

# Integrated sustainable mobility in cities

- a practical guide

Sustainable Mobility Project 2.0



wbcSD mobility

# Foreword

**Mobility is an enabler of economic growth and prosperity both for developed and developing countries. It enables access for people and goods to markets, to education, to medical services, and to family and friends.**

Sustainable mobility is one of the pathways towards the WBCSD's Vision 2050 for a world in which nine billion people can live well, and within the planet's resources, by mid-century. Vision 2050 includes: "universal access to safe and low carbon mobility".

SMP2.0 follows previous work published as Mobility 2030: Meeting the challenges to sustainability (2004) and Mobility for Development (2009). The first project provided a vision of global road transportation and identified seven sustainable mobility goals, while the second set out to measure the state of mobility and the issues in four rapidly developing cities.

In 2013, 15 companies from different mobility-related sectors came together to design a practical framework to help cities understand their mobility situation in relation to criteria such as environmental compatibility, economic efficiency and quality of life, and to anticipate emerging mobility concerns. With rapid

urbanization and population growth forecast, cities were the focus while recognizing that mobility issues exist across society. **Under the auspices of the World Business Council for Sustainable Development (WBCSD), we launched a Sustainable Mobility Project (SMP2.0) to tackle the challenges of sustainable urban mobility. The project's city engagement process focuses on positive examples to accelerate the implementation of sustainable mobility solutions in an integrated, multimodal and comprehensive way.**

Now, three years later, we have tested the framework as described in this report with six pilot cities from across the world. These cities are different in size and other characteristics, such as economic development and mobility concerns. The engagement with the cities varies in outcome. In some cases the result was a practical implementation roadmap, in others an input to existing or future mobility plans.

The framework design has proved universal and beneficial for the cities. Initiating a dialogue process brings together relevant city departments and interest groups; selecting the most appropriate solutions is based on a fact-based and integrated assessment of

their mobility issues; and where possible the process includes practical trials in the cities. We thank the officials of these six cities, namely Bangkok, Campinas, Chengdu, Hamburg, Indore and Lisbon, both for their openness to work with us and their support throughout the process. We thank all the stakeholders involved in this process including citizens, NGOs, universities, and city planners. We thank the Assurance Panel of SMP 2.0 which supported with guidance and recommendations. We thank the WBCSD and its national partners for hosting this project and last but not least we thank all involved member company and other experts who helped make this project a success.

**We now encourage other cities and organizations to build on this work, to use the framework developed to make the mobility system of their cities and regions more sustainable and to ensure a sustainable growth in harmony with nature and society.**



Peter Schwarzenbauer  
Member of the Board of Management  
BMW AG



Bob Dudley  
CEO  
BP plc



Yuichiro Takenami  
Vice President and Senior Officer  
Bridgestone Corporation



Vasco de Mello  
Chairman and CEO  
Brisa



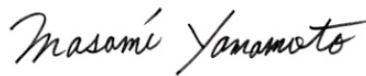
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and CEO  
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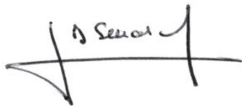
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Honda Motor Co., Ltd.



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Michelin Group



Takao Asami  
Alliance Global VP Senior Vice President  
Nissan Motor Co., Ltd.



Dr. Marco Tronchetti Provera  
Executive Vice Chairman & CEO  
Pirelli & C.S.p.A



Marvin E. Odum  
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Shell Oil Company



Fujio Cho  
Honorary Chairman  
Toyota Motor Corporation



Dr. Thomas Steg  
General Representative  
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Volkswagen Aktiengesellschaft

# WBCSD President's Statement

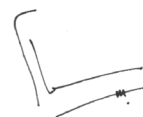
**The Sustainable Mobility Project (SMP2.0) is a project that demonstrates how to take a vision and transform it into action. Building on the earlier work of member companies it brings together two essential global forces for sustainable development – city sustainability leadership and business innovation and solutions delivery – and demonstrates that through strategic public-private collaboration it is possible to make real progress.**

I would like to thank the SMP2.0 Co-Chairs – Brisa, Ford and Toyota – and the twelve other industry-leading participating companies for their vision and passion in developing the tools and process that underpin SMP2.0. Of course, in collaborative projects this needs other parties too so I would also like to thank the six cities around the world that have dedicated time and effort and worked with SMP2.0 to test and refine this model of collaborative engagement.

At the WBCSD we know that it takes strong leadership to drive change. It also takes a clear process that involves all parties in a collaboration to deliver a holistic, integrated set of solutions to implement. The tools and processes, together with the supporting reports on indicators and financing mechanisms provide a solid platform on which all cities can build their urban mobility system and make it more sustainable.

WBCSD is determined that business can make a difference. This will come about through collaboration that leads to concrete action. SMP 2.0 is a great example of how to build such a collaborative model. In 2013 WBCSD launched its Action2020 Initiative to catalyze sustainable business solutions at scale to address the world's most urgent environmental and social priorities. To do so we need to work with city leaders, citizens and other city sustainability initiatives to co-create and implement innovative business solutions to the complex cross-cutting challenges facing the world's cities. SMP2.0 has shown that it is possible to put these partnerships for action into practice.

For all of us, the challenge and the opportunity are clear: Sustainable cities are the key to achieving a sustainable world. How we scale up opportunities like SMP2.0 will be key to changing the way we all live a more sustainable life.



Peter Bakker  
President and CEO  
WBCSD

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### ABBREVIATIONS USED IN THIS REPORT

|            |                                 |               |                                  |
|------------|---------------------------------|---------------|----------------------------------|
| <b>BRT</b> | Bus rapid transit               | <b>GHG</b>    | Greenhouse gases                 |
| <b>CSR</b> | Corporate social responsibility | <b>Ifmo</b>   | Institute for mobility research  |
| <b>CTF</b> | City task force                 | <b>PPP</b>    | Public Private Partnership       |
| <b>EV</b>  | Electric powered vehicle        | <b>SMP2.0</b> | Sustainable Mobility Project 2.0 |

# EXECUTIVE SUMMARY

## Cities can take advantage of the knowledge and practical expertise of the private sector

The Sustainable Mobility Project 2.0 (SMP2.0) is an ambitious global project building on previous work, showing how cities and businesses can collaborate to better develop sustainable mobility. This is essential to achieve the economic, environmental and social progress incorporated in global development goals. Cities must create infrastructure and services that allow people and goods to move safely, swiftly, affordably and sustainably.

## Cities can cope sustainably with increasing mobility demand

Cities are faced with rapidly rising populations, changing patterns of shopping, leisure and work and growing environmental concerns. Many cities are interested in concepts such as vehicle-sharing schemes, traffic management systems and improved integration of different transport modes. The importance of quality of life aspects such as comfort and pleasure, active mobility and social inclusion are also widely recognized. But cities want to make progress more rapidly on all fronts.

The process developed and tested by this project provides a systematic, data-driven approach that can accelerate progress towards sustainable urban mobility. Building on previous work from around the world, the project has demonstrated a practical city/business platform for cooperation on sustainable mobility. It brought together six showcase cities and a group of 15 leading global companies involved in mobility with cross-sector implementation expertise (See Figure 1). They have delivered a globally applicable, robust process for developing integrated mobility.

## Cities get systematic analysis from the data-driven process

This collaborative project focused on integrating mobility solutions based on systematic analysis. The data-driven process is neutral on transport mode and technology, using the same assessment criteria for all potential solutions. The project developed, tested and refined a comprehensive set of indicators assessing the sustainability of the urban mobility system. Solutions are derived from a database of best practice, including the necessary enablers to achieve progress. Practical trials and stakeholder engagement helped to refine the chosen solutions.

The output is a contribution to a practical, integrated sustainable mobility plan enabling the city to meet its challenges and priorities.

The process is based on a holistic vision of urban mobility. It begins with the essential foundation of creating a multi-disciplinary city/business task force with a shared vision. Five steps follow:

1. Understand the city's mobility situation and its existing projects
2. Calculate 19 indicators to analyze the city's sustainable mobility performance and agree priorities
3. Based on those priorities, search the Solution Toolbox to find best practice solutions, including sources of finance
4. Conduct stakeholder dialogue and trials to refine potential solutions and enablers
5. Contribute to an integrated sustainable mobility plan for the city

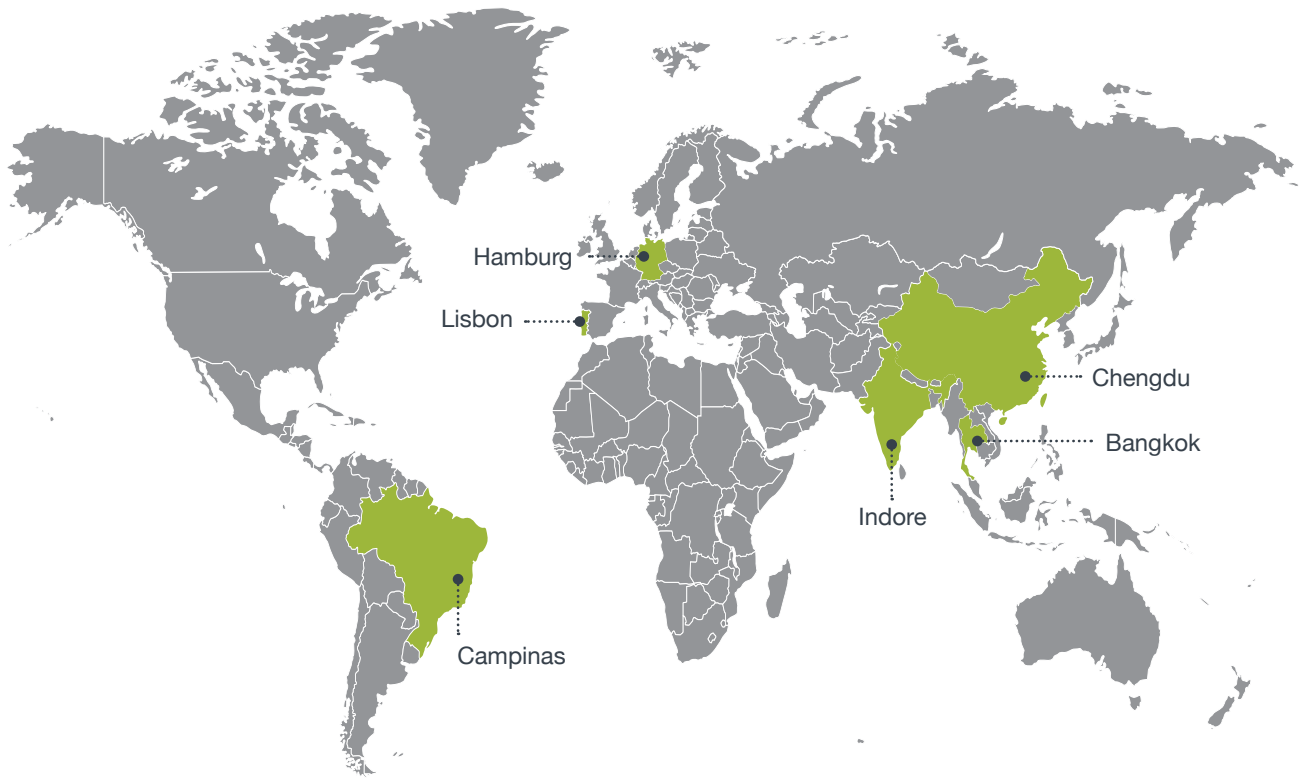


Figure 1: SMP2.0 companies and showcase cities

15  
Cross-sectorial  
companies

6  
6 Showcase  
cities

SMP2.0 is an opportunity to develop a new form of exchanging information and working. The change of perspective while discussing with companies enabled to get a holistic and integrated view and the creation of new concepts.

● Carlos Barreiro, Secretary of Transport, Campinas



The SMP2.0 process ensures a holistic approach because it is based on a comprehensive set of indicators covering the three dimensions of sustainability (economic, social, environmental) as well as the mobility system performance. The data-driven analysis simplifies the relationships between the components of the mobility network, helping the city to define its priorities and search for integrated solutions. The Solution Toolbox offers options that the city may not have been aware

of. It includes links to examples implemented around the world as well as financing mechanisms and enablers for infrastructure, behavior and policy.

#### Cities can benefit from stakeholder input

Cities' plans need to take account of stakeholders' views and the process incorporates engagement in two ways. First, some of the indicators are based on citizen surveys. This provides a reality

check against the city's perceptions as well as fully engaging relevant people and gathering essential data. Second, stakeholder dialogue is used to share proposed solutions with relevant groups, test their practicality and bring valuable insights to make them more achievable. While cities may hesitate to expose preliminary ideas, experience in this project found that it brings rich rewards.

#### KEY CONCLUSIONS:

- Collaboration brings together all departments and stakeholders including business. Mobility surveys, dialogue and trials all build trust between the many players
- SMP2.0 is a catalyst for cross-sector cooperation between cities and business
- at an early stage through which cities benefit from business knowledge and practical expertise
- The SMP2.0 framework ensures a holistic approach. It breaks down complexity with a data-driven approach, visualization and prioritization using the proven indicator
- set, leading to a city-tailored and integrated solution portfolio
- Trials and stakeholder dialogues, including citizens, are key to adapting solutions to local circumstances.

Cities wishing to discuss adopting the SMP2.0 process can contact WBCSD:  
info@wbcسد.org | Phone: +41 (0)22 8393100

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The cooperation with WBCSD and its member companies will generate new thoughts for improving the sustainability of transport in Hamburg. We expect the project to provide valuable input for our ongoing process of sustainable urban mobility planning.

● Andreas Rieckhof, Hamburg's Secretary of State for Economy, Transport & Innovation







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Based on deep analysis and extensive investigation, WBCSD SMP2.0 project has put forward a number of recommendations targeting metro transportation, ground transportation, traffic convergence, traffic congestion and slow traffic for Chengdu. These will be served as important references for Chengdu to build a green, civilized and sustainable transportation system.

● Xiaopeng WAN, Chief planner, Chengdu Planning and Management Bureau

# INTRODUCTION: A PROCESS FOR DEVELOPING MORE SUSTAINABLE CITIES

- Many of the world's cities are challenged with rapidly growing populations and the resulting environmental, social and economic issues
- Cities need integrated approaches to mobility that support sustainable growth
- SMP2.0 is a distinctive project delivering a systematic process based on collaboration between cities and businesses
- Successful application in six very different cities shows that the process is applicable in varied economic, political and cultural conditions

To be successful in the 21<sup>st</sup> century, the world's cities urgently need solutions to mobility challenges as a key element in their pursuit of sustainable growth. Mobility of people and goods is essential for quality of life, business competitiveness and cities' economic and social development. But creating the infrastructure and services that allow people and goods to move safely, swiftly and sustainably is increasingly challenging. Development must respond to urban populations that are growing and ageing, information and communications technology (ICT) that is changing patterns of shopping, leisure and work, shifting preferences and behaviors, increased pollution and other environmental impacts.

Cities need to meet these challenges if we are to limit climate change. Cities and towns used more than 67% of the world's energy and accounted for 71% of global CO<sub>2</sub> emissions in 2006.

Energy use in cities is estimated to rise further to 73% of the global total and 76% of CO<sub>2</sub> emissions by 2030<sup>1</sup>. And by 2050 there will be three billion more city-dwellers<sup>2</sup>. Energy-intensive urban development must be reversed. A systematic, replicable approach is essential if sustainable urban mobility is to be implemented rapidly around the world.

In response to these challenges, cities are exploring new approaches to increasing mobility choices while tackling pollution and climate change. For example, [The Johannesburg Declaration on Ecomobility in Cities](#) set out a vision and call for action on sustainable urban mobility. Cities are searching for new ideas, new technologies, innovative policies and business models. The goal is to minimize negative impacts and maximize the contribution of mobility to urban prosperity. **Integrated, cross-sector approaches are required, rather than separate solutions for**

**each sector or transport mode. Such a holistic view of mobility benefits the city on several levels. It focuses attention on impacts across the system and on interactions between different transport modes and solutions. It increases the potential for different solutions to complement and reinforce each other. And on a very practical level, it can avoid duplication of effort, for example by incorporating all relevant transport modes in infrastructure upgrades such as road remodeling while installing a tram line.**

However, developing integrated sustainable mobility is extremely challenging. The many possible solutions have complex interdependences and effects. But responsibilities are often unclear or dispersed, especially in larger metropolitan areas with several separate local authorities where mobility needs and services do not neatly follow local civic boundaries. Also, traditional responsibilities, expertise and

<sup>1</sup> IEA (2008). World Energy Outlook, Paris

<sup>2</sup> UN-Habitat, 2013

funding tend to be specific to each transport mode and organized separately. Mobility planning tends to be sequential, taking each issue in turn rather than considering the whole system. In addition, cities need to understand aspects such as behavior change and build expertise in implementing solutions.

### A distinctive global project

This project has developed and demonstrated a systematic approach to providing a practical contribution to the sustainable mobility plan. SMP2.0 has built on the earlier mobility related work within WBCSD and on research and experience developed by others such as EMBARQ, the Institute for Transportation and Development Policy (ITDP) and the SMART project at the University of Michigan. They have demonstrated the value of collaboration with industry in creating an integrated,

systematic, multi-modal concept involving stakeholders. This project has developed those ideas and introduced a systematic, data-driven approach.

The SMP2.0 process (see Figure 2) will enable cities to be effective in their efforts to meet the Sustainable Development Goals announced in September 2015, especially goal 11.2 which focuses on providing access to safe, affordable, accessible and sustainable transport systems for all.

The SMP2.0 process produces an integrated solution portfolio based on global best practice. Solutions match a city's priorities, conditions and political goals and respond to the implementation challenges. This process has been tested in a range of cities as a basis for mobility plans tailored to specific characteristics and objectives.

## A VISION OF SUSTAINABLE MOBILITY

In order to truly impact sustainable mobility, solutions need to be chosen across the whole spectrum of mobility options. Cities need a data-driven, holistic approach that delivers a comprehensive and integrated set of mobility solutions. Multimodal mobility has to be considered to combine efficiency and choice of modes while still meeting personal needs and allowing freedom of mobility options.

SMP2.0 aims to accelerate and extend access to safe, reliable and comfortable mobility for both goods and people while aiming for affordability, zero traffic accidents, low environmental impacts, and reduced demands on energy and time in cities.

## SMP2.0

Accelerate and extend access to safe, inclusive and low environmental impact mobility.



Figure 2: The SMP2.0 process for city-business collaboration on integrated sustainable mobility

### THE PROJECT HAS FEATURED:

- A cross-sector group of leading global companies with practical experience of sustainable urban mobility
- A holistic approach, neutral on transport mode and technology and focused on integrated, multimodal solutions
- Systematic analysis based on facts and data

- Practical trials and stakeholder engagement to understand obstacles and how to overcome them

### THE RESULTS INCLUDE:

- A methodology to identify an integrated set of optimal, cross-sector solutions responding to the city challenges and political priorities

- A comprehensive set of indicators that enable cities to understand their sustainable mobility performance and identify priorities
- A database of worldwide best practices to support the design of a mobility action plan
- Necessary enablers to support rapid and widespread implementation

| CHALLENGE   | APPROACH OF SMP2.0   |
|---|--|
| Lack of confidence in collaborating with the private sector   | <b>FOUNDATION</b><br>This global platform encourages sector and cross-sector cooperation between industries and cities through which cities benefit from the innovative solutions brought by the cross-sector team.  |
| Silos within city departments and between city, higher level government and business which inhibit an integrated approach | <b>STEP 1</b><br>Collaboration brings together all departments and stakeholders, including business, to bridge these silos. The result is a powerful tool to facilitate continued balance between supply and demand. |
| Complexity of the mobility system   | <b>STEP 2</b><br>SMP2.0 breaks down complexity with a data-driven approach, visualization and prioritization.  |
| Cities considering isolated solutions to meet individual objectives.  | <b>STEP 3</b><br>The SMP2.0 framework ensures a holistic, integrated approach leading to a tailored solution portfolio.  |
| Lack of alignment between best-practice solutions and the cultural and behavioral context of the city.                    | <b>STEP 4</b><br>Trials and stakeholder dialogues, including citizens, are key to adapting solutions to local circumstances.   |
| Creating a long-term plan that remains valid even with political changes  | <b>STEP 5</b><br>Combining data-driven objectivity and stakeholders' experience to draw up an integrated, practical mobility roadmap that addresses the needs of the city.   |

Table 1: Challenges in developing sustainable urban mobility and the approach of the SMP2.0 process

# Bringing cities and companies together

SMP 2.0 has been a three-year program with a global, cross-sector group of 15 companies and six cities (see Figure 1). It has demonstrated the potential for mobility-related companies to provide direct support early in the planning process for cities seeking sustainable urban mobility.

The companies participating in SMP2.0 are global businesses with expertise in mobility and a commitment to sustainability. They develop and/or operate fuel, tire, vehicle, train, infrastructure and communication technologies and services. All are interested in developing new business models that help to meet mobility objectives sustainably.

They recognize that cities are at the heart of the mobility challenge and believe that integrated approaches are needed to develop appropriate urban strategies. A systematic approach is necessary to meet the diverse needs of different urban populations. Solutions need to integrate the whole spectrum of mobility modes, creating multimodal connectivity through which transport modes complement and reinforce each other.

Private sector involvement in urban mobility has typically been limited to tendering for individual contracts to provide isolated solutions. This can result in

solutions disconnected from feeder networks, such as a non-integrated Bus Rapid Transit system, and some mobility modes or users over-emphasized at the expense of others.

SMP2.0 has demonstrated an alternative to this common city/business relationship in which companies are asked to propose solutions to individual objectives identified by a city. In contrast, the SMP2.0 project team engaged with cities collaboratively in the early stages of strategic planning. They cooperated with the cities to assess relevant data and identify integrated solutions for sustainable urban mobility. This is a model of public/private co-operation that can accelerate cities' sustainability progress and has been described as "public-private innovation"<sup>3</sup>. The resulting plans, based on objective analysis and including systematic monitoring of indicators, offer some protection against disruption of strategic developments due to short-term political changes.

## The six cities

SMP2.0 worked with a group of cities across three continents with a wide range of characteristics (See box "Six city clusters" p16 and Appendix 1).

The project invited cities to participate that had showed a commitment to sustainable mobility. For example:

- The Portuguese capital of Lisbon is seeking to promote various soft mobility options such as bike-sharing.

- The Brazilian city Campinas is currently building a Bus Rapid Transit (BRT) system and understands the need to integrate it into the rest of the mobility system to make it successful.
- Bangkok in Thailand is focusing on traffic demand management which can be improved through co-operation between the private sector, the government and the city.
- Hamburg, in Germany, which has a good public transport network and a wide provision for soft mobility, is seeking a holistic view of the system and how it could be improved
- In India, the city of Indore has introduced a BRT system and wants to build on this to provide a more effective mobility system.
- The western China city of Chengdu has some world class individual solutions (metro, BRT, High speed train) but these are not well connected and the whole system needs better integration.

<sup>3</sup> Urban Transport: A Case Study of an Innovative Telecom-GIS Solution in Bangalore Zielinski, Zellner, Mahesh



represent specific urban mobility patterns, using a typology that identifies urban clusters based on a detailed analysis of mobility factors (see box and appendix 2). The six showcase cities range from 'Traffic saturated' to 'Hybrid', allowing comparison within as well as between the clusters.

They represent a wide range of

geographies, levels of development and mobility patterns, typical of many of the world's cities with the most urgent sustainability challenges.

The project was therefore able to test and adapt the process and methodology to make them applicable to different types of city. As a result, SMP2.0 has

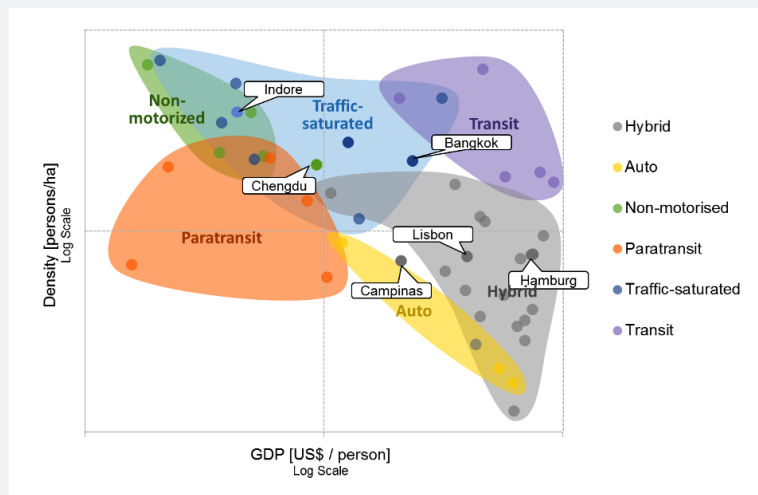
demonstrated that the process and tools are applicable to cities around the world with quite different characteristics.

## SIX CITY CLUSTERS

SMP2.0 used a cluster analysis developed by Prof. Kenworthy<sup>4</sup> to characterize cities based on the performance of their mobility system, the ability to serve sustainable mobility, the challenges and opportunities.

The analysis uses 59 descriptors covering transport supply and impact, mobility and investment as well as general city descriptors. It plots cities according to their level of economic development and population density and identifies six clusters with common mobility features. In general, as cities develop they move along an arc beginning in the top left quadrant (Non-motorized) and widening as it curves to the right (Transit or Hybrid). The showcase cities are situated along this path, enabling the project to demonstrate that the SMP2.0 process is relevant to cities at many developmental stages.

The cluster analysis demonstrates that some challenges and opportunities are common to different city clusters but there are also significant differences between them. It will help a city to understand its relative position, recognize relevant demand factors and the nature of the challenges.



The showcase cities are from along the mobility development arc. The cities range from Indore, which is Traffic Saturated but still displays some characteristics of Non-motorized and Paratransit, to Hamburg which is an advanced Hybrid city. Both Chengdu and Bangkok have a high density population, are developing quickly and are starting to move towards the Transit cluster. Campinas and Lisbon are both in the Hybrid cluster with a dense urban core with growing suburbs outside that core.

See appendix 2 for more detail on cluster analysis.

<sup>4</sup> Mobility cultures in megacities, Technische Universität München on behalf of Institute for Mobility Research (ifmo), 2010

# Demonstrating an adaptable process

The following pages describe each step in the SMP2.0 process (See Figure 3), illustrated by examples from the six cities, beginning with the foundation of creating a strong inter-disciplinary city-business team.

More details of the project tools are available in reports at <http://www.wbcds.org/mobility.aspx>, the SMP2.0 webpage.



## SMP 2.0 PROCESS

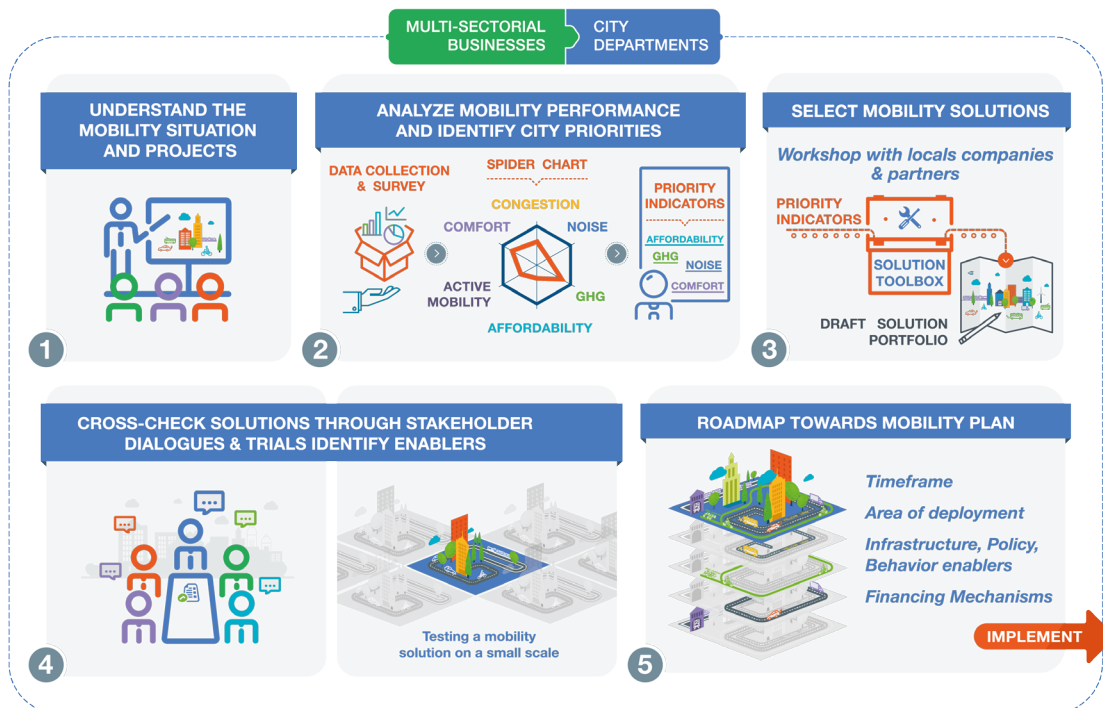


Figure 3: the five-step SMP2.0 process illustrating the systematic approach and integrated solutions

# FOUNDATION – BRING THE RIGHT PEOPLE TOGETHER

- A multi-disciplinary team representing all relevant areas manages the process
- Businesses contribute experience and expertise in implementing innovative solutions

## CHALLENGE

Lack of confidence in collaborating with the private sector

## APPROACH OF SMP2.0

This global platform encourages sector and cross-sector cooperation between industries, cities and city departments through which the cities benefit from the innovative solutions brought by the cross-sector team

It is vital to create a strong, multi-disciplinary City Task Force to oversee the project, with members from the relevant authorities, businesses and key citizen organizations.

The team must include the people with the best understanding of the city's mobility performance, sustainability challenges and potential solutions. They should be in positions to ensure full engagement with decision makers, possibly including political as well as technical leadership. Membership goes beyond those who are directly responsible for transport because the project needs to consider a range of factors such as air quality, accessibility and economic development. City personnel will therefore represent several areas and disciplines and need to interact freely with each other. The SMP2.0 approach requires open communication across city departments, avoiding a 'silo' approach in which departments

focus solely on their direct responsibilities and areas of influence.

It may also be necessary to include representatives from regional and national governments with policy,

financial and other responsibilities. Other local authorities may also need to be present. Such a wider involvement is especially important where the city is part of a wider conurbation consisting of several local authorities.



Figure 4: Urban mobility spills over city boundaries in Lisbon.

<sup>5</sup> Redefining "urban": a new way to measure metropolitan areas, OECD 2012



For example, Lisbon has 500,000 inhabitants but as it is part of a metropolitan area of 2.8 million a further 500,000 commute into the city each day. Approximately 160,000 cars are registered in Lisbon itself but another 360,000 come across the city boundary each day.

In this context, the appropriate definition of 'city' (used throughout this report) is: "a contiguous area that relies on an urban center for trade and employment"<sup>5</sup>. Urban mobility is not constrained by city boundaries but spills over to suburbs and adjacent authorities, as illustrated in the case of Lisbon (see Figure 4). The City Task Force therefore needs to cover the wider metropolitan area and the outer

areas need to be represented in the city team.

Business members of the City Task Force bring expertise and experience in innovative business models and in areas ranging from infrastructure to communications and vehicle technologies and services. They need to develop an understanding of the relationships between the city departments and representatives to ensure the project team members work well together.

Companies should provide staff with experience of the city, with good access to experts in their organizations and the capacity to maintain their involvement throughout the engagement. Collectively, they should bring

a range of skills and represent several disciplines. This will enable them to provide practical knowledge of relevant solutions and contribute to developing the integrated solution portfolio.

A formal steering committee may be necessary for sound governance of the engagement (see Table 2 for examples). It can combine a range of perspectives, help to ensure the involvement of the private sector and stakeholders as well as relevant city departments at a senior level. The Steering Committee should endorse a shared vision for the City Task Force and ensure that the project maintains a focus on achieving a holistic solution portfolio.

| BANGKOK   | INDORE   |
|---|--|
| <p>CO-CHAIRS:</p> <ul style="list-style-type: none"> <li>• Deputy Governor of Bangkok Metropolitan</li> <li>• Permanent Secretary of Ministry of Transport, Thailand</li> <li>• Deputy Commissioner of Metropolitan Police Bureau of Royal Thai Police</li> <li>• Representative of leader-company of WBCSD SMP2.0 Bangkok CTF</li> </ul> <p>MEMBERS</p> <ul style="list-style-type: none"> <li>• Bangkok Metropolitan Administration</li> <li>• Ministry of Transport</li> <li>• Metropolitan Police Bureau</li> <li>• Bangkok Rapid Transit System</li> <li>• Mass Rapid Transit Authority of Thailand</li> <li>• Express Way Authority of Thailand</li> <li>• Thai Retail Association</li> <li>• Bangkok Christian College</li> <li>• Land developing company</li> </ul> | <p>CO-CHAIRS:</p> <ul style="list-style-type: none"> <li>• The District Collector</li> <li>• WBCSD</li> </ul> <p>MEMBERS:</p> <ul style="list-style-type: none"> <li>• CEO, AICTSL (City transport company)</li> <li>• Commissioner, Indore Municipal Corporation</li> <li>• CEO, Indore Development Authority</li> <li>• Additional Superintendent of Police – Traffic, Regional Transport Officer</li> <li>• Joint Director – Town and Country Planning</li> <li>• The Madhya Pradesh State Urban Development Department</li> <li>• Representatives from academia</li> </ul> |

**PROJECT LEARNING ON BRINGING THE TEAM TOGETHER**

- Ensure that all relevant disciplines and departments are represented consistently throughout the project, including participants from regional and national government and associations if appropriate.
- Involve relevant company experts with local knowledge or with knowledge of applying the solution in different cities and contexts and with the capacity to engage sufficiently in the city teams
- Agree on a clear vision and goals including tangible targets

Table 2: Examples of Steering Committees

# STEP 1 - UNDERSTAND THE MOBILITY SITUATION

- The team explores the city’s mobility system to reach a common understanding
- They develop a shared vision to underpin the collaborative engagement

|                           |   |
|---------------------------|---|
| <b>CHALLENGE</b>          | Several city departments often work in silos and do not have a shared understanding of the challenges and existing projects                                   |
| <b>APPROACH OF SMP2.0</b> | Bringing together all departments and businesses to discuss the city situation and develop a common understanding as a basis for the integrated planning work |

The first step in developing a sustainable mobility plan is to understand the context in each city. The clustering approach recognizes broad similarities between cities and differences between each cluster, but every city is individual. It is essential to recognize the specific mobility situation, the background of previous developments and current projects, the cultural, political and geographic context.

Each member of the City Task Force may have different perspectives on these factors because their daily work focuses on different aspects and targets slightly different goals. In addition, workload sometimes prevents meetings and discussions across the city teams and with other stakeholders, leading to diverse perspectives on the same situation.

In response, SMP2.0 proposes an initial discussion to share these perspectives, helping the city’s team members to reach a common position and share it with the business representatives. This initial stage also includes a fact-finding exercise to identify mobility initiatives in place or in the pipeline.

Building on this initial exercise, the team needs to develop a shared vision which will underpin the collaborative approach that is required. Investing time and effort to agree on the vision for sustainable mobility will create the necessary cohesion between the differing perspectives and priorities. Some cities already have a clear mobility vision (see Figure 5) providing strong guidance to the project.

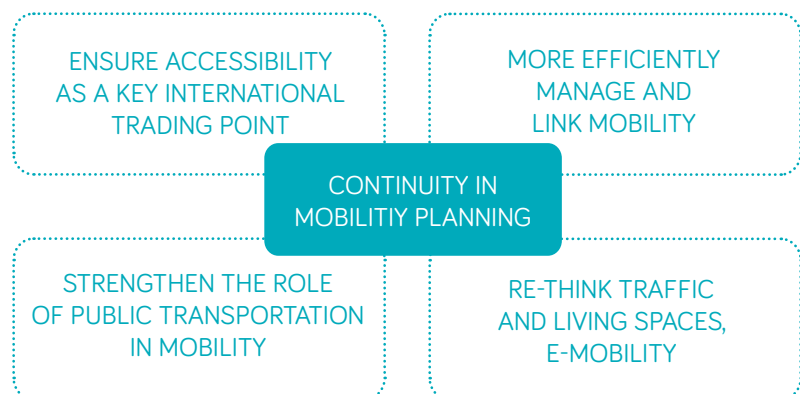


Figure 5: Example of a city’s existing sustainable mobility objectives



## PROJECT LEARNING ON UNDERSTANDING THE MOBILITY SITUATION

- In planning the project, adapt the process to the individual needs, culture and characteristics of the city
- Invest in developing mutual understanding within the city team and between the city/ business members of the city's mobility priorities
- Cities need to have or to develop a consistent vision for mobility across the different departments

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When we tried to put forwards various proposals for the improvement of the city mobility, we get lot of pressures from different dimensions. WBCSD study has enabled us to improve the mobility support of the city with its various suggestions. Now we are in a very comfortable situation to improve the mobility of the city. Now we can say that the WBCSD study which is done in a very scientific manner will enable us to convince everybody in order to improve the mobility of the city.

● P Narahari, District Collector Indore

# STEP 2 - ANALYZE

## MOBILITY PERFORMANCE

---

- A data-driven approach enables analysis of the complex and interrelated urban mobility network
- Data is collected from citizen surveys as well as existing data sources
- Cities define priorities based on 19 indicators
- The priority indicators drive the search for integrated solutions.

|                           |  |
|---------------------------|--|
| <b>CHALLENGE</b>          | Complexity of the mobility system  |
| <b>APPROACH OF SMP2.0</b> | A fact-based approach with visualization of all relevant sustainable mobility factors and consultation of citizens |

The SMP2.0 process includes a data-driven assessment, using a comprehensive set of indicators (Table 3) to evaluate the mobility system and identify the priorities.

The use of data-based indicators enables the city to look at mobility objectively and comprehensively and to challenge assumptions. The analysis stimulates fact-based thinking, highlights relationships between priorities and drives the search for integrated solutions.

As indicators are interrelated, the analysis also helps to clarify the interactions. For example, reducing congestion will improve GHGs, air pollution and travel time, but may increase traffic noise in some cases due to faster vehicle speeds. Similarly, more affordable public transport can increase occupancy but may result in a strain on public finances.

Careful interpretation of data values is essential as the implications may differ depending on the city context. For example, a high proportion of walking may be negative – a sign of poor infrastructure or unaffordable transport services – rather than welcome evidence of active mobility.

|  |   |  |
|--|---|--|
| <ul style="list-style-type: none"> <li>• Affordability of public transport for the poorest group</li> <li>• Fatalities</li> <li>• Access to mobility services</li> <li>• Intermodal integration</li> <li>• Accessibility for mobility-impaired groups</li> <li>• Mobility space usage</li> </ul> | <ul style="list-style-type: none"> <li>• Air polluting emissions</li> <li>• Net public finance</li> <li>• Comfort and pleasure</li> <li>• Noise hindrance</li> <li>• Commuting travel time</li> <li>• Opportunity for active mobility</li> <li>• Congestion and delays</li> </ul> | <ul style="list-style-type: none"> <li>• Quality of public area</li> <li>• Economic opportunity</li> <li>• Security</li> <li>• Emissions of greenhouse gases</li> <li>• Urban functional diversity</li> <li>• Energy efficiency</li> </ul> |
|--|---|--|

Table 3: Indicators for sustainable mobility

### Presenting a data-based view of mobility performance

The 19 indicators cover the three pillars of sustainable development plus the performance of the mobility system in the city. The indicator set:

- is derived from a vision of sustainable mobility rather than short term demands
- presents an objective, holistic picture of the city mobility system
- provides balanced coverage of mobility performance, considering positive and negative factors
- is neutral as to transport mode and technology

SMP2.0 developed methodologies to calculate the indicators from defined data inputs. The results are on a scale of 0-10, where 10 represents best practice from a sustainability point of view. A 'spider chart' or radar map (see Figure 6) presents the sustainability performance of each component and provides a holistic view. It presents 19 indicators in a single view, highlighting strengths and weaknesses of the city's mobility system. A spreadsheet tool has been developed to support cities in making the calculations based on the city input data.

The indicator set is intended primarily to provide an internal assessment and for the city to compare its progress over time. It is not used to rank cities, since the indicators are not designed to be aggregated in an index of overall performance. However, cities can

understand their performance on individual indicators because the 0-10 scale for each indicator is based on city data from around the world.

A city can use the spreadsheet tool to simulate the impact that solutions can have on one or several indicators. For example, a city can examine the impact on GHG emissions, air pollution and public finance from converting its bus fleet to run on cleaner fuel. A further application is to assess the viability of targets, as Lisbon did during the project by evaluating the actions necessary for a given change in GHG emissions.



# Finding data for objective measurement

The indicators are calculated according to clearly defined formulae (See an example for affordability in the box). Many are based on hard data from existing sources. Several use information from citizen surveys, which reveal preferences including their willingness to pay for sustainable mobility.

## Gathering data from citizen surveys

Seven indicators are based on researching citizens' experience:

- accessibility for the mobility impaired
- comfort and pleasure
- commuting travel time
- economic attractiveness of the city
- intermodal integration
- quality of public areas
- security

Designing and interpreting the survey needs to be sensitive to the local culture and conditions. For example, people in some cultures are more willing to express dissatisfaction than in others; respondents in some cities will be more nervous about providing personal details than in others. Similarly, interpretation of results needs to bear in mind a tendency for citizens to focus on immediate, short-term considerations such as public transport costs at the expense of longer term goals such as lowering greenhouse gas emissions. In general, SMP2.0 found that online surveys are more effective than face-to-face research for collecting this data, either with an open invitation to the public or using a panel representative of the population.

Conducting the survey to collect this data early in the project is very helpful in building cities' commitment and ensuring the involvement of departments across the administration. It also provides new insights which help to define priorities. Responses can be particularly enlightening. For example, SMP2.0 found that the data challenged some city teams'

perception of issues such as the level of congestion, the quality and availability of provisions such as disability access ramps and cycle paths. Citizens' attitudes to public transport and private cars were sometimes surprising.



## CASE STUDY 1: THE OPINION SURVEY IN CAMPINAS

The online survey was promoted through the local media with the incentive of entry in a lottery for prizes including bicycles. It drew an enthusiastic response, from more than 3,500 people representing a broad cross-section of citizens. The survey included questions on accessibility for the impaired, comfort and pleasure, security, public areas and travel time. The results helped the city to reassess services, recognize the need for action in areas which had not been identified previously and reinforce their commitment to others. In particular, the responses emphasized the need to publicize the existing services for disabled citizens more effectively.

## EXTRACT FROM INDICATOR CALCULATION – AFFORDABILITY OF PUBLIC TRANSPORT FOR THE POOREST GROUP

### DEFINITION

Share of the public transport cost for fulfilling basic activities of the household budget for the poorest quartile of the population

### METHODOLOGY DESCRIPTION

The parameter is based on existing socio-economic statistics or database analysis to identify the average household budget in the targeted specific group (the poorest 25th percentile of the population). In this context, affordability is defined as the fare expenditure made by a household as a percentage of its income. Therefore, affordability captures the ability of transportation system users to pay for transportation. A more affordable system is one that consumes a smaller share of users' incomes. The number of trips and the length of the trip are set for all cities at 60 trips of 10 km per month.

### FORMULA & CALCULATION METHOD

$$AI = \frac{\sum_i TPT_i * F10km_i}{Minc_{25\%}} * 60$$

AI = Affordability index of public transport for the poorest population quartile [% of household income]  
TPT<sub>i</sub> = Monthly percentage of PT trips with PT mode i [%]  
F10kmi = Fare 10km PT trip with PT mode i [monetary unit]  
Minc25% = Average monthly income of poorest population quartile [monetary unit]  
i = Available public transport mode [type]  
60 = sixty trips per month

Scale

0:  $\geq$  35 [% of household income]  
10:  $\leq$  3.5 [% of household income],



### Hard data – a hard task

The fact-based, data-driven approach ensures that the mobility plan is derived from rigorous and objective analysis. It is important that cities use reliable, appropriate and consistent sources, which presents a significant challenge.

The city can use some approximations and adapt the standard methodology to meet local data availability and formats, subject to consistency over time to allow the monitoring of progress. For example, the SMP2.0 methodology for GHG is

based on vehicle miles traveled and the vehicle register but cities can use fuel consumption if lacking necessary data for the recommended methodology. Data from sources might also need to be reworked to extract the required input.

In most cases the data exists, but it may not be held by the city authorities and the source may not be immediately identifiable. The challenge is to find the right sources, be alert to differences between different sources and ensure that the same data is used in all relevant calculations.

For example, the total vehicle mileage should be the same for all the indicators that it applies to. Also, data should be disaggregated as much as possible to focus on the relevant citizens, city zones and time periods. See Table 4 for examples of data sources.

| INDICATORS                            | EXAMPLE OF DATA SOURCES  |
|---------------------------------------|--|
| Affordability                         | Public transport companies report; National/City census; Office of statistics  |
| Air pollution; GHG; Energy efficiency | City data: vehicle park; Environmental agencies; National/City emission report; Standard regulations on emissions/km |
| Congestion                            | (if not field measurement) Online mapping software or navigation devices   |
| Noise                                 | (if not field measurement) Office of statistics  |
| Fatalities                            | Statistics of Road Traffic Accidents; National/City census; World Bank/UN Global Indicators databases                |
| Access                                | National/City census; Office of statistics   |
| Functional diversity                  | Urban planning office;   |
| Public Finance                        | Public transport companies sustainability report; City budgets   |
| Space Usage                           | Urban planning office  |
| Active mobility                       | Urban planning office; Mobility office;  |

Table 4: Possible sources for indicator data

<sup>6</sup> The methodology is available here [<http://wbcsdpublications.org/project/smp2-0-sustainable-mobility-indicators-2nd-edition/>]



Overcoming this challenge often results in valuable collaboration with organizations not initially part of the project, including universities and other experts.

This can stimulate the involvement of a wider group, strengthening the project team.

SMP2.0 has refined the indicator methodologies<sup>6</sup> based on the project experience with the six cities, including suggestions for the most appropriate approximations.

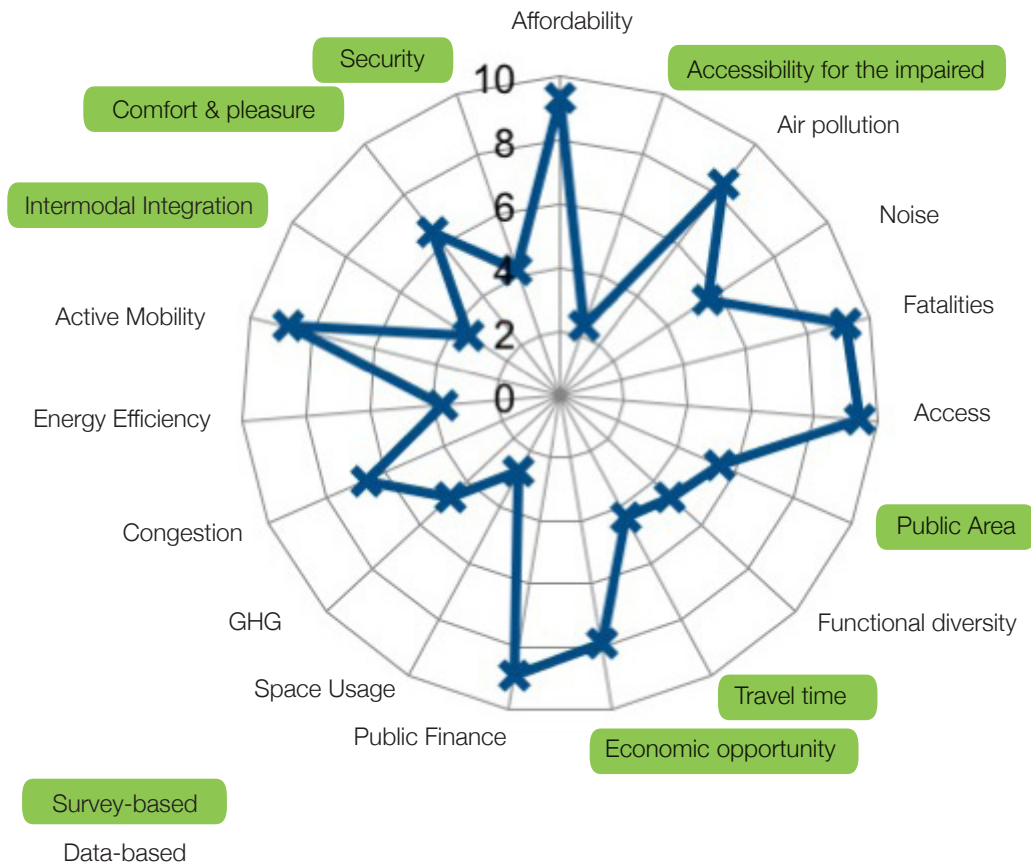


Figure 6: A typical spider chart which shows both strengths and weaknesses of different aspects of the mobility system

# Agreeing on the priority indicators

Cities use the results of the indicator calculations to define their priorities. Opinions among the city team can diverge, influenced by each department's responsibilities and focus area. In this project, the use of the objective results often proved effective in building agreement on the priorities for the city.

The data may reveal that performance on some indicators is better or worse than the city believed, challenging the team's initial views. Political considerations may also lead to items being considered priorities even though the indicator does not show poor performance.

The final definition of priorities is the basis for the search for solutions, using the Solution Toolbox described in the next chapter. Table 5 shows the final indicator selection in each showcase city, demonstrating

the top priorities in each city's holistic approach. It illustrates some common themes but also shows that travel time was the only indicator prioritized by all six cities. Some were prioritized by none of the cities, although this does not suggest that the cities believe they are unimportant<sup>7</sup>.

● Priority indicator

| INDICATORS                 | BANGKOK | CAMPINAS | CHENGDU | HAMBURG | INDORE | LISBON |
|----------------------------|---------|----------|---------|---------|--------|--------|
| GHG                        | ●       |          |         |         |        | ●      |
| Public finance             |         |          | ●       |         |        |        |
| Congestion                 | ●       | ●        | ●       | ●       | ●      |        |
| Economic Opportunity       |         |          |         |         |        |        |
| Travel time                | ●       | ●        | ●       | ●       | ●      | ●      |
| Space usage                |         |          | ●       |         |        |        |
| Quality of Public area     |         |          |         | ●       | ●      |        |
| Access                     |         | ●        | ●       |         | ●      |        |
| Fatalities                 |         |          |         |         | ●      | ●      |
| Noise hindrance            |         |          |         |         |        |        |
| Air pollution              | ●       |          |         | ●       |        |        |
| Comfort and pleasure       | ●       | ●        | ●       | ●       |        | ●      |
| Accessibility for impaired |         | ●        |         | ●       | ●      |        |
| Affordability              |         |          |         |         |        |        |
| Security                   |         |          |         |         |        |        |
| Functional diversity       |         |          |         |         |        |        |
| Intermodal integration     |         | ●        |         | ●       | ●      | ●      |
| Active mobility            |         | ●        | ●       | ●       |        | ●      |
| Energy efficiency          | ●       |          |         |         |        |        |

Table 5: Priority indicators selected by each city

<sup>7</sup> Note that cities did not include as priorities indicators that they were already tackling. Some had a special interest in ones that a wide group of mobility companies could help more than the usual, focussed "single topic" approach.



Source: Stadtrads Hamburg

### PROJECT LEARNING ON BRINGING THE TEAM TOGETHER

- Carry out a citizen survey early in the process to provide a reality check against the city's perceptions and expectations, fully engage relevant people and gather essential data
- Focus on priorities among the many dimensions of sustainable mobility
- Collect data from the most relevant sources, including finding sources the city may not be aware of. This will require collaboration across mobility and environmental stakeholders
- Use alternative indicator calculations when necessary to adapt to the data available
- Recognize connections between different sustainability indicators (such as GHGs and congestions) and take this into consideration when identifying priority indicators

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Indicator calculation results confirmed really well the city priorities and thus showed the city was right in its intuition and the relevance of the indicator set.

◆ Tina Wagner, Head of Transport and Infrastructure Development, Hamburg

# STEP 3 - FIND BEST PRACTICES AND ENABLERS IN THE SOLUTION TOOLBOX

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- The City Taskforce searches for an integrated solution set to target the range of priority indicators
- The city agrees a draft solution portfolio for dialogue and potential trials

## CHALLENGE

Cities often consider isolated solutions to meet individual objectives.

## APPROACH OF SMP2.0

The SMP2.0 framework ensures a holistic, integrated approach leading to a tailored solution portfolio. It uses a database of best practices ranked by impact on the indicators to select the optimal solution portfolio and the associated enablers to meet the identified priorities

SMP2.0 created a database containing more than 200 leading mobility solutions from around the world. This Solution Toolbox includes contributions from the project companies, best practices already in place, and emerging solutions identified in project research.

The extensive database provides a datasheet for each relevant solution with links to implementation examples around the world (see Figure 8). It also provides infrastructure, behavior and policy enablers and financing mechanisms. Cities use the database to build a portfolio of solutions responding to their priorities.

The wide range of options in the database highlights possibilities that the city was not previously considering or even aware of (See examples in Figure 7). For example, Indore wanted to explore the concept of right-turn filtering lanes and Campinas was interested to find that car-sharing works in similar cities.



## USING THE SOLUTION TOOLBOX

The database returns a list of solutions based on the indicators chosen by a city. Users of the database specify the priority indicators identified in the early phase of the project and search for solutions for individual indicators and any combination of them. Users can scrutinize potential solutions, including relevant timeframes, financing mechanisms and other enablers, and build a preliminary roadmap.

The database uses a 5-level scale from negative to high positive for the impact of indicators on a given solution, based on the extent of implementation and the level of uptake by citizens. The scale is based on assumptions about the average level of implementation, for example the length of a tram line and the frequency of the service.

The impact of each option on all 19 mobility indicators is ranked so that the results show the best solutions for a given indicator and the biggest impacts of a solution on different indicators.



Figure 7: The eight categories of solutions in the Solution Toolbox



## 1 INDICATORS

[Start a new report](#)   [Import a report](#)

| Indicator                  | 1. City Priority |   | 2. Solution search |              |
|----------------------------|------------------|---|--------------------|--------------|
|                            |                  |   |                    | Reset values |
| GHG                        | 1                | ▼ | 1                  | ▼            |
| Air pollution              | 0                | ▼ | -1                 | ▼            |
| Noise hindrance            | 0                | ▼ | -1                 | ▼            |
| Fatalities                 | 1                | ▼ | 2                  | ▼            |
| Congestion                 | 0                | ▼ | -1                 | ▼            |
| Access                     | 1                | ▼ | -1                 | ▼            |
| Affordability              | 1                | ▼ | -1                 | ▼            |
| Energy efficiency          | 0                | ▼ | -1                 | ▼            |
| Intermodal integration     | 0                | ▼ | -1                 | ▼            |
| Accessibility for impaired | 0                | ▼ | -1                 | ▼            |
| Active mobility            | 1                | ▼ | -1                 | ▼            |
| Security                   | 0                | ▼ | -1                 | ▼            |
| Public Finance             | 0                | ▼ | -1                 | ▼            |
| Economic opportunity       | 0                | ▼ | -1                 | ▼            |
| Public Area                | 0                | ▼ | -1                 | ▼            |
| Space usage                | 0                | ▼ | -1                 | ▼            |
| Travel time                | 0                | ▼ | -1                 | ▼            |
| Functional diversity       | 0                | ▼ | -1                 | ▼            |
| Comfort and pleasure       | 0                | ▼ | -1                 | ▼            |

## 2 SOLUTION SEARCH RESULTS

Search Solutions

| Selecti                             | SolutionName  | City impact |
|-------------------------------------|---|-------------|
| <input type="checkbox"/>            | <a href="#">Introducing time-controlled access restrictions</a>   | 7           |
| <input checked="" type="checkbox"/> | <a href="#">Strolling zones</a>                                   | 7           |
| <input checked="" type="checkbox"/> | <a href="#">Integrated bicycle plan</a>                           | 7           |
| <input type="checkbox"/>            | <a href="#">Public transport and soft-mobility corridor</a>       | 7           |
| <input type="checkbox"/>            | <a href="#">Underground / Metro Rail</a>                          | 6           |
| <input checked="" type="checkbox"/> | <a href="#">Web-based traffic management</a>                      | 6           |
| <input type="checkbox"/>            | <a href="#">Heavy Rail</a>  | 6           |
| <input checked="" type="checkbox"/> | <a href="#">Light Rail Vehicle</a>                                | 6           |
| <input type="checkbox"/>            | <a href="#">Urban Monorail</a>                                    | 6           |
| <input type="checkbox"/>            | <a href="#">Pedestrian Mobility Measures</a>                      | 6           |
| <input type="checkbox"/>            | <a href="#">Dedicated bicycle lanes</a>                           | 6           |
| <input type="checkbox"/>            | <a href="#">Bicycle Paths</a>                                     | 6           |
| <input checked="" type="checkbox"/> | <a href="#">Bus Rapid Transit</a>                                 | 5           |
| <input type="checkbox"/>            | <a href="#">Semi-autonomous electric vehicle for public tran:</a> | 5           |
| <input type="checkbox"/>            | <a href="#">Commercial Vehicle Fleet Management</a>               | 5           |

Record: 1 of 28   Unfiltered   Search

### 3 SELECTED CITY SOLUTIONS

Upload the result table

| SolutionName   | Timefram | Sensitive                           | Comment        | Category        |
|--|----------|-------------------------------------|----------------|-----------------|
| <a href="#">Integrated bicycle plan</a>                        | 1 year   | <input type="checkbox"/>            |                | Demand manaj    |
| <a href="#">Strolling zones</a>                                | 1 year   | <input type="checkbox"/>            | Land availabil | Demand manaj    |
| <a href="#">Introducing time-controlled access restriction</a> | 1 year   | <input type="checkbox"/>            |                | Demand manaj    |
| <a href="#">Light Rail Vehicle</a>                             | 5+ years | <input type="checkbox"/>            |                | Collective pass |
| <a href="#">Web-based traffic management</a>                   | 5+ years | <input type="checkbox"/>            | Deployment     | Transport teler |
| <a href="#">Bus Rapid Transit</a>                              | 2-5 year | <input type="checkbox"/>            |                | Collective pass |
| <a href="#">Shuttle buses to the business district</a>         | 1 year   | <input type="checkbox"/>            |                | Collective pass |
| <a href="#">Advanced Driver Assist System</a>                  | 1 year   | <input type="checkbox"/>            |                | Safety and secu |
| <a href="#">Tire solutions for public transport</a>            | 1 year   | <input type="checkbox"/>            | Partnership w  | Collective pass |
| <a href="#">Park and Ride Scheme</a>                           | 1 year   | <input type="checkbox"/>            |                | Collective pass |
| <a href="#">Off-Peak Deliveries</a>                            | 1 year   | <input type="checkbox"/>            |                | Urban freight l |
| <a href="#">Safe driving support</a>                           | 2-5 year | <input type="checkbox"/>            |                | Safety and secu |
| <a href="#">Congestion Charging</a>                            | 5+ years | <input checked="" type="checkbox"/> |                | Demand manaj    |
| <a href="#">Smart parking</a>                                  | 2-5 year | <input type="checkbox"/>            |                | Demand manaj    |
| *  |          | <input type="checkbox"/>            |                |                 |

### 4 ENABLERS

[Reinitialize all Financing Mechanism/ Enablers Selection.](#)

Solution for which you are looking for enablers

Bus Rapid Transit

#### A. Financing mechanisms

Source of funds and Mechanism Categories available for your solution

|   |                                     |                              |
|---|-------------------------------------|------------------------------|
| 5 | City Operations                     | Grants                       |
| 6 | City Operations                     | Incentives for Private Inve: |
| 7 | Development Assistance Institutions | Flexible Support             |

| Selection                           | Mechanism                               |
|-------------------------------------|---|
| <input type="checkbox"/>            | <a href="#">Traffic impact fee</a>      |
| <input checked="" type="checkbox"/> | <a href="#">Land value taxes</a>        |
| <input type="checkbox"/>            | <a href="#">Tax incremental finance</a> |
| <input checked="" type="checkbox"/> | <a href="#">Special assessments</a>     |

Record: 1 of 7

#### B. Behavior, Infrastructure, Policy Enablers

| Selection                           | Type     | EnablerName  |
|-------------------------------------|----------|--|
| <input type="checkbox"/>            | Behavior | <a href="#">Awareness-Raising Campaigns For Sustainable Mo</a> |
| <input checked="" type="checkbox"/> | Behavior | <a href="#">Green commuter plans</a>                           |
| <input type="checkbox"/>            | Behavior | <a href="#">Gamification</a>                                   |

Record: 1 of 4

Save Financing Mechanisms/ Enabler Selection for that solution

### 5 REPORTS

#### SELECTED SOLUTIONS

- [Solutions with descriptions and link](#)
- [Solutions by category](#)
- [Solutions with indicator impact](#)
- [Total indicator impacts](#)

#### ENABLERS

- [Selected enablers](#)
- [Selected financing mechanisms](#)
- [All enablers](#)

- 1 Select & prioritise indicators according to city requirements
- 2 Choose your city solutions among the list proposed
- 3 Personalize your list
- 4 Select the financial, policy, infrastructural, behavioral enablers for your solutions
- 5 Export reports

Figure 8: SMP2.0 Overview of the Solution Toolbox. The figure has been constructed from screenshots of the tool.

# Creating a solution portfolio

The solutions selected from the Solution Toolbox form a “long list” of potential actions addressing the priority indicators. This is narrowed down in the light of the city’s particular geographical, political and financial context to create the basis for a target-oriented, integrated and achievable mobility plan. The City Task Force applies members’ expertise and knowledge of the city context to select the most promising solutions (see Figure 9).

Showcase cities used several criteria to prioritize solutions, including:

- High impact on any of the priorities
- Total impact on all city priorities
- Speed and cost of implementation
- Need for companies’ expert input

There were a surprising number of common solution choices across the six cities even though the mobility systems are at very different levels of development. For example, solutions leading to multi-modal integration were especially popular. In general, cities preferred solutions which offered new mobility options rather than restrictive measures such as

limiting parking spaces, creating low emissions zones or congestion charges.

This draft portfolio is discussed with city decision makers, explaining the rationale, the holistic nature of the portfolio and how it could integrate with the city’s existing plans. Priorities are identified, to be tested in physical trials (where appropriate), included in stakeholder dialogues (see the next chapter) and then incorporated in the mobility plan.

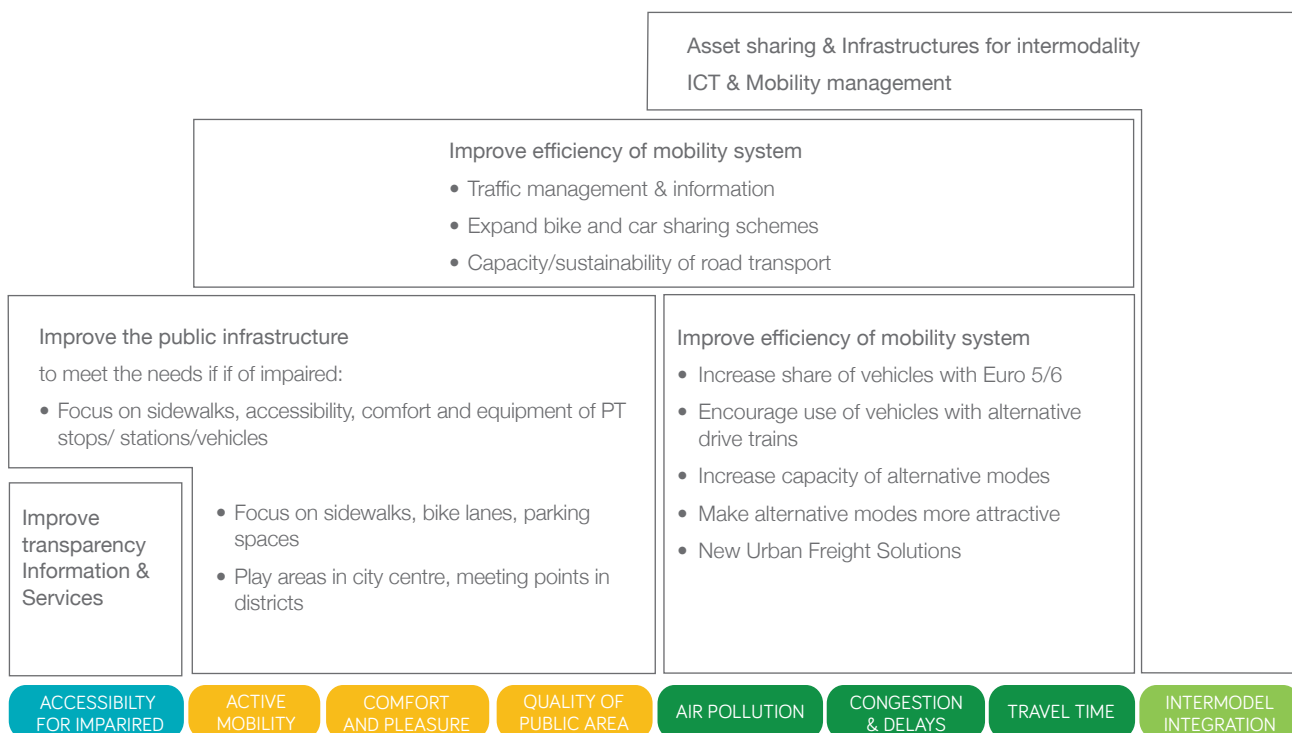


Figure 9: A portfolio of solutions chosen to simultaneously impact on several priority indicators and form an integrated response to the range of city priorities



# Using the Solution Toolbox to identify enablers

The Solution Toolbox includes many examples of the enablers which are necessary to make the solutions a success. It considers four categories:

- Infrastructure requirements, such as space for new public transport routes, pedestrian, cycle and vehicle lanes; interconnections; and technological capacity such as charging stations for electric vehicles
- Financing options, including funds for maintenance as well as capital spending, and new business models
- Enablers of behavioral change, especially overcoming the natural reluctance of people to change habits and embrace unfamiliar aspects of mobility

- Legislative and policy changes, including disclosure and labelling, requirements and permissions

It includes suggestions for potential enablers relevant to each solution, which act as a starting point for determining the specific action required (See Table 6). Given differences in city resources, national policies and regional approaches, the database does not attempt to offer definitive suggestions. It describes the attributes, benefits and risks to help cities identify suitable enablers.

| BEHAVIOR  | INFRASTRUCTURE   | POLICY  |
|---|--|---|
| <ul style="list-style-type: none"> <li>• Promotion of zero-emission electric scooters</li> <li>• Low-emission vehicle Promotion</li> <li>• Clean vehicles web portal</li> </ul> | <ul style="list-style-type: none"> <li>• Solar hydrogen Station</li> <li>• Energy data management system</li> <li>• Smart integration of electric vehicles to electricity grid</li> <li>• Parking sites for electric two wheelers in the city center</li> <li>• Solar powered bus service</li> <li>• Electric vehicle charging points</li> <li>• Hydrogen highway</li> </ul> | <ul style="list-style-type: none"> <li>• Plug-In Electric Vehicle Charging Infrastructure Promotion</li> <li>• Lower/free parking tariffs for low-emission cars</li> <li>• Plug-In Electric Vehicle Charging Stations Building Requirements</li> <li>• Cleaner city fleets</li> <li>• Green fleet management</li> </ul> |

Table 6: Example of enablers in the Solution Toolbox for zero-carbon, zero-emissions vehicles in city fleets”

## Infrastructure

Some solutions may require integration or adaptation of infrastructure. For example, clean vehicles need energy delivery systems and traffic management systems need various sensing methods to collect and process data and then inform users. But infrastructure requirements do not always involve heavy construction or advanced technology. They can entail relatively simple changes in land use to enable a different purpose, such as leasing existing parking space to a Park and Ride service.

## Finance

The type and scale of investment needed determines the potential financial mechanisms. Finance must cover maintenance of assets as well as financing new projects, and in some cases operating

costs which are not matched by revenues. The aim must be to provide sustainable finance for sustainable mobility. Without adequate continuing resources, new investments will gradually decay and fail to meet their long-term objectives.

SMP2.0 commissioned PwC to create an inventory of financing mechanisms for urban mobility. A decision tree guides the city towards the most relevant financing mechanisms (See figure 10).

The main sources of funds are:

- Cash flows from mobility projects
- Taxes, fees and other funds from a city's financial operations
- National and sub-national governments
- Development assistance institutions

- Private sector institutions and investors

Each solution in the Toolbox includes references to relevant financing mechanisms and sources of funds (See Figure nn)). Potentially suitable sources will depend on who is driving the solution and their ability to secure appropriate finance. It may depend on the availability of capabilities and infrastructure to support financing mechanisms. Cities may also consider using taxes and fees to drive new behaviors such as encouraging walking and cycling (see below).

The roles of the national and subnational governments, development assistance organizations and the private sector are especially relevant. They provide an increasing number of grants and investments as they prioritize sustainability as a strategic goal.

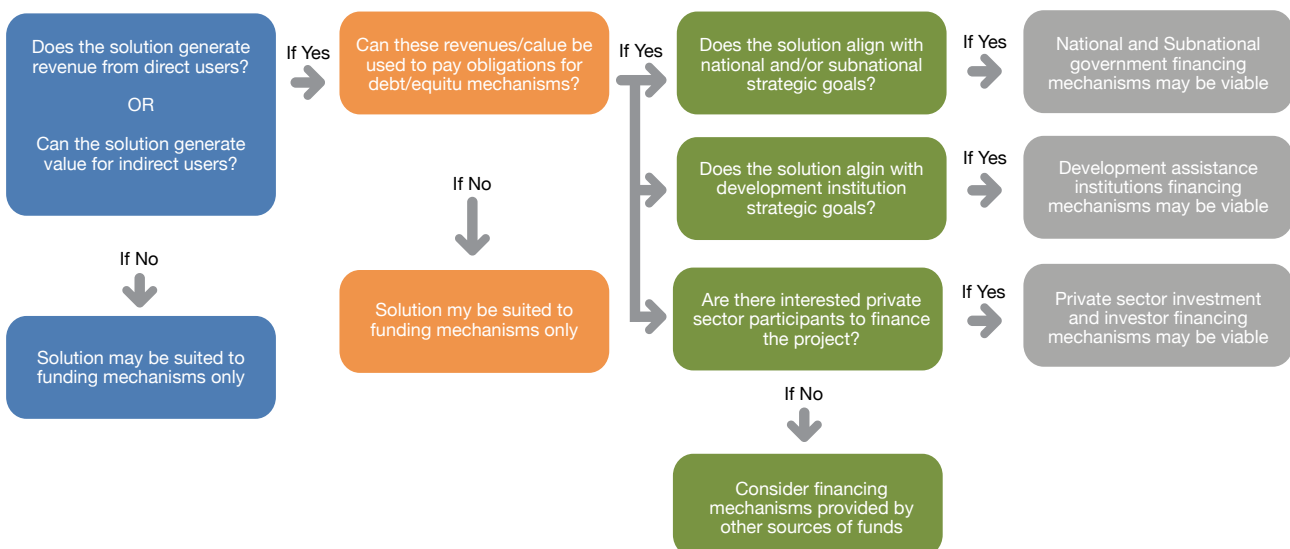


Figure 10: A route to funding sources

Financing mechanisms can be combined in many ways and can include emerging and innovative alternatives including novel ways of structuring debt finance. These sources can supplement conventional finance, but they may be challenging to implement and may carry additional risks. Cities must consider the level of expertise needed and potential precedents in choosing mechanisms, especially with novel approaches. Debt finance obligations may impact the future financial health of the city as well as the viability of the mobility solution.

Supplying next generation transport systems is becoming an opportunity for cities worldwide, whether in developed or emerging economies. Some of the most disruptive innovations, including taxi-hailing services, car and bike sharing, peer-to-peer services and traffic management apps, link innovative business and service models with telecommunications technology. This provides both local and exportable solutions through “public-private innovation” around sustainable transport.

For example, local and national governments of Scotland, Finland, and Sweden have all introduced significant innovation, industry and economic policies and programs. Investment supports this drive to grow New Mobility industry clusters and enterprises, including “Mobility-as-a-Service” models.

Sustainable mobility also has wider economic implications and opportunities. Cities (as well as state and national governments) are beginning to see sustainable transport not only in terms of cost savings, but more importantly in terms of significant sustainable economic development and business opportunities. They see potential for job creation, talent attraction, New Mobility industry clusters and enterprise development for export.

### Behavior

Changing people’s behavior is essential for some mobility solutions. For example, using integrated travel modes may require changes in people’s daily routine, while carpooling or greater compliance with traffic rules improves traffic flow. In some cases, the behavior change is particularly difficult because it relies on culture and aspirations – promoting cycling in the developing world is confronted by the aspirational status attached to private car use and convenience versus the view that bicycles are only for the poor. Changing such habits requires a combination of interventions, including awareness building and communication. The alternatives need to be at least as convenient, to connect with people’s values and needs, including pleasure-seeking and risk-avoidance and their willingness to pay.

A city can encourage the target behavior and/or discourage undesirable action. Incentives can take various forms: direct financial incentives, gift certificates through accumulating points, discounts in car insurance, parking charges or even taxes. Such schemes can be funded by government or private companies.

The Solution Toolbox includes suggested enablers of behavioral change, describing types of activities or campaigns that have proved successful. (See table 7 and more detail in the Solution Toolbox).

The SMP2.0 process includes steps that can generate support for change (see the next chapter). Some cities in this project trialed solutions on a small scale such as a stretch of a busy corridor. The trials also tested the practicalities of solutions, emphasized the benefits and helped to build support for potentially controversial or innovative measures – such as Bangkok’s support for private companies providing parking spaces.

Stakeholder dialogue also exposes potential solutions to scrutiny and identifies necessary behavioral changes. Dialogue can reveal that apparent behavioral barriers are actually policy or infrastructure issues. For example, on-street parking in Indore is a practice that stems from a lack of parking infrastructure in some shopping areas of the city.

| ENABLER OF BEHAVIORAL CHANGE        |  |
|-------------------------------------|--|
| NAME                                | DEFINITION   |
| Transport Eco Point System          | Transport Eco Point System provides smart card-based public transport usage management, encouraging eco-friendly transport. Transport eco-points are calculated based on public transport usage as recorded on the smart card. Users can check how many transport eco-points and usage points they have accumulated via the website. The usage point system earns users points they can redeem for credit. CO <sub>2</sub> reductions are calculated for individual schools and workplaces, and the results are published online to encourage participation. |
| Insurance based on driving behavior | Advances in telematic technology now permit insurance risk to be assessed and cover provided on a per journey basis. By providing transparency on risk variables e.g. driving style, distance travelled and time of travel, drivers are now empowered to revise their travel plans and lower their total cost of ownership. Pay As You Drive insurance is predominately targeted at high risk drivers (young / inexperienced); reducing their risk profile and an insurer's risk pool allows cheaper insurance.  |

Table 7: Example enablers of behavioral change.

## Policy

New regulations can be required either as solutions (such as environmental zones, prohibition of lane changing at an intersection) or to support essential measures (such as subsidies for the installation of eV charging stations). In some cases, the enabler reflects the need to enforce existing policies or laws, as with illegal parking in Bangkok.

Many policy areas are relevant, in addition to those concerned directly with transport.

For example, promoting mixed land use and appropriate housing development is beneficial.

On the other hand, policies that are important for city revenues can hinder sustainable mobility, such as land taxes and sales which can encourage urban sprawl.

See Table 8.

## PROJECT LEARNING ON USING THE SOLUTION TOOLBOX

- Integrated tools such as the Solution Toolbox efficiently map solutions that complement each other and address the range of cities' priorities simultaneously rather than sequentially
- Use the scale of impact of a solution carefully to reflect a realistic level of implementation
- Developing cities can leapfrog intermediate steps to implement more developed solutions now, such as real-time bus information
- Recognize that solutions can impact several priorities simultaneously and consider how solutions can reinforce each other in selecting solutions
- The technical expertise and implementation experience of the private sector was very useful to provide practical context for the solutions and evaluate the potential for the city
- The Toolbox allowed for an efficient selection of best practices to then build integrated solution portfolios relevant to the range of city priorities

| POLICY  |  |
|---|--|
| NAME  | DEFINITION   |
| Electric Powered Vehicle (EV) Charging Infrastructure Promotion | <p>The policy plan is to develop and expand the infrastructure needed to promote the use of EVs. Policy steps include:</p> <ul style="list-style-type: none"> <li>• expediting the permit and installation processes for charging outlets</li> <li>• providing incentives for employers and other organizations who install charging infrastructure at the workplace and other parking facilities</li> <li>• developing standard regulations governing EV infrastructure across the region</li> <li>• establishing programs to purchase EVs for use by city and state employees.</li> </ul> <p>The Mayors in San Francisco are working with other cities in the Bay Area as well as regional government organizations and private sector partners through the Bay Area EV Corridor Project and the Association of Bay Area Governments. They have published a guide with standardized policies, ordinances and best-practices, providing a consistent framework for deployment of EVs and EV infrastructure.</p> |
| Lower/free parking tariffs for low-emission cars                | <p>Cities can provide lower tariffs or free parking for low emission vehicles (hybrid electric, electric, CNG, LNG, biofuel cars). The implementation of a reduced tariff is a choice by the local government to improve air quality and raise awareness. A non-transferable pass is given to registered owners of low emissions cars and must be placed on the vehicle dashboard. The revenue lost can be counterbalanced with an increase in the parking fees for the other, more polluting cars. This pricing stimulates the increase in the share of cleaner vehicles, which has a positive impact on the GHG and air pollution levels.</p>  |

Table 8: Examples of policy enablers.



This project allowed us to have a better understanding of where Lisbon mobility strengths and weaknesses are, particularly when compared with other world cities: This is an effort we thank WBCSD and Brisa for. When we combined the diagnosis we made within the project, with the mobility

vision we have for Lisbon, the results were very clear, and reinforced the idea that we need a clear change in mobility paradigm! We need, and we are already humanizing public space and making Lisbon greener, protecting elderly and children, increasing street attractiveness and safety, giving back the streets to people, walking people, empowering the public transport network, rationalizing the use of cars, introducing cycling infrastructure, creating modern mobility services, sharing assets, reducing energy consumption and emissions, fighting climate change and help save the planet!

◆ Manuel Salgado, Lisbon city councilor for Urban Planning and Mobility

# STEP 4 - TEST SOLUTIONS AND ENABLERS

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- Testing and dialogue focuses on developing very practical roadmaps
- Stakeholder Dialogues test practicalities and pinpoints barriers as well as enablers
- Trials highlight implementation challenges and help to identify additional measures to make solutions practical and successful on the ground

## CHALLENGE

Best-practice solutions may not fit the cultural and behavioral context of the city.

## APPROACH OF SMP2.0

Trials and stakeholder dialogues, including citizens, are key to adapting solutions to local circumstances.

Stakeholder dialogue sessions and trials help to refine the solution portfolio in preparation for creating a practical sustainable mobility roadmap. Discussing proposed solutions with members of the wider community and/or leaders of relevant organizations is a vital step in understanding how to adapt proposals to suit local conditions. Citizens, businesses and organizations linked to mobility in the city have useful insights that can make proposals more practical and achievable.



# Discussing options in stakeholder dialogue

Stakeholder dialogue makes it possible to listen to the citizens and the direct users of the mobility system, giving the City Task Force invaluable inputs on where solutions should be implemented and how to make them successful.

Cities may hesitate about presenting outline proposals publicly without having developed

detailed plans that make clear how individual solutions will be implemented. There may also be no tradition of such engagement. However, the SMP2.0 project experience demonstrates that cities can reap substantial benefits from being open to wide consultation. Indeed, the more open they are, the greater the likely benefit – from both mapping the system and discussing enablers.

## A successful dialogue:

- Spreads awareness of the sustainable mobility goals and proposed solutions
- Gathers feedback from all stakeholders served by mobility options—including non-traditional stakeholders

and representatives of the underserved

- Is based on actual experience in the city
- Improves the city's understanding of challenges and possible barriers
- Discusses the best locations for trials and implementation of solutions
- Provides local leaders with perspectives to identify priorities for policy implementation and behavior/culture change  
Maximizes the perspective of the stakeholders
- Provides local leaders with aligned stakeholders as the city develops its blueprint for the future

## STAKEHOLDERS TO INVOLVE IN DIALOGUE

Stakeholders to involve in dialogue

The specific individuals and groups who can best contribute will be city-specific. A city may opt to issue an open invitation, as proved successful in Indore. Specific stakeholder groups to consider are:

- Citizens from communities where solutions will be implemented
- NGO's active in areas such as accessibility, community development, transport, environment and energy
- Academics and researchers in subjects such as technology, social development, transport, land use, economic development and sustainability
- Entrepreneurs and companies, especially those involved in IT, innovative products and services, real estate, planning and architecture, tourism, transport and logistics
- Venture capitalists and other financiers

## System mapping

The mapping exercise explores how solutions should be applied to the city's mobility system. After the solution portfolio has been presented, stakeholders work in mixed groups. They discuss where each solution should be deployed and how the different solutions can interact and support each other. Using colored markers and post-it notes, they build their picture of sustainability onto the city's existing map, combining a regional view with local transport and land use features.

The contributions from each group reveal shared views, differences of opinion between the stakeholders and challenges to the understanding and perceptions of the City Task Force. For example, Chengdu stakeholders pointed out that the actual pattern of worker movements around the city did not fit the classic radial pattern that is the basis for the city's road and metro plan. This helped the city team reassess the demand in various corridors.

Stakeholders explore differences and discuss issues with the city team, including appropriate timescales. This process aims to develop a consensus, with new ideas to feed into the roadmap. It supports the overall design of the mobility plan as well as the choice of sites and identification of "hot spots" and "choke points".



Figure 11: A discussion group during the mapping exercise in Chengdu

## Identifying enablers

Stakeholders' knowledge and insights help to shape an effective roadmap because they bring specific local and practical experience of mobility challenges. The Enablers workshop aims to identify what is required in terms of Infrastructure, policy changes, desirable behavioral and cultural changes. The financing mechanisms which could support the introduction of solutions are also considered briefly in the workshop.



| SOLUTION                                  | ENABLERS  |   |  |  |
|---|---|---|--|--|
|   | INFRASTRUCTURE  | BEHAVIOR  | POLICY   | FINANCE  |
| Smart Parking                             | Start with manual simple low technology version   |   | To be part of all new parking facilities   | Part of multi-level funding                      |
| Parking fee enforcement strategy          | Requires parking places available<br>CCTV for car protection                              | Awareness campaign & reward schemes (eg Traffic Ambassador in Delhi)              | Fines and enforcement strategy for illegal parking (eg the e-challan electronic payments). |  |
| Passenger Friendly Bus Stops & terminals  | Building all-season stops on roadside where bus stops                                     |   | Design specification<br>Cleaning and maintenance policy                                    | Sponsorship (PPP)<br>CSR, Grants                 |
| On-board Bus Travel Information           | Plans already been developed and need to be integrated with this work                     |   |  | Funding options for integrated solution required |
| Bike Sharing                              | Bike parking stations, with theft control<br>Sufficient cycles<br>Redistribution vehicles | Awareness campaigns<br>"Walk the talk" with influential people<br>Safety training | Lanes exclusively for bikes<br>Free helmets  | PPP for Public Bike Sharing                      |
| Integrated cycling, with Public Transport | ITS Customized Control Centre<br>Junction design to let cycles be at front                |   |  | Funding options for integrated solution required |

Table 9: Example enablers identified in Indore

# Testing solutions on the ground

Testing a solution on a reduced scale can help to understand how to adapt it to citizens' needs and behaviors as well as to the city mobility conditions. Such a trial is a live demonstration of the advantages and implications of the solution and can help gain support from the various authorities as well as participation of citizens. In addition, the trial itself stimulates dialogue as it involves stakeholders to set it up. As a result, it helps to ensure sustainable financing and a scientific approach and to encourage behavior change. (See case studies 2 and 3, and Figure 12).

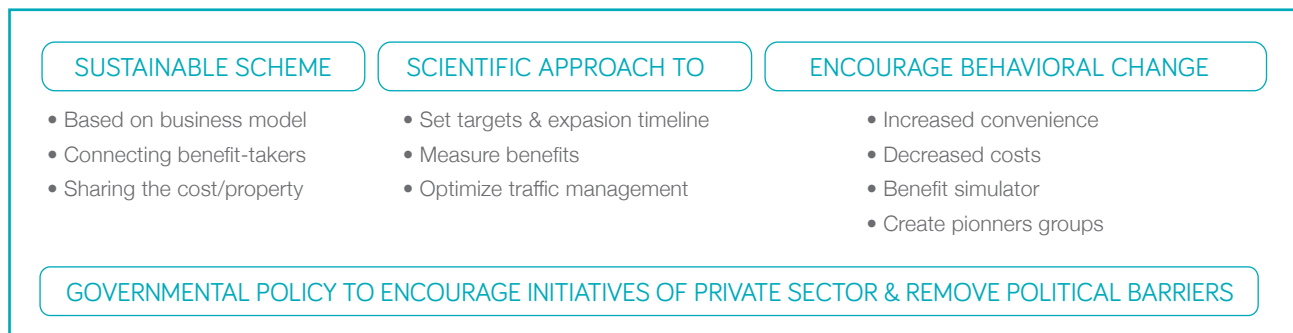


Figure 12: Criteria developed in Bangkok to develop the various trials

## CASE STUDY 2: TRAFFIC DEMAND CONTROL AND TRAFFIC FLOW MANAGEMENT IN BANGKOK

The project identified a need for control of traffic demand (Park & Ride, school shuttle buses and flexible working time) and traffic flow management (removal of traffic bottlenecks and supporting police to optimize traffic signal operations). It is necessary in light of government plans to expand the mass transit system.

Sathorn road was selected to implement a three-stage trial of these measures to develop a practical road map for traffic demand control and traffic flow management for the whole of Bangkok.

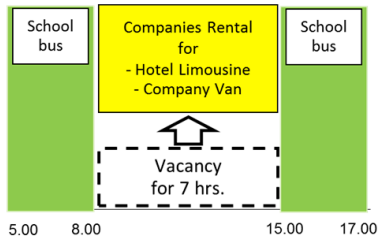
The first trial:

- Introduced shuttle buses for schoolchildren, to reduce the number of parents driving their children to school and parking on the road in front of the school.
- Provided a Park & Ride scheme for employees of companies in the Sathorn area.
- Tested flexible working for a number of companies in the area
- Tested removing traffic bottlenecks by restricting parking on the road, restricting lane changes immediately after the intersection, synchronizing the timing of cars entering Sathorn road with traffic signals and shortening the cycle time of traffic lights at intersections.

- Involving people is the key to success for traffic demand control and traffic flow management.

These findings led to a second trial:

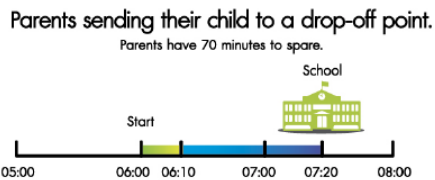
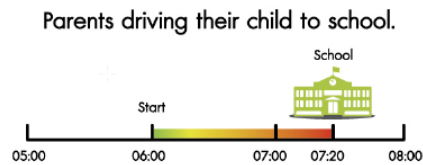
- Share the Shuttle bus with companies during vacant time to reduce the cost for parents.
- Use vacant parking spaces during the day for Park & Ride, such as the parking lots of stores.
- Visualize the benefits of choosing optimum mobility, such as reduced travel time, cost and GHGs by developing 'Benefit Simulator', a mobile phone application.
- Create a 'pioneer group' of people who changed their routines to share their experience.
- Collect ideas from citizen for removing traffic bottlenecks and evaluate them with a traffic simulation model.
- Support police in improving traffic signal operation using data analysis.

| Traffic Demand Control   |   | Traffic Demand Control   |
|--|---|--|
| <b>School shuttles</b>   | <b>Park and Ride</b>  | <ol style="list-style-type: none"> <li>1. Minimize traffic obstacles: <ul style="list-style-type: none"> <li>•Synchronize timing of cars entering a road (out of parkings, smaller roads) with traffic signals.</li> <li>•Prohibit lane change in and after the intersection</li> </ul> </li> <li>2. Simulations to find optimum traffic signal cycle time data and standardize.</li> <li>3. Allow only one lane on Sathorn road for parent to drop off / pick-up kids.</li> </ol> |
| <p>Shuttle buses are used for school mornings and evenings and by companies during day time to reduce parents' cost (shuttle bus sharing).</p>  | <p>Lease existing parking space, such as shopping centers or condominiums and sublease to Park &amp; Ride user. (Parking sharing)</p>                             |  |
|  | <p><b>Flexible working time</b></p> <p>Introduce Flexible Working Time for companies to shift traffic demand.<br/>Ave. travel-time reduced : 1.3h/ round trip</p> |  |

This trial revealed that:

- People who used the shuttle bus and Park & Ride were satisfied but many hesitated to change their routine.
- Flexible working time can benefit companies and employees by reducing overtime working and travel time
- Developing a viable business model is necessary to make the scheme sustainable.
- There is potential to improve traffic flow without huge investment.

Dialogues with various stakeholders about the results of these trials involved more people from government, the private sector and citizens and agreed there is significant potential to improve traffic congestion. This provided the basis for a roadmap for traffic demand control and traffic flow management for the whole of Bangkok.



Time saving from using the shuttle bus



Before and after on-street parking restrictions

### CASE STUDY 3: ACTION TO IMPROVE PEDESTRIAN MOBILITY IN INDORE

Sidewalks and roads in the Madhya Pradesh city of Indore are typically blocked by shopkeepers' goods, street vendors and parked vehicles. As a result, non-motorized slow traffic mixes dangerously with two and four wheelers on heavily congested roads. The City Task Force identified pedestrian mobility, congestion and road safety as priorities for the city and the solution portfolio included parking and loading restrictions.

A trial, in a heavily congested commercial area, explored how best to implement these solutions. It involved designated parking places for each vehicle type, restricted loading and unloading and limits to shops encroaching onto the sidewalks along a 1.2Km stretch of road.

The trial was widely covered by local media, stimulating inputs from interested individuals, businesses and other organizations. Shop owners, citizen groups and others engaged enthusiastically in a stakeholder dialogue session to review the first trial. Many considered the trial to be a success, with improved conditions for businesses and traffic. But shop owners were concerned about loss of business, and the parking restrictions were only respected when there was a police presence. The stakeholder dialogue meeting came up with additional ideas such as requiring basement parking for all new construction.

This led to the development of a second trial in a different location to gain further experience, including consideration of how to implement solutions with limited funds and a lack of spare land for parking lots.

PS graphics suppressed for size matter in this version



## PROJECT LEARNING ON TRIALS, STAKEHOLDERS' DIALOGUE AND THE ENABLERS' WORKSHOP

- Run trials to adapt solutions to local circumstances by understanding the barriers to implementation and uptake by citizens and how to overcome the barriers
- Involve a wide group of stakeholders in building a sustainable trial that can be scaled up subsequently
- Trials help regulators understand benefits from solutions that require behavioral changes
- A sustainable business model needs to be developed during solution trials to ensure that they can later be deployed at scale
- System mapping is an engaging and tangible catalyst for action and forming new partnerships
- Some cities are hesitant to talk to citizens directly, preferring to work through representative bodies. Project experience demonstrates that the more open that cities are, the greater the likely benefit

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Bangkok city task force tested solutions by several trials on Sathorn. Sathorn model focuses on collaboration and integration. You can see from the recent Leaders' Forum where government, private sector, and citizens show their views and put their hands to create sustainable travel on Sathorn area.

● Pr. Sorawit Narupiti, Chulalongkorn University

# STEP 5 - BUILD THE ROADMAP

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- The roadmap is an integrated set of solutions to address the city priorities.
- It is based on the best practices in the Solution Toolbox and benefits from the trials and stakeholder dialogue and contains the enablers needed to achieve practical implementation
- The roadmap belongs to the city and contributes to its mobility plan. The city makes final decisions on strategy and implementation

## CHALLENGE

Creating a long-term sustainable mobility plan that remains valid through the cycle of political changes

## APPROACH OF SMP2.0

Combining data-driven objectivity and stakeholders' experience to draw up an integrated, practical mobility roadmap that addresses the needs of the city

The SMP2.0 roadmap presents the portfolio of solutions to meet the city's priorities, together with the enablers that will make them work. It charts a path through the multiple options and interdependences, addresses any gaps in experience and expertise in the city and any confused responsibilities.

The roadmap is the summation of the data-driven, systematic, holistic thinking on solutions and their integration. It brings together the thought processes and discussions during the project with the best practices collected in the Solution Toolbox and the learning from trials and dialogue. The result is a time-based plan for implementing the various elements (see Figure 13).



This plan belongs to the city, which will make final decisions on strategy and implementation. It is a valuable new resource, guiding the existing and future administrations as they create a more sustainable city. It includes a work plan and an estimate of the impacts on the SMP2.0 indicators. The administration can use it to monitor improvements on each indicator.

The roadmap considers the overall and mobility-specific city objectives, bearing in mind growth expectations. It is based on:

- The current mobility status and needs
- Key positive and negative elements of the existing system
- Desired changes to meet the city's objectives

- The main barriers and enablers
- The solution portfolio, analyzed by timeframe of implementation, with indications of the scale of deployment and costs

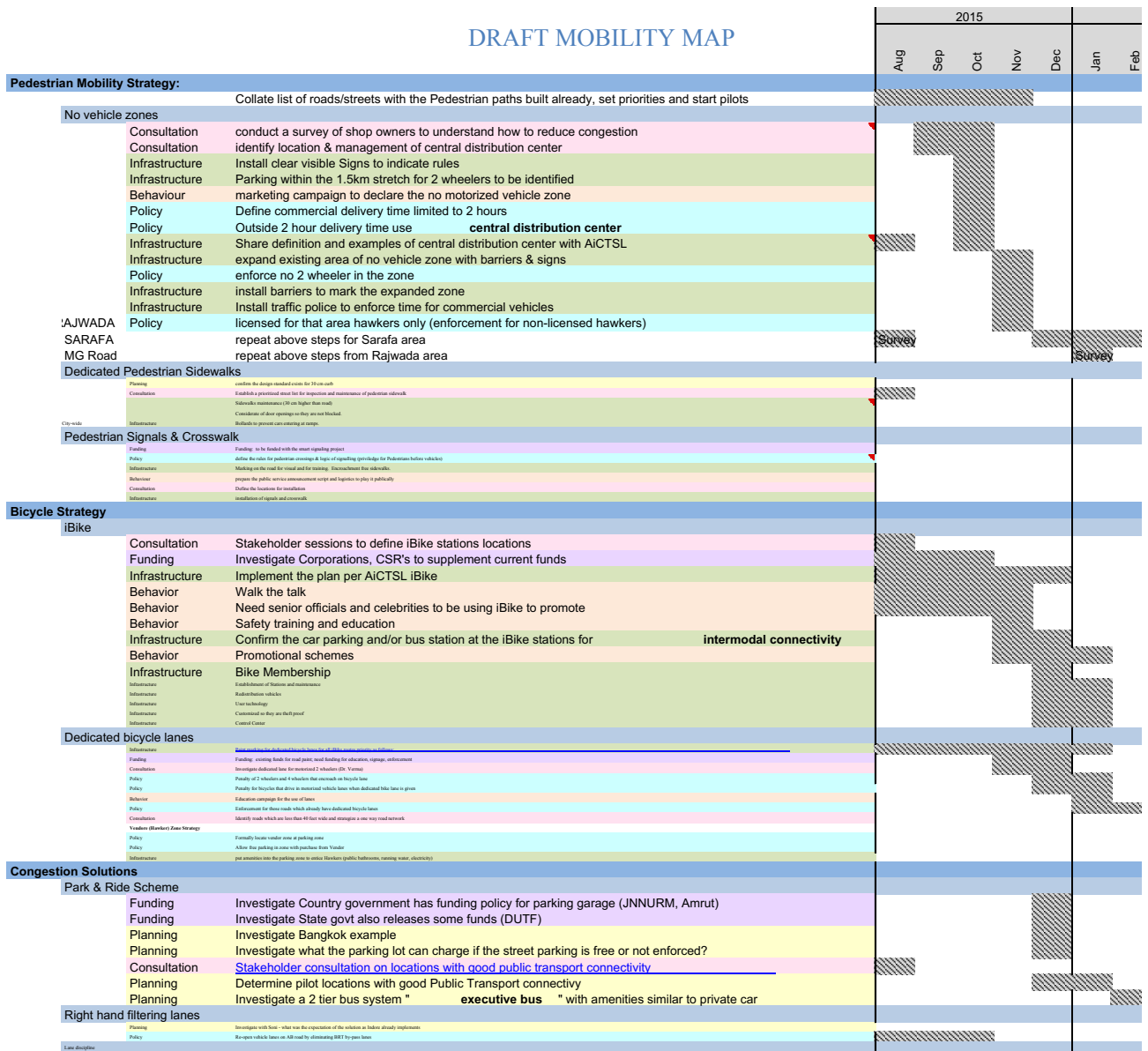


Figure 13: Extract from a city roadmap

These elements create an outline plan consistent with the city's view of realistic timescales. Short term solutions are often answers to urgent problems or preliminary steps to pave the way. For example installation of CCTV cameras to enforce the respect of bike lanes, parking restrictions etc. Long term solutions meet any expected increase in demand. They often require the deployment of enablers and preliminary steps before they can be implemented. Solutions may be city-wide or in a location as small as an individual road or junction. In some cases, further investigations will be needed to define more precisely the existing needs in terms of location and scale.

#### PROJECT LEARNING ON THE ROADMAP

- Fit the range and detail of the roadmap to the city's needs
- Business inputs can bring practical experience of previous solution implementation in other cities
- The city needs to keep strong ownership of the mobility plan, ensuring realistic timescales and steps to implementation are derived from the roadmap.
- Use the implementation experience of the businesses to ensure practicality
- The city benefits by consulting all relevant parties in preparing for implementation and mobilizing decision makers to ensure full support





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SMP2.0 proposed very practical suggestions. The plan definitely faces challenges – it needs plenty of consensus between the city administration and public representatives. Even mobility and transportation issues need agreement from citizens also. The sustainable mobility project has been helpful to give a direction on where to go. This a very good plan, and there will be a practical timeline schedule. So the timeline will propose how the city can take all these additions forwards.

P. Narahari, Indore District Collector

# LEARNING AND RECOMMENDATIONS

SMP2.0 has demonstrated that a city/business collaboration in the early stages of strategic planning can catalyze the transition to sustainable urban mobility. The process represented a new approach to city/business relationships, some of which are continuing in some of the cities.

## Learning

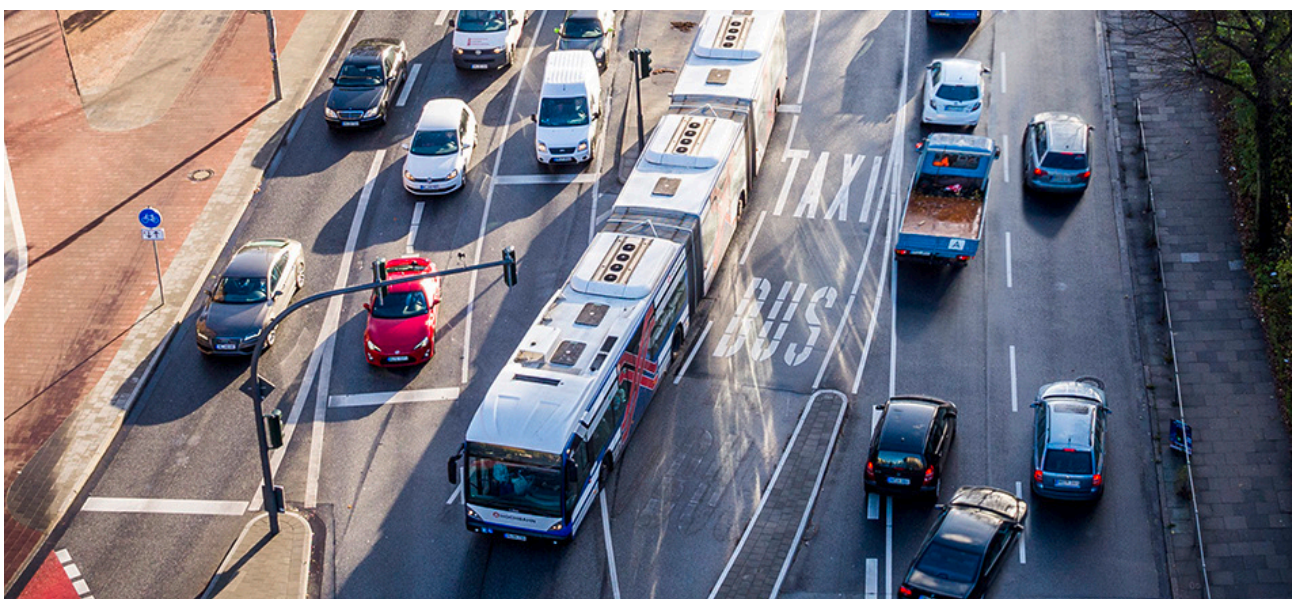
The data-driven, analytical approach proved helpful in structuring cities' thinking and maintaining a focus on sustainable mobility alongside the many other priorities on cities' agendas. City personnel appreciated the holistic approach, the different perspectives of the business teams, their project and technical knowledge and expertise and their results orientation. Company representatives gained new insights into city relationships and processes, as well as an understanding of how the cities

perceive the changing mobility landscape.

The six cities gained an enhanced understanding of their mobility systems and developed their thinking holistically. In particular, the project has demonstrated the value of:

- Introducing cross-sector, technical and implementation business expertise into city strategy development
- Bringing an external perspective to city goals, plans and working style

- Using data to describe and simplify a city's mobility performance in a set of key indicators
- Access to a database of best practices from around the world in the Solution Toolbox
- Exposing potential solutions to a wide group of stakeholders
- Using the analysis and feedback to create a roadmap with defined enablers and timescales



| FOR CITIES:  | FOR BUSINESSES:   | FOR ALL STAKEHOLDERS:  |
|--|---|--|
| <ul style="list-style-type: none"> <li>• Expert support on mobility solutions through an open dialogue with businesses</li> <li>• Feedback on existing city plans from business</li> <li>• Increased awareness of existing mobility best practices and emerging solutions</li> <li>• An opportunity to consider new ideas and reconsider those they had previously rejected</li> <li>• A holistic and integrated view of city mobility</li> <li>• Clear and objective identification of mobility priorities for the city</li> <li>• Recognition of the importance of different city departments working together to address mobility challenges</li> <li>• The opportunity to develop a collaborative form of information sharing and working</li> <li>• An open, innovative methodology for the city</li> </ul> | <ul style="list-style-type: none"> <li>• Insight into cities' processes and where business can support cities in meeting their challenges</li> <li>• A perspective on how citizens see the mobility system</li> <li>• Awareness of how business offerings interact with other solutions to create new concepts for cities</li> <li>• An improved understanding of city needs and how to develop relevant solutions</li> <li>• Practical experience of conducting trials and observing behavior changes</li> <li>• A cross-sector dialogue to develop new partnerships with other companies and with relevant city representatives.</li> </ul> | <ul style="list-style-type: none"> <li>• Input to the selection of solutions based on consultation and citizen surveys</li> <li>• Involvement early in the solution planning process leading to a better fit of solutions with actual needs and habits</li> <li>• Participation in trials in partnership with businesses and local authorities to increase mobility options which are financially sustainable and locally relevant</li> <li>• Increase the visibility of citizen's needs through the survey results</li> </ul> |

Table 10: Benefits of collaboration through the SMP2.0 process

## RECOMMENDATIONS:

Experience with the six showcase cities shows that many factors are critical to success:

### FOUNDATION - BRINGING THE TEAM TOGETHER

- Ensure that all relevant disciplines and departments are represented consistently throughout the project, including participants from regional and national government and associations if appropriate.
- Involve relevant company experts with local knowledge or with knowledge of applying the solution in different cities and contexts and with the capacity to engage sufficiently in the city teams
- Agree on a clear vision and goals including tangible targets

### STEP 1 - UNDERSTAND THE CITY'S MOBILITY SYSTEM

- In planning the project, adapt the process to the individual needs, culture and characteristics of the city
- Invest in developing mutual understanding of the city's mobility priorities among the city team and between the city/business members
- Cities need to have or to develop a consistent vision for mobility across the different departments

### STEP 2 - ANALYZE MOBILITY PERFORMANCE

- Carry out a citizen survey early in the process to provide a reality check against the city's perceptions and expectations, fully engage relevant people and gather essential data
- Focus on priorities among the many dimensions of sustainable mobility
- Collect data from the most relevant sources, including finding sources the city may not be aware of. This will require collaboration across mobility and environmental stakeholders
- Use alternative indicator calculations when necessary to adapt to the data available
- Recognize connections between different sustainability indicators (such as GHGs and congestions) and take this into consideration when identifying priority indicators

### STEP 3 - FIND BEST PRACTICES AND ENABLERS IN THE SOLUTION TOOLBOX

- Integrated tools such as the Solution Toolbox efficiently map solutions that complement each other and address the range of cities priorities simultaneously rather than sequentially
- Use the scale of impact of a solution carefully to reflect a realistic level of implementation
- Developing cities can leapfrog intermediate steps to implement more developed solutions now, such as real-time bus information
- Recognize that solutions can impact several priorities simultaneously and consider how solutions can reinforce each other in selecting solutions
- The technical expertise and implementation experience of the private sector was very useful to provide practical context for the solutions and evaluate the potential for the city
- The Toolbox allowed for an efficient selection of best practices to then build integrated solution portfolios relevant to the range of city priorities

## RECOMMENDATIONS:

### STEP 4 - TEST SOLUTIONS AND ENABLERS

- Run trials to adapt solutions to local circumstances by understanding the barriers to implementation and uptake by citizens and how to overcome the barriers
- Involve a wide group of stakeholders in building a sustainable trial that can be scaled up subsequently
- Trials help regulators understand benefits from solutions that require behavioral changes
- A sustainable business model needs to be developed during solution trials to ensure that they can later be deployed at scale
- System mapping is an engaging and tangible catalyst for action and forming new partnerships
- Some cities are hesitant to talk to citizens directly, preferring to work through representative bodies. Project experience demonstrates that the more open that cities are, the greater the likely benefit

### STEP 5 - BUILD THE ROADMAP

- Fit the range and detail of the roadmap to the city's needs
- Business inputs can bring practical experience of previous solution implementation in other cities
- The city needs to keep strong ownership of the mobility plan, ensuring realistic timescales and steps to implementation are derived from the roadmap.
- Use the implementation experience of the businesses to ensure practicality
- The city benefits by consulting all relevant parties in preparing for implementation and mobilizing decision makers to ensure full support

# Appendix 1 – Demonstrator city engagement summaries

# Bangkok

## The city and its mobility vision

Bangkok is a large, expansive city with an official population of 8.5 million but many unregistered citizens not included in this total. Bangkok's city limit covers 1570 square kilometers (larger than Los Angeles) and includes at least five separate areas of business concentration.

The wider Bangkok metropolitan area covers 7760 square kilometers, including the provincial level city of Bangkok and the provinces of Samat Prakan, Samut Sakhon, Pathum Thani, Nonthaburi and Nakhon Pathom. The suburban areas have grown even more quickly than the city area so that the metropolitan area has a population of nearly 15 million.

The Bangkok area is covered by numerous freeways and expressways. However, a lack of city planning means there is no arterial road network and the many waterways create bridge bottlenecks, adding to the mobility challenges. The road network is also characterized by the soi – many narrow streets branching off main roads, often with no other exit.

Historically, Thailand had a passenger car-oriented policy. Commuting in Bangkok relies primarily on passenger cars, which are 42 percent of the traffic in Bangkok. Motorcycles and vans/pickups are 37 and

14% respectively. Mass transit systems, including skytrain (BTS), subway (MRT) and the airport rail link (ARL), total 80 stations and 85 km of track. They have gained a share of commuting but this does not appear to lessen traffic congestion.

The reliance on cars and buses results in the Bangkok metropolitan area contributing 44% of the country's total transport GHG emissions. Thailand ranks in the bottom 10 countries in Asia in terms of per-capita CO<sub>2</sub> emissions from transport.

Bangkok's vision is for a multi-modal city by 2019, with large-scale mass transit networks.

The government is committed to increasing public transport capacity and Bangkok launched a Master Plan for Mass Transit in 2007. But the mass transit network does not have good connections for private vehicles. Also, there has been little attention paid to measures such as traffic demand control, traffic management, and behavior issues such as illegal parking and violation of traffic signals. One of the reasons is the large number of transport institutions exercising responsibilities in city transport, including government offices and state-owned enterprises.

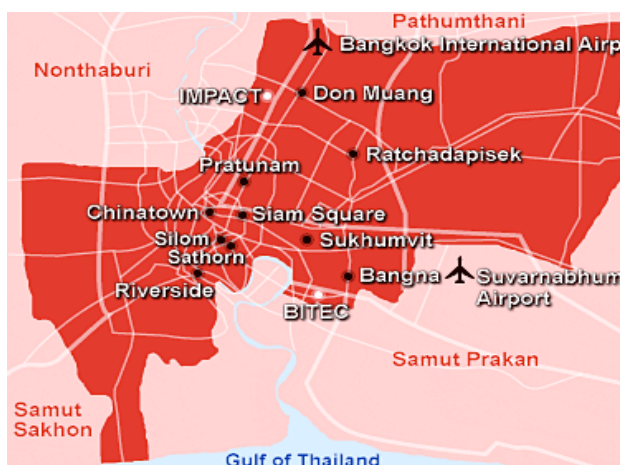


Figure 1: Bangkok metropolitan area and its mass transit master plan until 2019<sup>10</sup>

<sup>10</sup> Annual Report, TEAM Consulting Engineering and Management, 2009.

## The project engagement

An MoU of cooperation was signed by the Bangkok Metropolitan Administration, the Ministry of Transport, the Traffic police division and WBCSD. It allowed the creation of a Steering Committee to conduct the project with three different governmental authorities and members of the business community who have an impact on and interest in mobility in Bangkok.

In 2015, Chulalongkorn University was commissioned to scale up trials of the solutions and develop Sustainable Mobility roadmap, receiving a grant from the Toyota Mobility Foundation.



Figure 3: Signing the MoU

CTF LEADER



Figure 2: The company members of the City Task Force

## The city's choice of priority indicators

Three key concepts influenced the choices:

- Focus on traffic congestion, one of the biggest traffic problems in Bangkok
- Choose indicators which relate to traffic congestion and can reflect improvements.

- Measure the effects of trials using the chosen indicators and estimate scale-up effects.

The City chose six of the 19 WBCSD indicators to focus on these themes and measure the performance of the trial and social experiment to develop a roadmap.

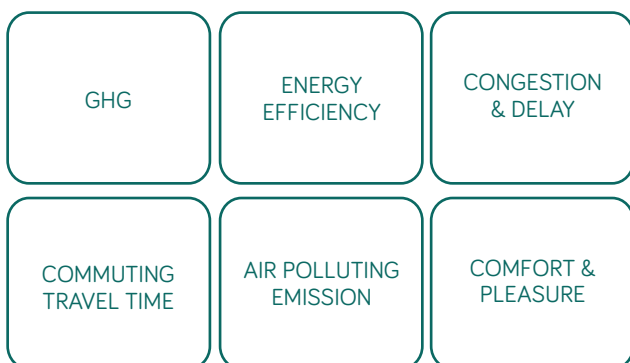


Figure 4: Priority solutions selected by Bangkok



### Select solutions and develop a role model by implementing trials at Sathorn road

Solutions concentrated on Traffic Demand Control and Traffic Flow Management, which need to be implemented simultaneously and which need cooperation between the private sector, government and citizens.

A three-stage trial /social experiment on Sathorn road was used to increase the practicability and sustainability of solutions, using a Plan-Do-Check-Action cycle. These trials also developed a business model to make the solutions financially sustainable.

| TRAFFIC DEMAND CONTROL   | TRAFFIC FLOW MANAGEMENT   |
|--|---|
| <ul style="list-style-type: none"> <li>• Park and Ride</li> <li>• Shuttle buses for school and business</li> <li>• Car Pooling</li> <li>• Traffic information service to encourage citizens to choose optimum mobility</li> <li>• Flexible Working Time</li> </ul> | <ul style="list-style-type: none"> <li>• A traffic simulation model</li> <li>• Dynamic traffic information</li> <li>• Reversible lane management</li> <li>• Right or U-turn filtering lanes</li> <li>• Restrict road side parking / lane change</li> <li>• Optimize traffic signal operation</li> </ul> |

### Park & Ride

The Park & Ride project offers parking facilities at transit stations, including BTS, MRT, ARL and BRT stations, which are generally located in the suburbs of metropolitan areas or the urban fringe.

The project consists of two key parts. The first part involves efforts to expand parking supply for Park & Ride users. This will be done by using a business model in which owners of underused parking lots near transit stations offer parking spaces for Park & Ride use at a discounted rate. Parking owners benefit from revenues generated by the otherwise underused parking spaces. In the case where owners are shopping malls, they also benefit from greater traffic and sales revenues from Park & Ride users. The second part involves efforts to attract commuters who drive to work to use Park & Ride.

### Shuttle Bus

Several schools, totaling 17,000 students, are located along Sathorn Road and the majority of home-school trips are by private vehicles. This project proposes shuttle bus services to and from schools, as well as promoting car-pool/van-pool transport and behavioral change in the travel mode to reduce traffic congestion.

The project also developed a scheme for companies in Sathorn Road to use the shuttle bus service for their businesses when not required for school use. This reduces the cost for parents.

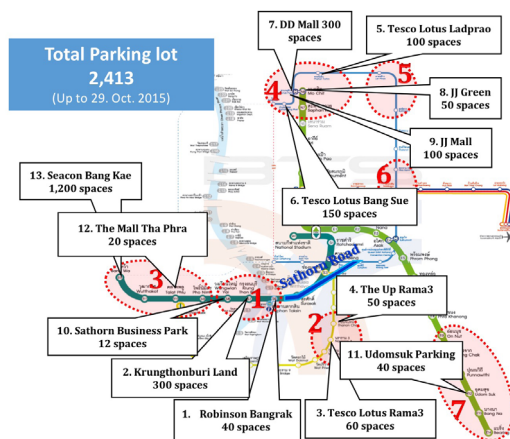


Figure 5: Park & Ride parking

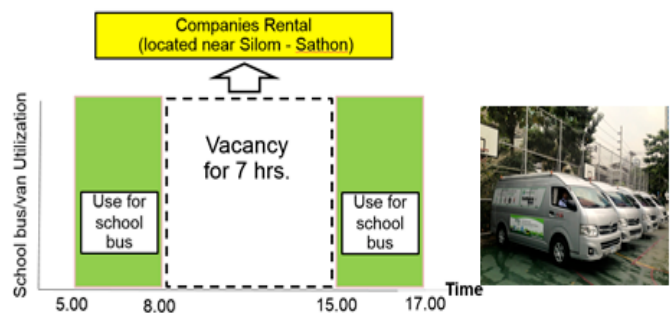


Figure 6: Shuttle Bus share to over the operation cost

## Information System

The main objectives of this scheme is to encourage people to choose optimum mobility and route by providing transport information such as estimated travel time, travel cost, CO<sup>2</sup> emissions and traffic congestion. This scheme will help to improve quality of life in the target area and reduce travel time.

## Flexible Working Time

Flexible Working Time is not common in Thailand. Several companies implemented Flexible

Working Time as a trial, finding that it is beneficial for employees, companies and society.

## Traffic flow management

The first trial stage proved that there are ways to maximize or expand critical road capacity without huge infrastructure investment.

An internet survey and interviews with road users contributed ideas on mitigating bottlenecks. These ideas were evaluated by a traffic simulation model, leading to implementation of some of the ideas.

Supporting tools were provided to police to maximize the efficiency of traffic signal operations by visualizing key operational factors based on traffic data analysis.

## Call for Action and Leadership of the leading 50 companies

The success of the Sathorn Model is due to cooperation by individuals, the private sector, and government.

A brain storming session by representatives of companies in the Sathorn area developed a long list of actions which companies can take. After discussion by senior executives, the CEOs of 50 companies came together to show leadership with a call to action to citizen.

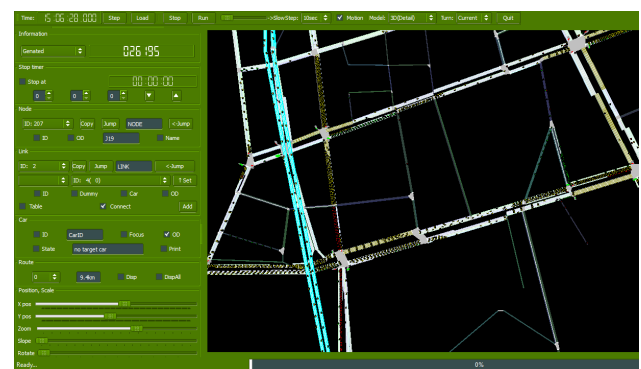
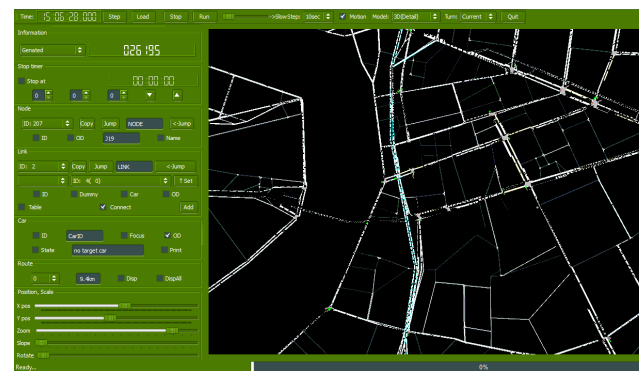


Figure 7: Traffic flow management measures: parking restrictions, synchronizing timing of cars entering a road, traffic simul model, optimize traffic signal cycle

## Barriers and enablers

An MoU of cooperation was signed by the Bangkok Metropolitan Administration, the Ministry of Transport, the Traffic police division and WBCSD. It allowed the creation of a Steering Committee to conduct the project with three different governmental authorities and members of the business community who have an impact on and interest in mobility in Bangkok.

In 2015, Chulalongkorn University was commissioned to scale up trials of the solutions and develop Sustainable Mobility roadmap, receiving a grant from the Toyota Mobility Foundation.

|  |   |   |
|--|---|---|
| People hesitate to change traffic behavior                                     | → | Created Pioneer groups of the scheme using incentives and publicize voices of the pioneer group to the public. Visualize the benefit of choosing optimum mobility by developing a mobile phone application.   |
| Operation cost of the shut-tle bus cannot be fully covered by school bus fares | → | Convince the companies in Sathorn Road to use the shuttle bus service for employees during off-peak hours.  |
| Limited demand for school bus  | → | With systematic research surveys, identify students' travel behavior and formulate relevant strategies to attract more users.   |
| Self-financing for traffic in-formation application                            | → | Promote a Social challenge and reward for Linkflow's users. Add more features gathered from the questionnaire survey e.g. flex time support   |
| Benefits of Traffic demand control not being shared among different groups     | → | Data from Park & Ride are useful inputs for the benefit calculator, such as travel time and costs before and after joining the program. Potential Park & Ride users who are parents can also be encouraged to join the school bus programs and receive additional incentives. |
| Benefits of Traffic Flow Man-agement not being shared among different groups   | → | Gathering voices of citizen and proving effectiveness by a scientific ap-proach to improve traffic management helps to convince the government.   |



## The roadmap

Along the three phases of the trials, the end goal of this project is to continue and sustain this progress. Once the business model is understood, each scheme could lay down the “procedure” that resulted from the experiment and the lessons learned (from the PDCA cycle). This business model and/or standard will make it possible for society to engage with the schemes and move them forward (via another cycle of PDCA).

The end results from this project include: technical knowledge (knowhow), social engagement (local experience) and the Roadmap (model and/or standard for the interested group of people/business/ government agencies to take as a starting point of their own PDCA cycle).

|                  | <b>PHASE 1 : SOCIAL INTEREST (2015)</b>   | <b>PHASE 2 : SOCIAL IMPACT (2016)</b>  | <b>PHASE 3 : SOCIAL MOVEMENT (2017 Onwards)</b>         |
|------------------|---|--|---|
| <b>OBJECTIVE</b> | <ul style="list-style-type: none"> <li>• Maximizing Awareness + Elaborate understanding in Sathorn area</li> <li>• Create Engagement + participation</li> </ul> | Expand No. of user of sathorn model  | Transfer Knowhow and practice to other areas in Bangkok |
| <b>STRATEGY</b>  | Communicate SOCIAL EXPERIMENT scheme in sathorn area  | <ul style="list-style-type: none"> <li>• Continue communicate Sathorn model</li> <li>• Communicate Multi-modal transportation</li> </ul> | Communicate success story of Sathorn model              |
| <b>CONTENT</b>   | Traffic Demand Control  | Traffic flow Management  | SUSTAINABLE Multi-modal Transportation society          |
| <b>TARGET</b>    | Parent and students   | Office workers   | Stakeholder + Government + Public                       |
| <b>MESSAGE</b>   | Happier way to school with School bus   | Happier way to work  | HAPPINESS of road sharing                               |

Figure 8: The three phases of the trials



## LEARNING ABOUT THE PROCESS

### **It is useful to create a governance structure that gives all players an equal voice**

The mobility system of a city is complex and involves many parties. Creating a structure that allows all parties to have their voice is a key success factor. Because the decision process involves not only finding of the right solutions through careful consideration but also the right decisions and proper implementation, having a dual structure with Working Groups and a Steering Committee allows the right mix of views from experts and decision makers. It enables the selection of proper solutions for achievable actions.

### **Trials need citizen involvement before they start**

A session with citizens who will be affected or be the users of the travel schemes before launching a trial generates very useful ideas that can be incorporated in the travel scheme deployment. Citizens suffer the problems every day and will have thought about potential solutions. Involvement also helps people to feel some ownership of the trial, which will encourage them to accept the change and eventually change their behavior.

### **Matching demand and supply is essential**

Many project schemes create ways to encourage people out of their cars to use mass transit. The social experiment showed that the demand for travel must be studied and understood before working on the supply side. In addition, marketing strategies should be

considered not only to attract new users, but also to retain existing users.

### **Collaboration of different parties is necessary**

Changes cannot happen unless “helping hands” come together. Government agencies are a crucial helping hand but the project showed that it is not necessary to wait for Government agencies to initiate policy and/or incentives. In reality, the success of the travel solutions come from all parties involved, not only governments, and they should accept and commit to collaborate with each other. The project took time to explain benefits to potential users, share the action and benefits to companies, and then talk to government agencies. In the end, the collaboration by all helping hands, the private sector and people who participated in the project creates a clear indication for the government agencies that the policy on sustainable travel is doable and the implementation can eventually be realized.

### **Traffic simulation models can help select solutions**

The development of a traffic simulation model for various potential solutions in Bangkok helped to understand the benefits of different traffic management approaches. It also was useful in persuading people to take action as they could see clearly how the traffic flow management scheme affects the road traffic conditions, and performance measures can be displayed.

# Campinas

## The city and its mobility vision

Campinas is a city of 1.1 million inhabitants, approximately 100 Km northwest of Sao Paulo. It is at the center of a much larger metropolitan area including 18 other local authorities, with a total population of more than three million.

Employment in the wider metropolitan area grew significantly from 1990 and GDP per head is the third highest of Brazil's urban areas. One consequence has been a rapid increase in private car ownership as cars have become more affordable, helped by generous government incentives. Car ownership has grown almost three times as fast as population growth in recent years.

This has therefore become a critical issue. Private transport has the lion's share of travel but travel time has increased, especially for the poorest. The city aims to reverse this trend and increase the use of public transport. It has also begun to promote active mobility through measures such as car-free Sunday mornings and the opening of new cycle routes.

## Mobility Vision

Campinas has four mobility goals:

- Reverse the growing dependency on private transport, through improvements to public transport and incentives for non-motorized modes
- Make the transport system more efficient by taking advantage of new technologies and investing in Infrastructure - with priority for public transport
- Increase road safety awareness through road safety campaigns and increased police controls
- Reduce air polluting emissions

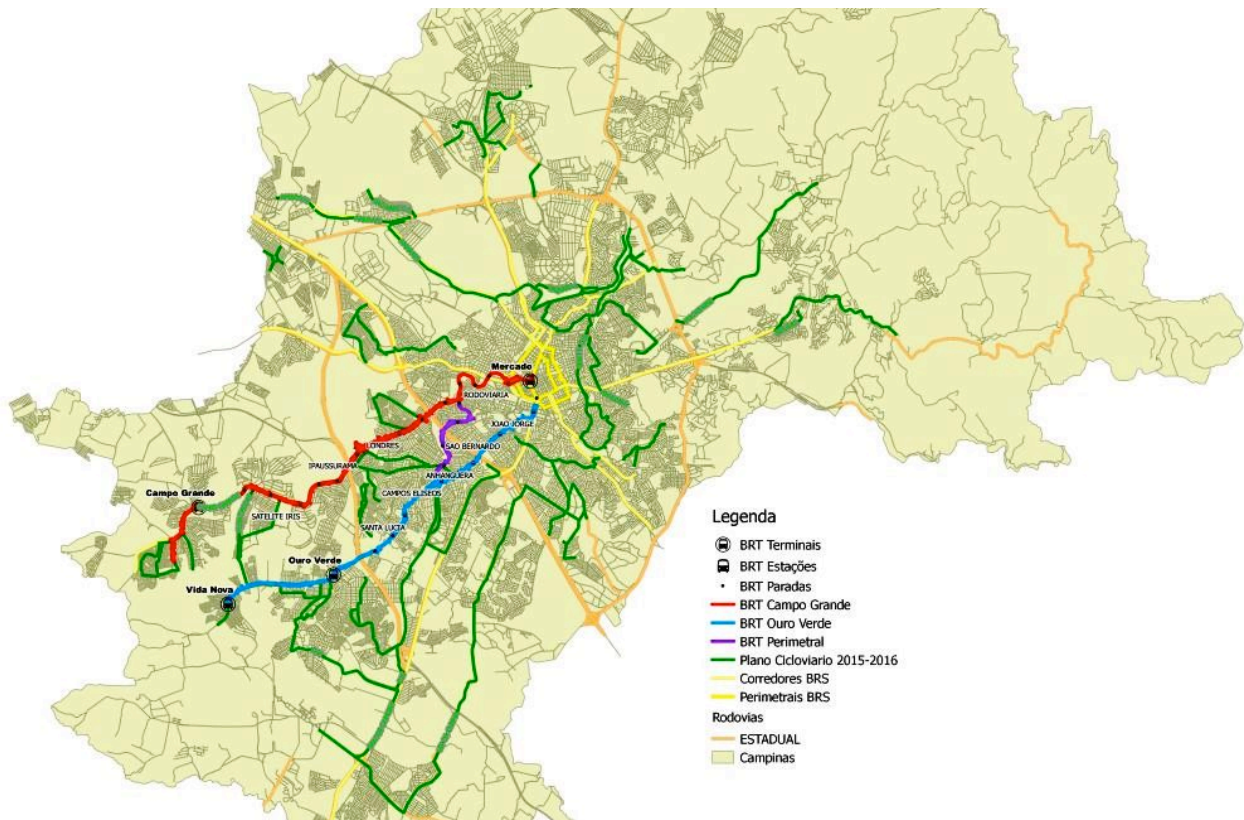


Figure 9: Campinas City Map including BRT corridors and cycle routes

## The project engagement

The engagement built on the city's vision and existing plans, identifying priorities and selecting a solution set to match the city's needs.

The city was interested in developing a broad-based mobility plan to achieve its long-term mobility vision, with the initiative supported by Mayor Jonas Donizette. The main points of contact with the city were the Secretary of Transport and the city mobility company, EMDEC. The urban planning department also provided inputs.

The plan was seen as an important output as it would support access to federal funds to help finance the required investment and would form part of the 2016 Urban Master Plan.

Local knowledge among the company team was important for understanding the complexities of the situation and adapting the SMP2.0 concept to the circumstances in Campinas. Similarly, the cross-sector business expertise helped the city to appreciate that mobility issues cannot be solved when working in a classical silo approach but need integrated multi-modal solutions.

The city representatives valued the global nature of the project and benefitted from interaction with the other cities. They found the citizen survey to be particularly enlightening. It was the first major survey of views on mobility for more than 10 years and over 3000 people responded. The number of responses allowed detailed analysis for each of the major city districts, not only the city as a whole.



The company members of the task force

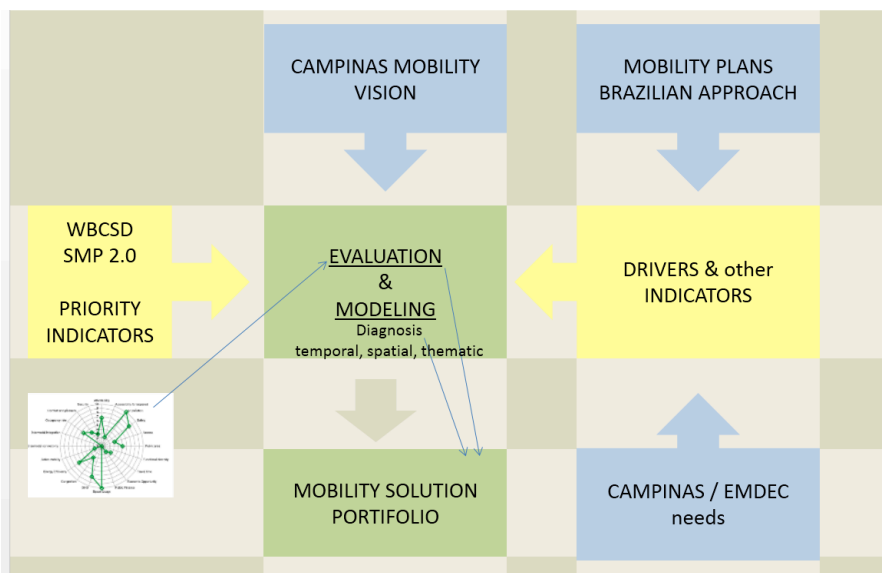


Figure 10: the project engagement building on the city's vision

## The city's choice of priority indicators

Three key concepts influenced the choices:

- Congestion will become a critical issue without significant action
- Bus Rapid Transit (BRT) should be the backbone of the mobility system, supported by active mobility
- Accessibility must be promoted. Three quarters of the bus fleet had already been adapted for wheelchairs and specially equipped minibuses were available on demand, but poor scores in the citizen survey highlighted the need for action on topics such as sidewalk conditions.

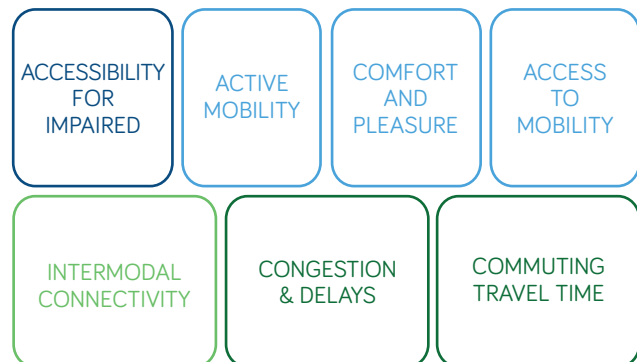


Figure 11: Selected priority indicators and their grouping

## The solution portfolio

### Support the development of the BRT system:

- A Feeder System to use the regular buses to bring passengers into the BRT
- Facilities such as secure parking to enable bike integration with the BRT system

### Improve the attractiveness of the bus system:

- Basic printed information on bus stops (timetables, routes)
- An app to make the timetable available online
- Terminals with additional services (shops, hairdressers, etc.) integrated into the facility
- Improved bus stops to provide a comfortable place to wait with weather protection
- Faster bus service by giving priority for public transport at junctions

### Improve traffic safety:

- A lower speed limit within the municipality
- Traffic calming zones in mixed use areas
- A road safety campaign, combining both education and communication

### Make cycling safe and attractive:

- Dedicated cycle lanes to keep cycles and cars separate
- A public bike-sharing system to allow all citizens to access this mode of travel

### Use cars more effectively:

- Offering others a ride in your vehicle (Car Pooling)
- Availability of cars for very short term hire, typically a trip (Car Sharing)

## Barriers... → and enablers

|   |   |   |
|---|---|---|
| Cost of implementation and maintenance                        | → | Access to federal funds based on urban mobility plan approval |
| Governance discontinuity due to change of local government    | → | Enshrine the mobility plan in law                             |
| Lack of broad understanding or knowledge of the mobility plan | → | Increase awareness through stakeholder engagement.            |



## The roadmap

The roadmap included timescales for each solution

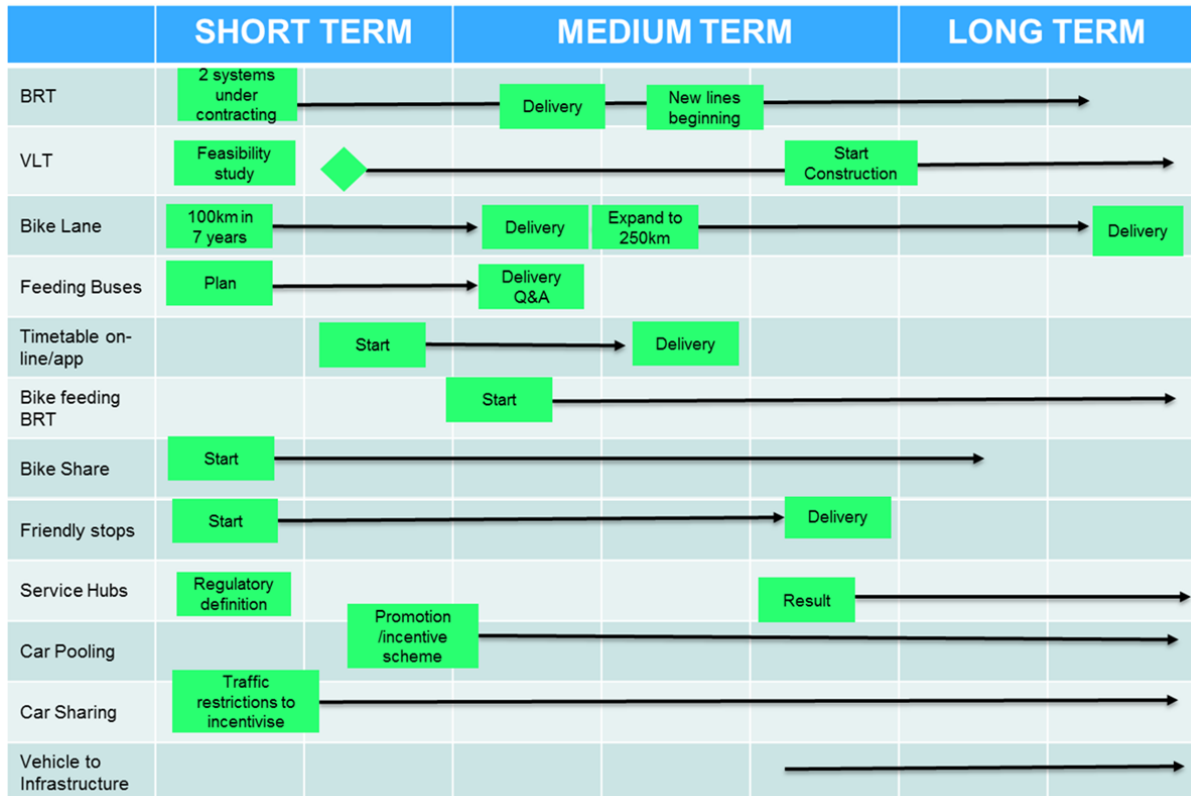


Figure 12: the Campinas roadmap

### LEARNING ABOUT THE PROCESS

#### Data for indicator calculations was not always available in the required form

Most of the required data for the city existed, but it was not always held by the city. The data management process needs to be adapted to fit existing data into the indicator methodologies.

#### The citizen survey was extremely valuable

The survey was supported by the City, which ran an awareness campaign (coupled with a small prize draw for completed surveys) that achieved a good response. Such a high response rate makes it possible to drill down and examine qualitative details in different city districts.

#### Locally-based team members would be helpful

The company members of the City Task Force were not based in Campinas and this slowed communication. The project really moved forward when there was a physical presence in Campinas. A full-time link between the companies and the city is desirable for an effective engagement.

#### Delivery of the roadmap required additional external inputs

The final output needed to be in a format suitable for the Federal Urban Mobility Plans. This required some very specific detail which was beyond the scope of the project and was resourced externally. It is helpful to use such external resources to enable the work to be formally adopted following the engagement.

# Chengdu

## The city and its mobility vision

Chengdu, in the south-west of China, is one of the country's largest urban areas and a major national and international transport hub. The metropolitan area already has more than 14 million inhabitants and is growing at almost one million a year. As a result, car ownership is increasing rapidly and the road network in the city center cannot cope with the traffic. The need to increase the use of public transport is hampered by an incomplete network. The city has invested in BRT and a Metro system but some lines are already at capacity. Further expansion is planned but the transport systems are not currently well integrated, with long transfer distances which provide poor interconnections.

The City's mobility vision is to expand public transport and create a more integrated system. Key elements will be an urban rail network and express tram lines, additional BRT lines and improved coverage for the bus system. A larger, well-integrated public transport system will enable an increase in walking and cycling, which will be encouraged by separate paths and

a bike-sharing system. A Park and Ride network will reduce private car traffic in the inner areas and electric vehicles will make a further contribution to reducing pollution. The sheer size of the city means that managing flows will be complex and a traffic management system is seen as a more scientific approach which will improve planning and daily operations.



Figure 13 Major routes in the Chengdu region



## The project engagement

As the city already had some well-developed plans, the engagement aimed to build on this foundation to accelerate progress towards the vision.

The Planning Bureau led the City team and brought together representatives from several planning departments as well as the traffic police. This range of expertise and responsibilities led to excellent discussions enabling the business representatives to gain a good understanding of the existing situation and the opportunities to introduce solutions to meet the City's priorities.

Stakeholder dialogue helped the Task Force to understand the mobility issues and recognize that the pattern of citizens' movements around the city did not match the structure of the transport network. Stakeholders also gave guidance on potential good locations for solutions.

## The city's choice of priority indicators

Three broad objectives influenced the choice of priority indicators:

- Doubling the public transport mode share to 30% by 2020
- Promoting "slow mobility" through measures such as Green Belt Paths
- Improving the allocation of road resources to meet citizens' needs

Recognizing that road building is not keeping up with private vehicle growth, the City sees that the answer to increasing congestion is to focus on public transport. Fast, attractive networks are needed to encourage a shift by car users and the networks need to be integrated with other modes, especially buses. It is also necessary to reverse the decline in active mobility, which is desirable for citizens' health and will address the capacity constraints faced by public transport as the population continues to expand.



The company members of the task force



Figure 14: Priority indicators and their grouping

## The solution portfolio

### Improve efficiency of the mobility system

- Public transport priority at intersections
- A public transport Control and Guidance System

### Traffic management & information

- Dynamic Traffic Management



### Bike and car sharing schemes

- Bike Sharing
- Car Sharing
- Car Pooling

### Improve public infrastructure

- Dedicated bicycle lanes
- Bicycle paths
- An integrated bicycle plan
- A Park and Ride Scheme
- A public transport and soft-mobility corridor

### Make alternative modes more attractive

- Proximity services at major passenger transport hubs

### Increase capacity of alternative modes

- Bus Rapid Transit
- Trolley Bus
- Rail Bound PT

### Improve connections between modes

- Integrated cycling and public transport
- Real-time displays for bus arrival time at bus stops
- On-board bus travel information
- A smart payment/ticketing system



## The roadmap

The absolute highest priority in the transportation plan was completing the Metro network and this was the basis for the roadmap, which incorporated the priority solutions and the enablers developed with input from the Stakeholder Dialogue. The Roadmap is a learning document which can adapt as the city continues its path towards improved sustainable mobility. It outlines the sustainable mobility plan and can be enhanced with new solutions and action items as appropriate. The solutions cover rail and other public transport, cycling, connectivity and congestion.

## Public transport expansion and connectivity

The roadmap envisages extended Light Rail Vehicle (LRV), metro and tram networks as well as an improved bus system. This will reduce the number of vehicles on the roads, minimize pollution, optimize urban mobility and the mobility mix. The quieter transport modes will also reduce noise levels.

Building the safe and reliable infrastructure for these networks requires substantial investment and is therefore dependent on the city's budget as well as its capacity to build and operate such a strong network.



Figure 15: Current and planned light rail network

Bus travel would be made more attractive with a Bus Rapid Transit system (BRT), Bus Only lanes and public transport priority at intersections. Bus passengers would also benefit from real-time displays for bus arrival time at bus stops.

A BRT network allows the bus traffic to flow smoothly, reducing CO<sub>2</sub> emissions associated with frequent stopping. Implementation depends on road infrastructure having capacity for multiple lanes and requires investment in hardware.

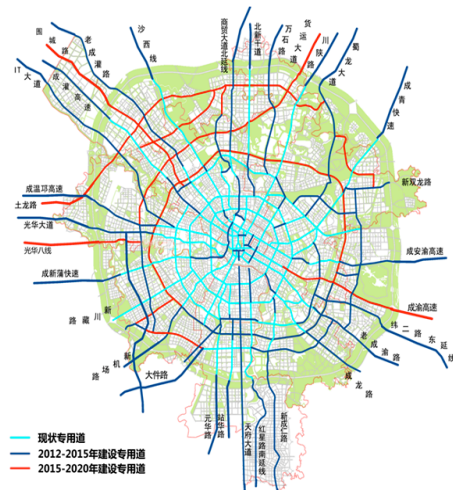
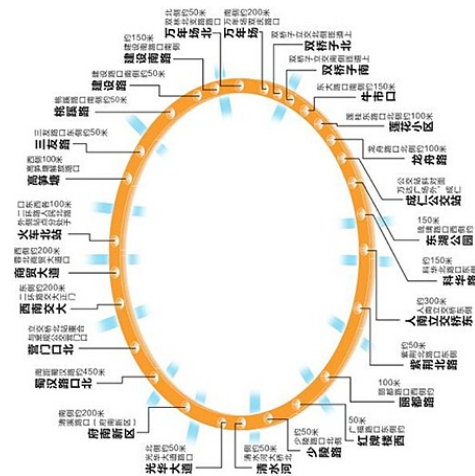


Figure 16: Planned BRT network and dedicated bus lanes

Connectivity aims to further enhance public transport and make it completely accessible for mobility impaired citizens and passengers with pushchairs. Co-ordination of public transport timetables

involves optimizing and coordinating transport schedules, using software and information management tools to understand synergies and allow the different modes to operate in parallel rather than independently. It reduces waiting times for passengers and thus improves convenience.

Proximity services at major passenger transport hubs also make public transport more attractive by providing non-mobility services such as delivery pick-up, laundry, meeting rooms, food- and non-food retail.

Accessibility requires infrastructure development such as raised kerbs at bus-stops, lifts at metro stations, supporting information and assistance.

## Cycling

Integrating cycling with public transport would encourage cycling to and from public transport interchanges. Infrastructure improvements are required, including improved cycle parking, and dedicated cycle lanes.

## Congestion

Several traffic management initiatives will reduce congestion without requiring heavy infrastructure spending:

- Reversible Lane Management allocates lane direction depending on the time of day. The lane direction responds to time and demand, improving road occupancy and traffic flow
- Right or left turn filtering at intersections adds a lane reserved for vehicles turning at the next junction, avoiding following vehicles that are not turning being delayed
- Park and Ride Schemes reduce congestion in the center by providing vehicle parking facilities on the outskirts of the city where mass transit transport links are available to connect users to the center

## LEARNING ABOUT THE PROCESS

### Data for Indicators was not always easily available

Most of the required data for the city existed, but was sometimes difficult to identify. In several cases the data was taken from a wider set, e.g. the figure for fatalities was taken from national data as it was unavailable for the city.

### The engagement would have benefitted from running the citizen survey online earlier in the process

Moving the survey forward and conducting it at the start of the process would have provided valuable input from the beginning. Face-to-face interviews were used as well as online interviews with a statistically selected

panel. The F2F survey gave skewed results whereas the panel appeared to give a more normal distribution of responses.

### Stakeholder discussions

The mapping exercise allowed a wide range of interested parties to have their voice heard. It allowed a deeper understanding of the issues, the appropriate measures to address them, and the best locations for these measures.

# Hamburg

## The city and its mobility vision

Hamburg is one of the largest container ports in Europe and the world's third largest location for civil aircraft construction. It is a city of 1.8 million people in northern Germany at the mouth of the Elbe river. The river Alster also runs through the city and the rivers, together with the port, shape Hamburg's urban structure.

The mobility challenges are the growth of port activity, a rising population, and increasing tourism on the one hand, while addressing the environmental impacts caused by traffic on the other.

The city's vision is to ensure Hamburg's accessibility at the heart of an international trading region. At the same time it aims to improve mobility and quality of life by strengthening the role of public transport and e-mobility, managing and interlinking mobility more efficiently, and re-shaping traffic and living spaces.

## The project engagement

The city's main interest was to get external expertise and third party input to the process of developing a Sustainable Urban Mobility Plan (SUMP).

The main point of contact was with the Head of Transport Development and the city team came from a wide range of departments. They had very different responsibilities and priorities and the engagement helped them to develop a common holistic view. The citizen survey, conducted online with a representative panel, produced interesting insights and was a valuable source for defining priorities.

A key component of the Hamburg-SUMP-process is the Mobility Board, including the most important decision makers and stakeholders in the field of transport policy in Hamburg. Stakeholder involvement in the SMP2.0 engagement came through presentations and discussions with the Mobility Board.



Figure 17: The company members of the task force



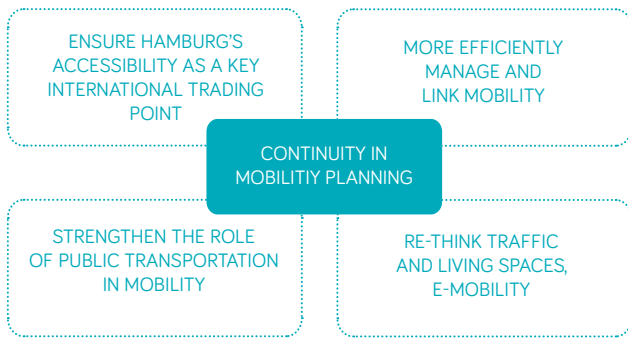


Figure 18: Hamburg's mobility vision



Figure 19: Hamburg's selection of priority indicators

## The city's choice of priority indicators

Selecting priorities was challenging because the different city departments had varying interests. The results of the survey and the indicator calculation helped to reach a common set of priorities. The focus was on reducing air pollution, travel time and congestion, enhancing comfort and pleasure of the mobility system, promoting active mobility and access to mobility for impaired citizens. Intermodal integration is already better in Hamburg than in many cities, but further improvement was prioritized.

The strong linkage between the indicators was recognized during the discussion on the selection of the priorities. For instance the city was keen to promote active mobility and recognizes that to do so it needs to improve the comfort and pleasure attached to cycling provision.

## The solution approach and recommendations

The solutions represent an integrated approach based on three fields of action:

### 1. Implementation of clear political and strategic direction:

- Quantifiable goals
- A defined basis and timeline
- Identified fields of action
- Appropriate and concrete measures
- Measurement of progress

## 2. Optimization of the transport/mobility system

### Use infrastructure more efficiently

- Comprehensive dynamic traffic management systems using real time traffic information
- Preparation for vehicle to infrastructure communication technologies
- Separation of freight traffic from peak passenger transport, e.g. through enabling off-peak deliveries

### Connect transport modes more closely

- Information and communication technologies (ICTs) such as multimodal real time information apps and smart payment/ticketing
- Easy and comfortable transfer options, e.g. through sufficient P&R infrastructure, integration of car pooling and public transport, integration/coordination of timetables
- Intermodal travel information centers

### Promote mobility management schemes

- Support for companies to handle employee commuting and business-related mobility demand, e.g. through company mobility managers
- A dedicated social mobility platform to support impaired citizens



### 3. Prioritization of sustainable transport means and services

#### Make sustainable mobility more attractive for users

- An integrated bicycle plan that promotes a bicycle culture and focuses on quality and width of bike lanes, cycling safety, enlargement and connectivity of the network (e.g. Velorouten)
- Parking policies favoring vehicles with alternative drive trains, car sharing and ride sharing vehicles, e.g. in zones with high parking pressure and at intermodal nodes
- Publicly funded projects to promote vehicles with alternative drive trains
- Improve image, capacity and speed of city busses, e.g. through consequent bus prioritization, separate bus lanes, infrastructure adaptations, testing a full BRT-system

#### Support the creation of urban logistic spaces

- Cooperation with retail and logistic companies to find appropriate lots and to operate them effectively, e.g. through bundling deliveries and prioritizing environmentally friendly vehicles



#### LEARNING ABOUT THE PROCESS

##### Finding data for the indicators was complex

Most of the required data existed, but was not always held by the city. It was possible to find alternative sources that were accurate enough not to have a significant impact on the indicator calculation. It is advisable to balance the effort needed to collect the data with the impact that each element has on the final calculation.

##### It would have been helpful to carry out the citizen survey early

Moving the survey forward and conducting it at the start of the process would have provided valuable input from the beginning. Using a structured panel was effective and allowed for quick collection of the survey responses.

##### Choosing priority indicators helped to surface different priorities

Calculation of indicators is a useful tool to trigger the discussion with the city representatives on their challenges and priorities and to foster cooperation with the city (or

cities). The exercise highlighted the different departments' views on the mobility system. Having to agree common priorities enabled the departments to better understand how they supported the overall mobility objectives of the city. Preliminary city priorities could be confirmed by the results of indicator calculations.

##### Involvement of different city departments was productive

The continued involvement of different city departments had a positive impact on the breadth of the discussions and was positive for the debates on the proposed solutions.

##### High-level stakeholder consultation was useful

The Mobilitätsbeirat (Mobility Board) of Hamburg provides a good mechanism to get feedback on the proposals from an established wider group of relevant parties.

# Indore

## The city and its mobility vision

Indore is classed as a 'Tier-2' city (based on size) and is seen as the financial capital of the state of Madhya Pradesh. It has a population of 2.5 million and is one of the 10 fastest growing cities in India. The urban area is growing rapidly and the number of universities is attracting high tech industries who are constructing new campuses. As a consequence there is growing vehicle ownership, increasing traffic congestion and pollution and a relatively high number of road accident fatalities.

The Mobility Vision is for integrated, multi modal public transport which is:

- Fast
- Comfortable
- Safe
- Reliable
- Affordable
- Environmentally friendly

CTF LEADER



BMW GROUP



Brisa

FUJITSU

VOLKSWAGEN  
AGTIVITÄTSGESellschaft

Figure 20: The company members of the task force

## The project engagement

The City was seeking inputs for an update of the mobility plan and saw the engagement with SMP2.0 as a good way to explore and develop new ideas. The engagement was structured with a Steering Committee representing the different departments that can influence mobility demand, including state representatives. The Steering Committee also included the city transport company, the police department responsible for traffic and academics from the local universities.

A key element in the engagement was a trial carried out on Jawahar Marg, a badly congested street that is also a major thoroughfare. The trial released valuable road space to improve traffic flow, promoting local off-street parking as an alternative to parking on the street. It highlighted the need for constant enforcement of both parking and on-street trading laws to maintain the benefits.





Figure 21: Traffic conditions before and after the trial

### The city's choice of priority indicators

Priorities were driven by an awareness that congestion and travel time would get even worse as the city grows, and that road safety was poor due to a lack of respect for the rules compounded by a weak driving test. The City wants the urban area to be enjoyable for all, with a desire to improve public areas and make public transport more accessible, especially for the elderly and those in wheelchairs. The City understood that multimodal integration is key, including the need to integrate the iBus, the Bus Rapid Transit system.

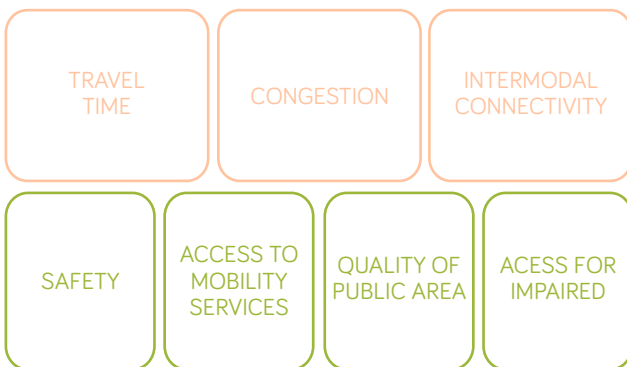


Figure 22: priority indicators selected in Indore

### Solution portfolio

Inspired by the WBCSD SMP2.0 Process, the City has already begun implementing a few measures:

#### 1. Safety:

- a. GPS in public transport: including all City buses, some autos and magi vans
- b. Pink auto: with female drivers

- c. CCTV cameras in all buses including intercity buses
- d. CCTV camera near 56 Dukan, Sarafa, Lasudia and at other major intersections
- e. BRTS bollards to avoid other vehicles entering the BRTS lane and for public safety

#### 2. Travel Time:

- a. Synchronization of signals
- b. Traffic wardens deployed at junctions
- c. BRTS operation extended up to Raw

#### 3. Congestion:

- a. Enforcement by the Traffic department with announcement on moving vehicles
- b. Continuous assessment of alternative routes/roads and of the development plan
- c. Instruction to education institutes to operate during non-peak hours

#### 4. Intermodal connectivity:

- a. Tele Rickshaw in operation
- b. iRide in operation (Rental Two wheeler)
- c. iBike is in the preliminary stage

#### 5. Quality of public Areas:

- a. Indore Municipal Corporation (IMC) is working on housekeeping
- b. Development of riverside corridor by IMC
- c. Development of various areas with input from the public
- d. Free Wi-Fi facilities to all iBus travelers

- e. Vending Machines and ATMs installed in public areas

**6. Access for impaired:**

- a. Ramp on BRTS (iBus) stations
- b. Concessional city bus passes

**7. Access to mobility services:**

- a. New routes identified to reach mass public
- b. Feeder routes started, such as Bichouli/Rau/Silicon City

**8. Rationalization of city bus routes and standardization of bus terminals**

The Roadmap for Sustainable Mobility in Indore comprehensively considers the priority solutions, the lessons learned from the trials, and the enablers developed via the Stakeholder Dialogue and core team meetings.

Increase bicycle mobility

- Bike sharing
- Dedicated bike lanes
- Integrated cycling in the public transport system

Support pedestrian mobility

- Pedestrian mobility strategy
- Visual displays at pedestrian crossings

Reduce congestion

- Park and Ride schemes
- Right turn filtering lanes

Improve public transport

- Passenger friendly bus stops
- Multimodal travel information
- On-board bus travel information
- Multimodal real time information apps
- 100% accessibility of public transport for physically impaired citizens

Introduce automatic payments

- Parking fee enforcement strategy
- Smart ticketing systems
- Smart parking

In summary, the roadmap activity is shown in Figure 3:

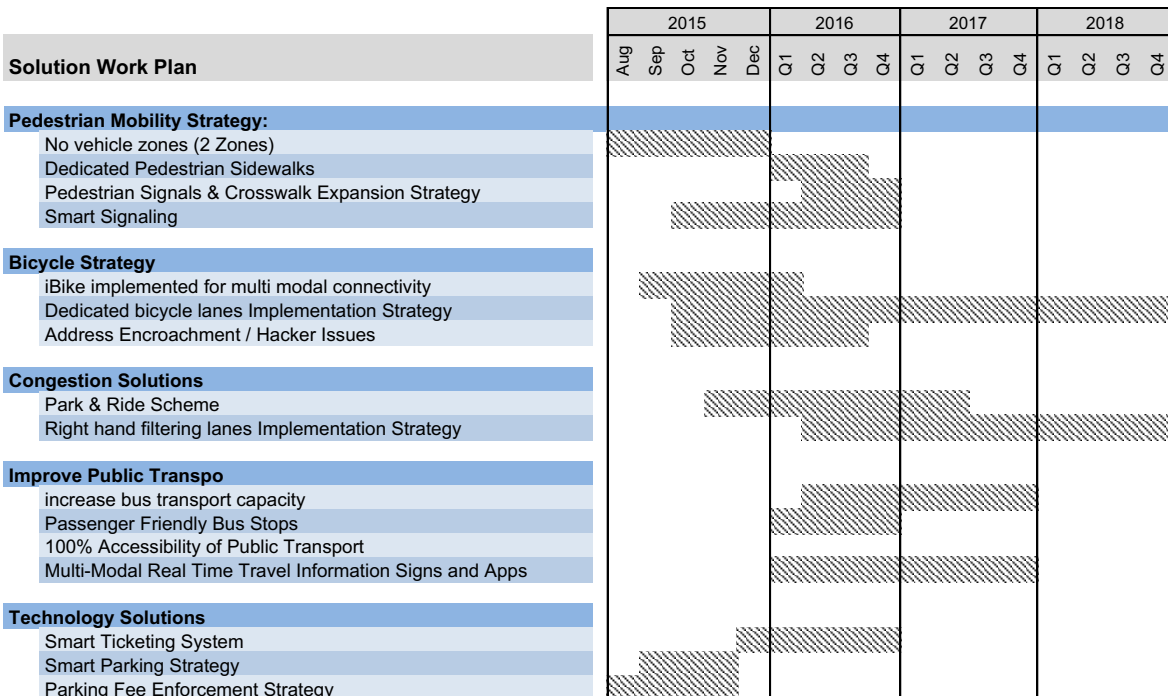


Figure 23: The summary roadmap

## Barriers... → and enablers

|   |   |  |
|---|---|--|
| Lack of respect and discipline for pedestrian sidewalks and dedicated bicycle lanes             | → | <ul style="list-style-type: none"> <li>• Clear definition of clear zone for sidewalks</li> <li>• Well-defined priority between different modes, with a strong policy in favor of pedestrians.</li> </ul> |
| Encroachment of traffic on footpaths  | → | Sufficient height of sidewalk to stop 2/4wheeler incursion   |
| Unavailability of parking in designated zones and an overall lack of parking spaces and signage | → | Park and Ride scheme   |
| Enforcement of parking rules and issuance of parking fines                                      | → | <ul style="list-style-type: none"> <li>• Awareness campaign and reward schemes</li> <li>• E-challans electronic payment system</li> </ul>  |

### LEARNING ABOUT THE PROCESS

#### Cross-sector collaboration supported a holistic approach

The project benefitted by bringing together businesses from several sectors to work with the city to develop a holistic approach to urban mobility, rather than individual businesses bidding on tenders for isolated solutions

#### Agreeing priorities was a strong foundation

The project methodology began with the mobility issues prioritized by the city and worked towards integrated solutions, rather than bringing isolated solutions to the city to address perceived issues

#### Dialogue was invaluable

The Stakeholder Dialogues conducted as part of the project were instrumental in forming the roadmap and enthusiasm for implementing the solutions.

#### Existing data was a major resource

Indore had a wealth of city mobility data based on previous work. This data was necessary to complete the calculations in the indicator analysis.



# Lisbon

## The city and its mobility vision

Lisbon is one of Europe's oldest capital cities and is also at the core of a metropolitan area with a population of 2.8 million. The city has been the main catalyst for the development of the wider metro area, and for that reason its current mobility model is challenged by heavy daily commuting into the city centre, that nearly doubles its population every day, from 560,000 residents to about one million users.

The city and its metropolitan area are serviced by a complete transportation system, which includes two high-capacity bridges and water-based transportation to cross the river Tagus, a varied set of Public Transportation modes (bus, tram, underground lines), and a strong suburban mass transit system based on road and rail.

In spite of this, cars are central to the system, representing 54% of daily commuting trips within the Lisbon Metropolitan Area. This means that 360,000 cars travel across the city boundary each day, creating a serious challenge for mobility in the city, for its quality

of life and its attractiveness as a tourist destination and an investment destination as well.

The city has a vision for a new economic and social development model that requires reinventing its mobility system. It aims to guarantee that anyone can use at least two transport modes, from any place to any other place, with freedom, safety, comfort, speed and in a sustainable and energy efficient way.

Lisbon's new master plan, approved in 2012, has the ambition to promote transformational change, to attract new investment, new jobs, and new population, by giving the city back to people, adopting a new sustainable mobility plan and implementing a low carbon development model.



Figure 24: Lisbon's new master plan, approved in 2012, has set ambitious goals



## The project engagement

Lisbon was the second city to agree to collaborate as a demonstrator-city for SMP2.0. The Mayor was enthusiastic about participating in the project and provided valuable support, which was continued even when a new Mayor came into office in March 2015.

Under the direct control of the Mayor, the city had recently reinforced its focus on Mobility issues and was finishing a new strategy for mobility. It was a critical moment of interest to get input to the development of a mobility plan.

The main point of contact was the Municipal Head of Mobility and the city team came from a wide range of departments and municipal agencies, with a wide range of responsibilities and priorities. The engagement helped them to go deeper into ongoing projects and develop a common holistic view. The citizen survey, which was highly discussed and adapted by the City team, was conducted online with a representative panel, and produced interesting insights to inform the choice of priorities. According to the City team it contributed to confirming but also adjusting the understanding of Lisbon’s mobility challenges and opportunities.

## The city’s choice of priority indicators

Priorities were chosen to support the five objectives of the Lisbon strategy – that the provision of mobility for citizens should be Affordable, Sustainable, Inclusive, Prosperous and Attractive

Although the city departments had a varied range of interests the choice was clear, showing that there was a clear vision about where to focus in the collaborative relationship with SMP 2.0 team. The results of the indicator calculation and the survey helped to consolidate the understanding of priorities. The focus was on reducing air pollution (as a tangible proxy for GHG emissions) and commuting travel time, preventing fatalities, enhancing comfort and pleasure of the mobility system, promoting active mobility and intermodal connectivity and integration.

The strong linkage between the indicators was recognized during the discussion on the selection of the priorities. For instance, the city was keen to promote active mobility and recognizes that to do so it needs to improve the comfort and pleasure attached to cycling provision.

CITY LEADER



Figure 25: The company members of the task force

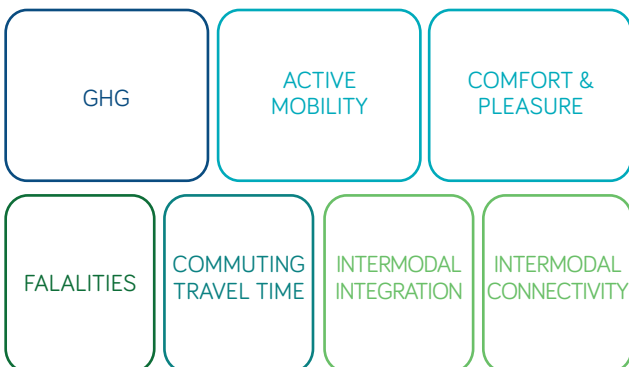


Figure 26: priority solutions selected by Lisbon

## The solution portfolio

Lisbon's purpose in considering the solution portfolio was to identify innovative solutions or solutions that were not yet in the City team's plans.

The City team finally selected 13 solutions, grouped in six fields of action, that will be part of a specific innovative mobility roadmap for Lisbon:

### Asset sharing to encourage less reliance on the mono-modal private car trips

- Car-sharing schemes
- A Bike Sharing scheme

### Facilitating active mobility

- An integrated bicycle plan
- Cycling Integrated with public transport to allow interchange and safe parking of bicycles

### Improving the ability to switch modes

- A multi-modal traffic information center
- A Park & Ride network
- A transport association with responsibility for public transport integration
- Multimodal real-time information apps

### Improving the speed of the public transport system

- A Bus Rapid Transit (BRT) network
- Public transport priority at intersections to reduce delays

### Reducing the impact of urban freight on the traffic flow

- An Urban Logistics Space from which local deliveries are made by small vehicles
- Automated locker boxes to allow deliveries when people are not at home

### Getting business to play its part

- Company Mobility Managers to promote sustainable mobility within their company





## LEARNING ABOUT THE PROCESS

### Finding data for the indicator calculations engaged city departments

Most of the required data for the city existed, but was not always easy to find. Though this made populating the indicators difficult, it also made different departments more aware of the impact that they have on mobility within the city.

### Running the citizen survey early would have been helpful

Moving the survey forward and conducting it at the start of the process would have provided valuable input from the beginning.

### The process led naturally to the choice of priority indicators

With a well-structured vision and strategy, choosing priority indicators that matched and supported the objectives set out for the city proved to be a logical process

### Stakeholder discussions highlighted the need for greater dialogue

Initial discussions with an invited set of stakeholders primarily involved with mobility provision in the city were valuable. They highlighted the need for a forum to create a more regular dialogue between the different parties so that developments can support overall objectives.



# Appendix 2 – City cluster analysis

The cluster analysis enables cities around the world to identify others having similar mobility patterns and challenges. As a result, it is easier for a city to find examples of similar cities having resolved the common challenges. SMP2.0 used cluster analysis as a basis for scaling up sustainable urban mobility. Having worked with six different cities, the project has created a base to support identification of similar cities and take-inspiration from their sustainable mobility solutions. A city can consider the solutions among the six roadmaps which best answer their challenges and are most appropriate to their local context.

To enable identification with the showcase cities it was necessary to clarify the positioning of the mobility system of the showcase cities in the cluster classification by the Institut for Mobility Research (ifmo).

## Background on the methodology and clusters

The objective of IFMO's initial research was to improve the understanding of mobility patterns and cultures in megacities to identify challenges for future urban mobility. The approach identifies similarities and differences between megacities and creates groups, described as clusters, with relatively similar properties.

The cluster analysis is based on 59 descriptors in five groups:

- general city characteristics (e.g. urban density, job density, GDP per capita)
- transport supply indicators (e.g. length of networks, car ownership)
- mobility indicators (e.g. number of trips, trip distances, mode shares)
- investment in private and public transport (by mode)
- various transport impact indicators (e.g. energy use, emissions, fatalities)

The analysis demonstrated that a smaller number of indicators (as few as 13) was sufficient to represent the underlying significance of the 59 used by ifmo.

Ifmo analyzed 41 cities and the clustering exercise resulted in the definition of 6 clusters. A representation of the 6 clusters as a function of GDP and population density is shown fig nn. Figure nn shows the position

of cluster center relative to the extremes on the leftmost (minimum) and rightmost (maximum) position for 22 variables.

Table nn shows how the sustainability issues relate to each of six city clusters based on the degree to which they have direct, immediate, and substantial impact on the wellbeing of the population. This means that the issues at the top of the table would usually have high priority for cities with a low level of economic development. The issues further down move into focus as cities mature. The city clusters increase in economic and sustainability maturity from left to right.

The sustainability issues most relevant for each cluster are therefore along the grey shaded pathway.

This analysis is a starting point to identify and categorize sustainability issues linked to urban mobility in widely differing cities around the globe. Cities in the same cluster can be quite different, especially in terms of their physical geography (the extent of rivers, proximity to the sea etc). Nevertheless, they are in the same cluster based on their similarities on the 59 variables mentioned above.

| PILLARS AND PROBLEMS FOR SUSTAINABILITY BY CATEGORY: | NON-MOTORIZED CITIES   | PARA-TRANSIT CITIES | TRAFFIC SATURATED CITIES | AUTO CITIES | HYBRID CITIES | TRANSIT CITIES |
|--|--|---------------------|--------------------------|-------------|---------------|----------------|
| <b>External benefits</b>                             | How well do the urban mobility systems perform in delivering the following benefits to citizens and businesses? (● = not very well ... ●●● = very well)            |                     |                          |             |               |                |
| Access to economic opportunities                     | ●  | ●                   | ●●                       | ●●●         | ●●●           | ●●●            |
| Basis for economic growth                            | ●●   | ●                   | ●●                       | ●●●         | ●●●           | ●●●            |
| Provision of accessibility                           | ●●   | ●                   | ●●                       | ●●          | ●●●           | ●●●            |
| Affordability of mobility                            | ●●   | ●                   | ●                        | ●●●         | ●●●           | ●●●            |
| Social and cultural integration                      | ●●   | ●                   | ●                        | ●           | ●●            | ●●             |
| <b>Negative externalities</b>                        | How prevalent are the following negative externalities that are generated by the urban mobility system? (● = not very prevalent ... ●●● = very prevalent)          |                     |                          |             |               |                |
| Health hazards                                       | ●●●  | ●●●                 | ●●●                      | ●●          | ●             | ●              |
| Transport deaths and injuries                        | ●●●  | ●●●                 | ●●●                      | ●●          | ●●            | ●●             |
| Air pollution  | ●●   | ●●●                 | ●●●                      | ●●●         | ●●            | ●              |
| Environmental impact of accidents                    | ●●●  | ●●●                 | ●●●                      | ●●          | ●             | ●              |
| Excessive need for transportation                    | ●  | ●●●                 | ●●                       | ●●●         | ●●            | ●              |
| Noise pollution                                      | ●●   | ●●                  | ●●●                      | ●●●         | ●●            | ●●             |
| Congestion and delay                                 | ●●   | ●●                  | ●●●                      | ●●          | ●●            | ●●             |
| GHG emissions  | ●  | ●●                  | ●●                       | ●●●         | ●●●           | ●●             |
| <b>Internal qualities</b>                            | How well do the urban mobility systems perform in delivering the following qualities to travelers and logistics providers? (● = not very well ... ●●● = very well) |                     |                          |             |               |                |
| Interaction with urban environment                   | ●●●  | ●                   | ●●                       | ●           | ●●●           | ●●●            |
| Comfort of travel                                    | ●  | ●                   | ●                        | ●●●         | ●●●           | ●●             |
| Joy of travel  | ●  | ●                   | ●                        | ●●          | ●●●           | ●●             |
| Opportunity for active transportation                | ●●●  | ●                   | ●                        | ●           | ●●●           | ●●             |
| Reliability of supply chains                         | ●  | ●                   | ●                        | ●●          | ●●            | ●●             |
| Flexibility and reliability                          | ●  | ●                   | ●                        | ●●          | ●●●           | ●●●            |
| <b>Internal weaknesses</b>                           | To which degree is the functionality of the transport system endangered by the following weaknesses? (● = not very much ... ●●● = to a very high degree)           |                     |                          |             |               |                |
| Security hazards                                     | ●●   | ●●●                 | ●●                       | ●           | ●             | ●              |
| Vulnerability to disaster                            | ●  | ●                   | ●●●                      | ●●          | ●●            | ●●             |
| Excessive use of resources                           | ●  | ●●                  | ●●                       | ●●●         | ●●            | ●              |
| Vulnerability to energy scarcity                     | ●  | ●●                  | ●●                       | ●●●         | ●●            | ●              |
| Inefficiency of investment                           | ●  | ●                   | ●●                       | ●●          | ●●●           | ●●             |

Table 1: Characteristics of city clusters

## The SMP2.0 approach to assigning cities to the clusters

SMP2.0 considered the 13 indicators and nine additional variables as strong predictors of cluster association and the showcase cities collected data for these indicators.

Two types of variable were selected:

- Indispensable variables:

Based on the experience of the original cluster analysis, these variables were deemed to be particularly strong predictors of cluster association. In addition, they are likely to be available without exception from official statistics for cities around the world, often comparable across cities. They form a fundamental basis for the cluster assignment.

- Highly desirable variables:

These variables were deemed to deliver additional important information about city cluster association. Their availability differs for cities around the world and the methodologies vary substantially across cities (e.g. from traffic counts, household surveys etc.). If these variables were available they were taken account of in the cluster assignment, but they were not necessarily

all available for all cities. Hence, these variables were used to validate cluster association for those cities for which they were available.

### Collecting the data was problematic in some cities.

Data for most variables was collected for five of the six showcase cities but there were some significant difficulties. For example Thai vehicle registration is accumulated, with delays in removing old vehicles from the register. This suggests an excessive rate of car ownership (750 cars per 1.000 population). In Chengdu difficulties arose due to the different geographic areas considered for the different types of variables (nine urban districts in the City of Chengdu but sometimes also four satellite cities and in some cases six surrounding counties). For this reason, the cluster associations and the city mobility system profiles of three of the showcase cities were completed using the expertise of the City Task Force, considering how well the descriptions fit compared to conditions in the cities.

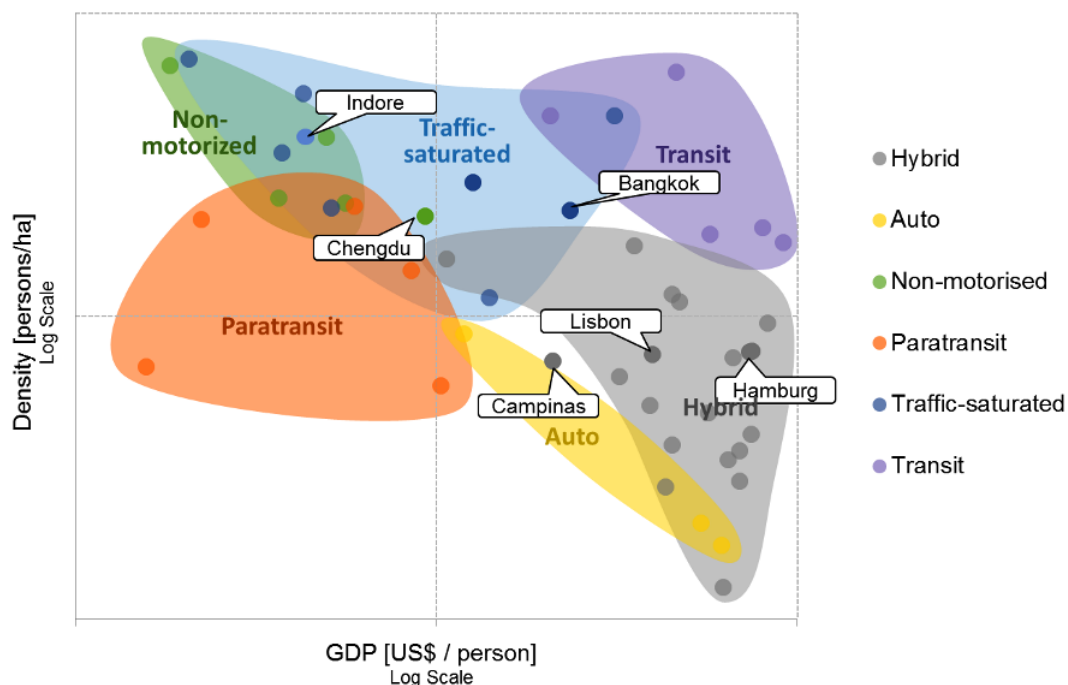


Figure 1: City clusters and showcase cities plotted against GDP per capita and urban density

## Result of the clustering exercise for the six showcase cities

Figure 15 illustrates the six clusters plotted against two major determinants of the urban mobility system – population density and GDP/capita – and the position of the showcase cities in the clusters.

Cities that are starting to see a movement towards higher incomes and lower densities as the city develops generally see more demand for living space as birth rates fall, life expectancy increases and incomes rise. As GDP per capita rises, a city will move from left to right, so the typical mobility development is a broad curve from top left to middle right.

The showcase cities are generally positioned along such a corridor, but there are important variations which make a huge difference, e.g. the Asian cities exhibit much higher densities than the European cities or Campinas in Brazil.

The overlap between clusters shows that factors other than these two dimensions are also important in deciding which cluster a city falls in. None of the showcase cities appears to be heading towards being a typical auto city.

**Bangkok** in 2011 was marginally closer to the Transit cluster than Saturated which was its 1995 position and the movement appeared to be due to uncertainties with some data points. The motorcycle ownership rate and the extent of motorized transit kilometers aligns with the Saturated cluster, while the low GDP is at odds with the typical Transit city.

**Campinas** came closest to the Hybrid cluster than any other although the analysis was not conclusive. The high motorcycle ownership and high transit mode share were more typical of the Saturated and Transit cities respectively. The occupancy rates were also similar to those two clusters, while other indicators,

including the use of non-motorized modes, have some characteristics of the Traffic Saturated cluster.

**Chengdu** had a similar profile to Campinas. It was closest to being a Transit city but also quite close to the Saturated and Hybrid clusters. The low population density, low GDP figure, high road supply, low transit supply and public transport boardings are all unlike the typical Transit city. Indicators of vehicle ownership and mode share were closest to the Traffic Saturated model. However the city is developing very quickly and this is resulting in rapid changes in the data at a much faster rate than in other cities

**Hamburg** clearly clustered as a Hybrid city, with variables such as population density and vehicle ownership close to the average for the cluster. The good supply and use of transit, the lower than average supply of roads and use of passenger cars are closer to the Transit cities, but Hamburg's population density is too low for that cluster.

**Indore** is most like the Traffic Saturated cluster but has a number of similarities to both Paratransit and Non-motorized. The development of auto-rickshaws and other para-transit solutions to respond to the low car ownership creates similarities to the other clusters.

**Lisbon** also fits the Hybrid model, with typical population density, road supply, car and motorcycle ownership. Transit supply and the use of transit are above average, making the Transit cluster the next most closely associated.

Table 11 shows the variables for each showcase city relative to the cluster average.

The table shows the position of each city relative to the extremes on the leftmost (minimum) and rightmost (maximum) position for the 22 variables.

For example “Reserved transit routes per capita” shows that Hamburg has by far the most of the six cities.

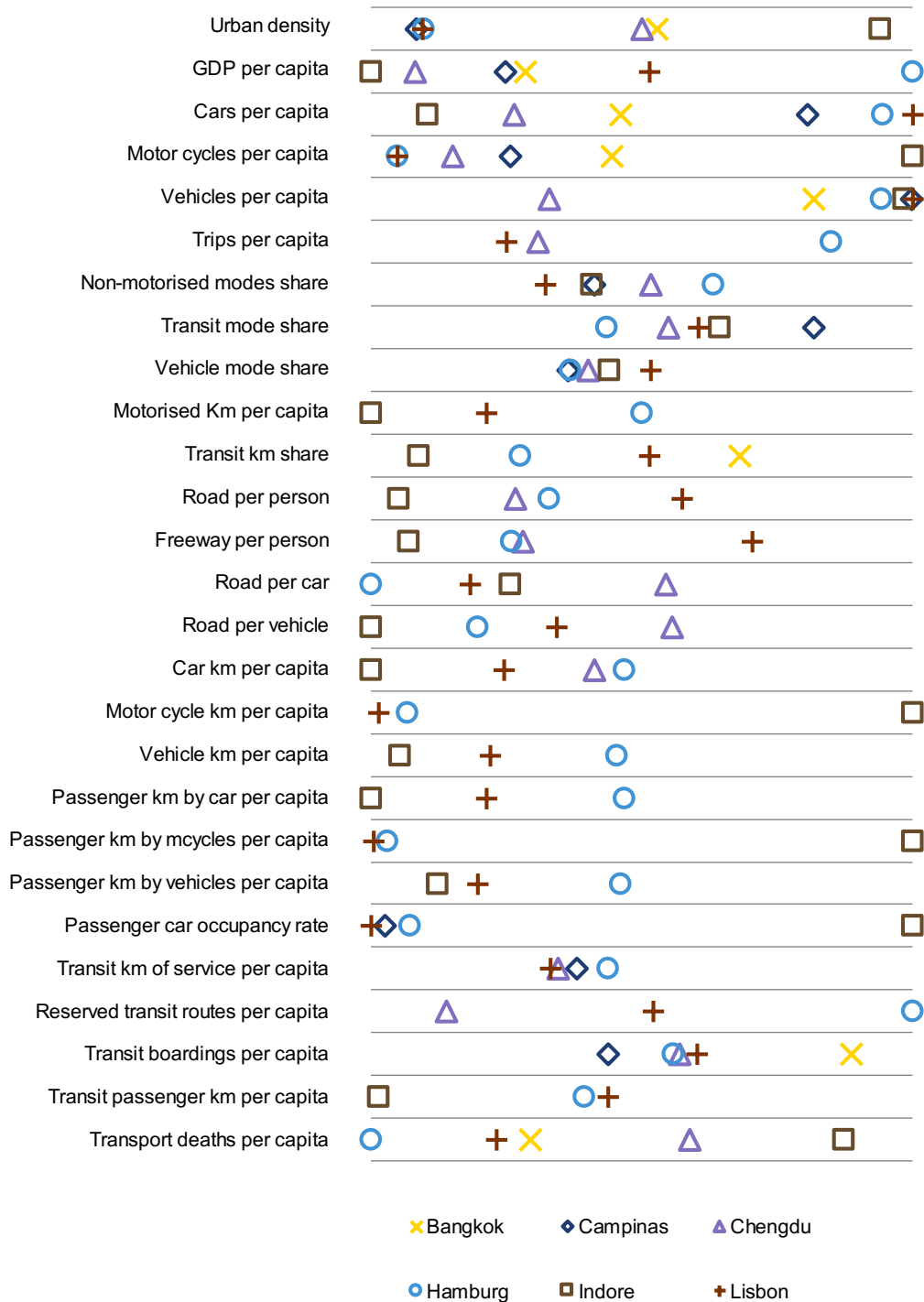


Table 2: Position of showcase cities relative to each other for 27 standardized variables (leftmost position = minimum value; rightmost position = maximum value)

# Statement from the assurance panel

At the outset of the project, an Assurance Panel was established to advise the WBCSD Secretariat on the quality and integrity of both the substance and process of the Mobility Project. The membership of the Group was: Masao Kuwahara, Pieter Venter, José Viegas, Simon Upton, and Susan Zielinski.

The group has contributed advice on the process, scope, and conclusions of the work to assist the WBCSD Secretariat in its monitoring of the project.

We believe that the project has been well served by Mr. Michael Fahy and Ms. Sophie Roizard whose task it has been to stay abreast of a vast and rapidly expanding literature as well as to work closely with, and support, the participating companies.

Such a diverse and broadly represented project will always pose challenges of consensus not only on the “whys and the whats”, but especially on the “hows”. Bearing in mind the inevitable constraints of a project of this size and complexity, we believe the companies have provided a useful contribution to the evolving understanding of the rapidly shifting environmental, social, and economic contexts, dynamics, effects, and opportunities related to the mobility sector and to identifying and applying practical, innovative, systems solutions and related business, policy, and narrative models.

The group has enjoyed free and frank exchanges with the project team throughout the life of the study with a view to making the participating companies aware of any limitations or shortcomings

they perceived in the approaches they have chosen. It is not, however, the role of the Assurance Group to endorse the final report of the project or its conclusions. The report represents the views of the member companies.

That said, we believe the report identifies many of the key issues and opportunities that communities and regions concerned with and excited about the future of mobility must both confront and embrace. If the very significant investment that the report represents is to be turned to advantage, the challenges and opportunities raised by it will need to be taken up with a sense of urgency and enthusiasm by participating companies, by related sectors, by civil society, by governments, and by the broader public.

|                 |  |
|-----------------|--|
| Masao Kuwahara  | Professor, Information Science and Technology, Tohoku University |
| Simon Upton     | Director, Environment Directorate, OECD                          |
| Pieter Venter   | CEO, Global Road Safety Program                                  |
| José Viegas     | Secretary-General, International Transport Forum                 |
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