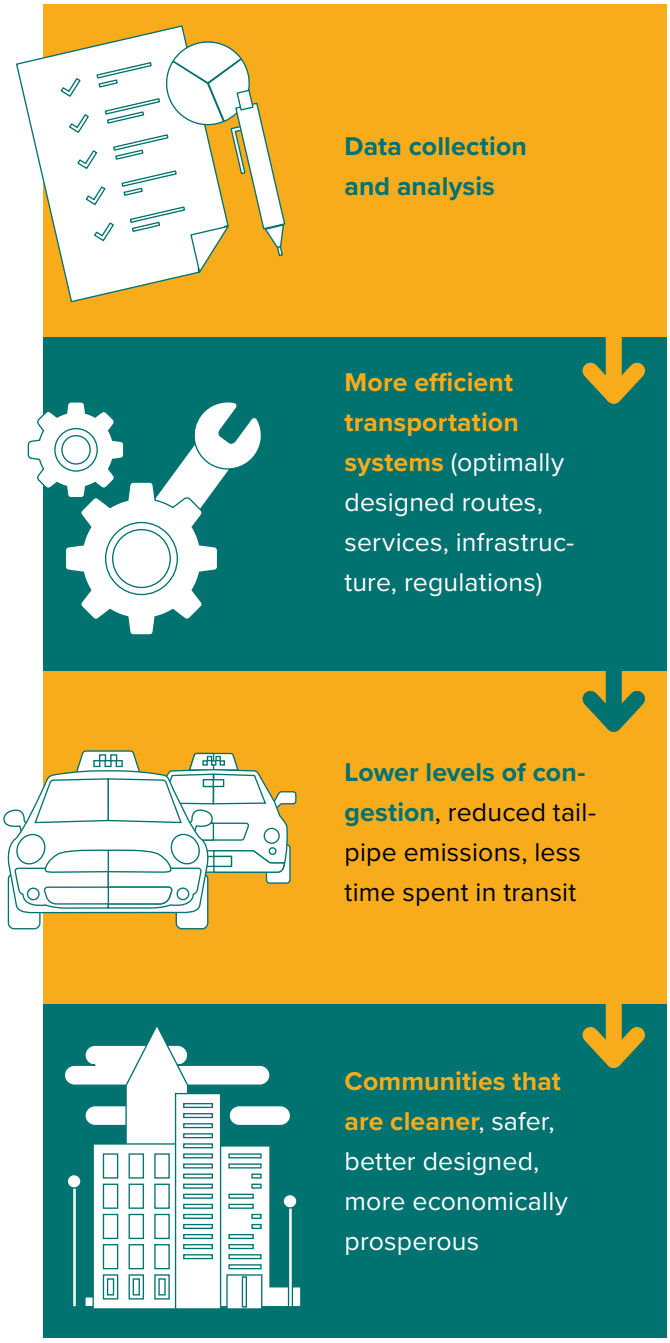
In addition to owning and benefitting from data, governments can play a role in enabling interactions between data owners and beneficiaries and protecting their interests.

Figure 2: Summary of key stakeholders in the data ownership, use, and regulation ecosystem for passenger mobility

2.0 Why is data useful in the mobility sector?

Data analytics can help unlock tremendous value in the transportation system by providing governments and organizations with the data they need to create more efficient transportation systems, with optimally designed routes, services, infrastructure and regulations. Doing so will lead to lower levels of congestion, reduced tailpipe emissions and less time spent in transit, resulting in communities that are cleaner, safer, better designed and more economically prosperous.

More and more transit organizations, both public and private, as well as individuals are collecting significant amounts of transit-related data. The range, scope, and volume of data collection are expanding. This increase in data presents a massive opportunity to better integrate components of existing transport systems, optimize transit options to users' needs and plan and regulate cities to match mobility patterns. The potential value that mobility data can unlock has led some analysts to dub data "the new form of oil"[4] for transport systems.



3.0 What are the key ways in which mobility data can benefit a city?

Using data analytics in the mobility space has the potential to create more efficient commutes and allow for the optimized design of city infrastructure and regulations. Taken from a societal perspective, this should lead to cities that are:

» Cleaner:
Using data to optimize commutes and goods transport will lead to fewer cars on the road, which means less tailpipe emissions.

» More economically prosperous:
Less time in transit means citizens have more time to contribute to economic activities.

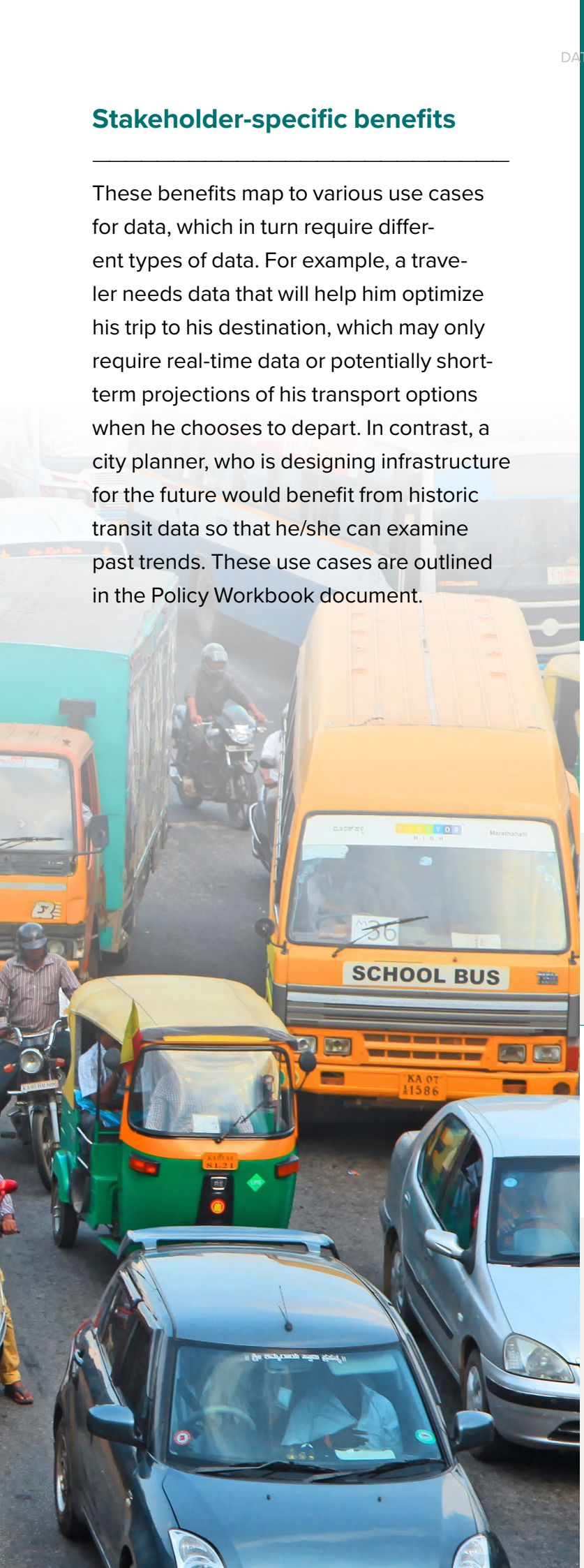
» Better designed:
Planners armed with historic mobility data can better optimize infrastructure design to meet typical transport patterns, or recognize areas that need to be re-designed to minimize commutes.

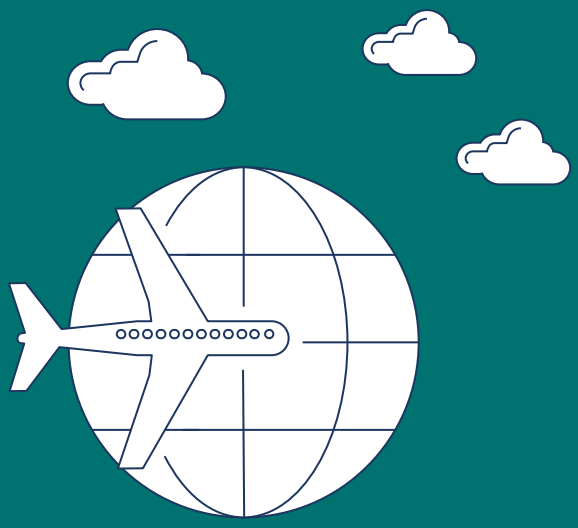
» Safer:
Improved monitoring will lead to quicker emergency response times and better understanding of pain points will allow cities to address underlying causes to reduce accident rates.

The use of data can allow for mobility assets to be better utilized and integrated and boost economic growth while building cleaner and more livable communities. The benefits of using data analytics for mobility can be further examined from the perspectives of various beneficiaries for passenger transport. A summary of the benefits specific to the perspectives of travelers, cities and researchers is outlined on pages 10 and 11.

Stakeholder-specific benefits

These benefits map to various use cases for data, which in turn require different types of data. For example, a traveler needs data that will help him optimize his trip to his destination, which may only require real-time data or potentially short-term projections of his transport options when he chooses to depart. In contrast, a city planner, who is designing infrastructure for the future would benefit from historic transit data so that he/she can examine past trends. These use cases are outlined in the Policy Workbook document.





Travelers

Visibility of options:
Easier to discover and compare transit options

Coordination between modes:
Easier to coordinate between different modes of transit required to reach a final destination

Accessibility:
Smart mobility services, enabled by open data, can meet the diverse needs of travelers and provide easier access to mobility

Better experience:
Integrated and multi-modal transit platforms would increase ease of transport, as well sense of security, given that transport providers are tracked and their location is known

Researchers

Improved data analytics capabilities:
Greater ability to conduct in-depth analysis in order to draw conclusions and make recommendations for the mobility system

Cities

Transit planning:
Using historic traffic patterns to better understand the best corridors to build new public transit routes and non-motorized transport infrastructure to meet commuter needs

Improved monitoring:
Better understanding of how the mobility system is being used, in order to identify where greater enforcement is required or where new regulations may be needed to help the system function smoothly

Reliability:
Ability to manage traffic incidents better and use data analytics to build a reliable transport system

Urban design:
Understanding commute patterns and areas of concern in the system would allow designers to create cities that support mobility better

Figure 2: Summary of stakeholder-specific benefits

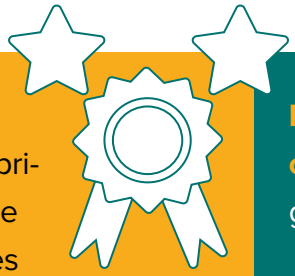
4.0 How can a city unlock these benefits?

There are a number of actions a city can take to build a strong data collection and sharing ecosystem in order to unlock the benefits of mobility data and implement a set of data use cases. In order to do this effectively, the proper institutional framework must be laid, beginning with the implementation of the structure outlined in the Data Smart Cities strategy. This strategy is still in draft form but is set to be released soon. (See the final section on current data-related policies and initiatives for more detail).

Once a city has appointed a City Data Officer and begun to create a City Data Alliance, as per the DataSmart Cities strategy, this structure can be used as the foundation to take steps towards implementation of transpor-

1

Appoint a transport data champion and allocate appropriate resources (e.g., staff) for the Champion to develop initiatives



Responsibilities of the Transport Data Champion include:

» Prioritizing transport data use cases and initiating the design of initiatives and policies accordingly (steps 2–4)

» Communicating with and convening key stakeholders

» Working closely with the City Data Officer and Mission Data Hub to develop and maintain a data-sharing platform for the city and and ensure appropriate safeguards for privacy and security

2

Prioritize transport data use cases, based on the city's goals and challenges

Consider:

» What are the most pressing challenges to be addressed within the transportation sector?

» What transportation goals does the city have?

» Does the city have funds to invest in the initiatives and infrastructure?

tation-specific use cases. A Transport Data Champion should be appointed to lead all mobility data-specific initiatives of the city. Depending on the size of the city, the capacity of the city government and the complexity of its transport system, the City Data Officer could also play the role of Transport Data Champion.

Once this individual has been appointed, he/she can lead the process of evaluating the city's transportation needs and goals, prioritizing transport use cases for data, developing initiatives and acquiring the necessary data to support the selected use cases. A high-level overview of this process is summarized in Figure 3. Each of these steps, along with additional recommendations for supporting a data-driven transportation system, is outlined in more detail in the Policy Workbook. The Evaluation Metrics document provides more details on reaching key benchmarks and monitoring continued progress in building a strong ecosystem for data collection, sharing and use.

Promoting data sharing between parties is key to maximizing the benefits of mobility data. Many public transit agencies, private companies and individuals are generating and collecting transport data. However, this data tends to be siloed between organizations and individuals and often recorded using different standards and formats. A city can play a key role in convening the relevant stakeholders and providing a platform for data-sharing in order to build an effective data-sharing ecosystem and practice to increase the amount of data available for planning, decision-making and innovation.

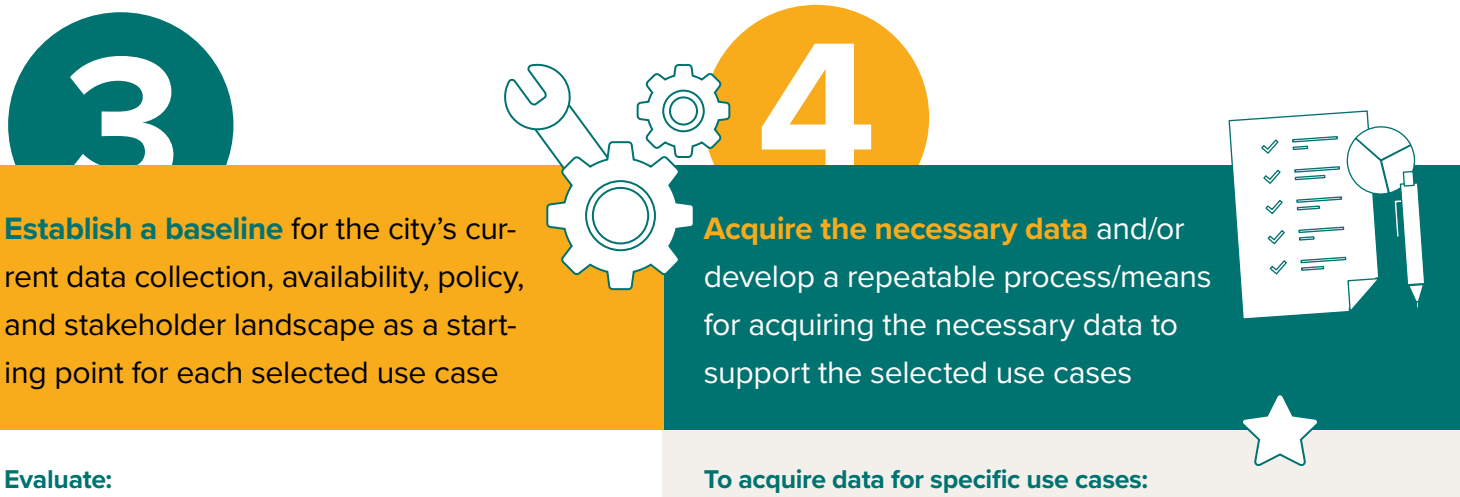


Figure 3: High-level steps for a city to take to implement transport data use cases (i.e. end goals of collecting and analyzing data), building on the DataSmart Cities strategy framework

5.0 How can a city monitor progress with respect to data collection, sharing and use?

Cities can play a critical role in supporting the development of an effective data collection and sharing ecosystem that involve both public and private entities. There are a number of steps that a city can take to build and strengthen this data collection, sharing and use ecosystem.

This checklist provides an introduction to these actions, which are described in more detail in the Policy Workbook and Evaluation Metrics documents.

While it is difficult to design Key Performance Indicators (KPIs) in the traditional sense for building a data collection, sharing and use ecosystem, a city can think of its progress with respect to the steps it has taken and the improvements it is making in strengthening the ecosystem, such as the level of buy-in from various stakeholders and the success of specific use cases the city chooses to implement. The improvement in data collection will in turn enable monitoring and tracking KPIs in other areas (e.g. electric vehicles and freight efficiency).

The checklist comprises a set of benchmarks aimed at building and strengthening a city's data collection, sharing and use ecosystem. Achieving each of the checklist items at a basic level will ensure that the city develops a foundational data capability and capacity. However, many of the checklist items are ongoing and should be periodically revisited.

The Evaluation Metrics document provides more detail on how to reach these benchmarks and monitor continued progress with respect to each as the ecosystem continues to develop and strengthen.

CHECKLIST FOR MONITORING PROGRESS
IN IMPROVING DATA COLLECTION, SHARING AND USE

DOES THE CITY HAVE...

01 Institutional framework outlined in the DataSmart Cities strategy, including a City Data Policy

02 An appointed transport data champion

03 Clarity and communication around the purpose and value of data collection and sharing

04 Defined and prioritized transport data use cases

05 Sufficient data collection mechanisms

06 Appropriate safeguards for data privacy and security

07 A participatory framework for transport data stakeholders

08 A city-level data-sharing platform

09 Investment in mobility data initiatives

6.0 What current data-related policies and initiatives already exist at the national level?

The Government of India has several relevant policies in place or drafted that pertain to data (though not specific to mobility data). Numerous states and cities also have their own data policies and guidelines. Relevant policies at the central government level:

National Data Sharing and Accessibility Policy (NDSAP)[5]:

This policy was approved in February 2012 and applies to all shareable non-sensitive data, in either digital or analog form, which are generated using public funds by various ministries, departments, subordinate offices, organizations and agencies of Government of India and state governments. The goal of the policy is to promote data-sharing and enable access to GoI-owned data for national planning, development and awareness. NDSAP aims at providing a platform for proactive and open access to data generated by various GoI entities, in machine-readable form through a wide area network, to permit a wider accessibility and usage by the public.[6]

» Open Government Data (OGD) Platform in India[9]: Government of India has launched Open Government Data (OGD) Platform (data.gov.in) to support Open Data Initiative for nation-wide data-sharing. OGD platform provides open access to datasets, documents, services, tools and applications collected by various ministries/departments/ organizations of Government of India for public use.

Data smart cities[11]:

The draft of this strategy document was released in December 2018 by the Smart Cities Mission under the Ministry of Housing and Urban Affairs (MoHUA). The goal of the strategy is to improve the culture and ecosystem around data collection and use across all relevant sectors, so that Smart Cities can use data to resolve critical problems. The document outlines the technical infrastructure and institutional framework to be developed at the central and city levels, as well as an index for measuring city data maturity.

» **At the Central level:** A Mission Data Officer will be appointed and a Mission Data Hub will be created within the Smart Cities Mission of MoHUA to lead all data efforts across Smart Cities. The Mission Data Officer will convene a Smart Cities Data Network, consisting of select City Data Officers and representatives from additional ministries, to act as an advisory group to the Mission Data Officer and act as a peer learning network across Smart Cities. The Mission Data Hub will also be responsible for setting up and maintaining the technical infrastructure for cities to share data.

» **At the City Level:** Each Smart City will be required to appoint a City Data Officer responsible for the implementation of the Smart Cities data strategy and the creation of a City Data Policy. The City Data Officer will set up a city data page on the central-level Data Platform. Additional Data Champions and Data Coordinators will be appointed within each relevant department/organization to champion and coordinate the implementation of the City Data Policy in their respective department/organization. Each city will additionally develop a City Data Alliance, comprising key stakeholders within that city.

Personal Data Protection Bill[12]:

The draft of this act was released in July 2018 by the Ministry of Electronics and Information Technology. The act focuses on the fair and reasonable processing of data. The Draft Act specifies that there must be a clear, specific and lawful purpose behind data processing and stipulates that only necessary data should be collected. Sensitive personal data may be processed on the basis of explicit consent. The Act is currently under the Ministry of Electronics and Information Technology's review.[13]

A Free and Fair Digital Economy[14]:

This report was released in draft form in July 2018, under the chairmanship of Justice BN Srikrishna. The report recommends that a data protection law should be set up, which will be responsible for the enforcement and effective implementation of the definition of personal data and sensitive personal data, legal affairs, policy and standard setting, research and awareness.

Srikrishna's report outlines seven key principles for effectively designing a privacy policy. At a high level, the principles are that the policy should be technology agnostic; holistic; include language on informed consent; recommend data minimization; assign controller accountability; structure enforcement and include deterrent penalties. The draft is currently under the Ministry of Electronics and Information Technology's review.

One Nation One Card[15]:

Government of India is soon to release a one-nation-one-card policy for public transit, which will mandate a single payment card across the country that works for all forms of public transit such as buses, metros, trains and toll payments. The goal of the card is to provide seamless connectivity across various modes of transport, and promote the use of public transport. NITI Aayog made the announcement[16] in September 2018. The timeline for implementation has not yet been clarified. The government held a contest open to the public for the naming of the card, which closed at the end of August. Delhi has been running a pilot project for a common travel card for metros and public buses since January 2018.

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