Federal Ministry
for Economic Cooperation
and Development

Urban Mobility Plans

National Approaches and Local Practice

Moving Towards Strategic, Sustainable and Inclusive Urban Transport Planning

Sustainable Urban Transport Technical Document #13

Published by giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

About the authors

Dr-Ing. Susanne Böhler-Baedeker (Rupprecht Consult) is a planner, specialised on urban mobility planning. After receiving her diploma Susanne joined the Wuppertal Institute (WI) for Climate, Environment and Energy. In her latest position at the WI she was the co-director of the research unit "Energy, transport and climate policy" with around 50 employees. She was responsible for the coordination and management of transport research related projects and was involved in several national and international projects about sustainable and low carbon transportation on different political levels.

Being a Rupprecht Consult staff member (www.rupprecht-consult.eu) since 2013, Susanne currently coordinates the EU-funded project CH4LLENGE which concentrates on policies to improve transport planning processes in European cities. In addition, she coordinates Rupprecht Consult's contribution to the SOLUTIONS project which focuses on international networking for low-carbon transport and capacity building of local stakeholders. She is also involved in the CIVITAS CAPITAL project.

Christopher Kost joined the Institute for Transportation and Development Policy (www.itdp.org) as a full-time staff member in 2008 after being involved as a consultant since 2004, focusing on transport projects in Africa and India. In Cape Town, Accra, and Johannesburg, he assessed the impacts of proposed BRT systems on greenhouse gas emissions. Chris is currently involved projects in Tamil Nadu, Maharashtra, Gujarat and Jharkhand, covering areas such as bus rapid transit, street design, parking management, and transit-oriented development.

Before joining ITDP, Chris worked for the Transportation and Land Use Coalition (now Transform) in Oakland; the Metropolitan Transportation Commission, also in Oakland; the City of Berkeley's Planning Department; Meyer, Mohadddes Associates, Los Angeles; and Delin Consult in Accra. Chris received his bachelor's and master's degrees in environmental policy from the Earth Systems Program at Stanford University.

Mathias Merforth joined the Transport Policy Advisory Services team at GIZ after receiving his diploma in transport economics in 2013. For his thesis at Technical University Dresden he analysed the regulatory, financial and practical challenges of urban public transport in Ukraine. From 2010–2011 he supported the development of sustainable mobility in Lviv and other Ukrainian cities as staff member of GIZ's project "Climate-friendly Concept for Sustainable Mobility".

Mathias' present work includes multiple activities in the field of knowledge management for the Sustainable Urban Transport Project (GIZ-SUTP) as well as supporting the German Partnership for Sustainable Mobility (GPSM).

This document also counted with vital inputs from **Kartik Kumar** (GIZ-SUTP).

This document has been developed in cooperation with

ITDP | Institute for Transportation & Development Policy

RUPPRECHT CONSULT
Forschung & Beratung GmbH

Acknowledgements

We would like to express our gratitude to Dr Robin King (Embarq), Oliver Lah (Wuppertal Institute), Siegfried Rupprecht and Frank Wefering (Rupprecht Consult) as well as Manfred Breithaupt (GIZ) for reviewing the document and providing invaluable feedback. We also would like to thank Jamie Osborne (ITDP) for his contributions to the analysis of challenges in Urban Mobility Plan preparation and best practice recommendations.

Moreover, we would like to express our gratitude to Maria Berrini (City of Milan), Erin Franke (Embarq Mexico), Guillermo Petzhold, Daniely Votto and Prof. Dr Toni Lindau (Embarq Brasil), Dr Volodymyr Motyl and Stephan Wegert (Dreberis Consult), Dr Friedemann Kunst, Nicolas Merle (CEREMA), N. Seshadri (UMTC) and Christian Hein (GIZ) for reviewing the country analysis as well as providing text inputs for the case studies.

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About this publication

This publication reviews urban mobility planning from various countries and showcases a growing number of examples calling for a shift away from the traditional, infrastructure-oriented approach towards sustainable and people-oriented planning. The intention of this document is to support local policy-makers and planners in shaping urban mobility processes and policies in an effective and inclusive manner. In the same time, the document assists policy-makers and experts at national level in shaping state-of-the art national policy frameworks for urban transport planning.

Urban Mobility Plans (UMP) are used as planning tool and policy instrument to guide the development of transport in urban areas and their surroundings (often applied for a wider transport region). National guidelines for urban mobility planning provide orientation to local authorities. In several countries, such as Brazil, France and India, the development of Urban Mobility Plans has become an obligatory requirement for receiving national government funds for local transport projects.

Chapter one outlines the rationale of urban mobility planning in the context of urban growth, changing mobility needs, diverging interests and different expectations of citizens and transport system users.

Chapter two presents common pitfalls in transport planning. A lack of reliable mobility data and improper planning methods may lead to inefficient planning and investment decisions and can even increase the negative effects of transport on cities and their inhabitants.

Chapter three provides an overview on urban mobility policy frameworks from Brazil, France, Germany, India, Italy, Mexico and Ukraine. Legal backgrounds, objectives and elements of planning processes are investigated.

Chapter four presents the European Union's initiative on the development and implementation of Sustainable Urban Mobility Plans (SUMP). The EU has developed SUMPs as a practical tool which supports policy-makers and planners in creating a vision on urban mobility and urban development as well as to identify the right measures to make local transport systems more sustainable.

Chapter five provides background information on selected planning steps like demand and transport system assessment, modelling, the evaluation of different alternatives, project monitoring and civic participation. Furthermore, implications for a sound integration of mobility and land use planning as well as for appropriate time horizons for Urban Mobility Plans are presented.

A number of ***city case studies*** throughout the document provide insight into particular contexts and local approaches on urban mobility planning. Some of the UMPs are still in the preparation process, but shine out through the innovative approaches and the challenging context in which they are being prepared. Each study focuses on particular aspects of urban mobility planning (e.g. diagnosis, public participation, goal framework, monitoring & evaluation, or political environment).

1. Introduction
The role of Urban Mobility Plans

Cities are the engine of innovation and economic growth. Employment opportunities and social services attract people from rural areas and other regions. To accommodate growing demand for residential and commercial space, urban boundaries are extending in an often uncoordinated manner, especially in rapidly growing cities in developing countries. Cities with an effective system for managing land use can ensure that this development happens in close proximity to high quality walking, cycling and public transport facilities. Mixed use and compact urban development can considerably reduce the demand for travel by private motorised modes.[1]

Too often, transport infrastructure fails to keep up with the mobility needs of the growing population. The use of private vehicles and informal paratransit increases the gap in demand that is not met by other modes. Growing use of personal motor vehicles contributes to traffic congestion, poor air quality, declining public health, social segregation and growing pressure to implement costly road expansions.

Setting a city on a sustainable course regarding its land use and transport system requires a clear roadmap—an Urban Mobility Plan (UMP)—that lays out a vision for the city, prioritises transport system improvements, clarifies the respective responsibilities of different stakeholders in implementing these initiatives, and identifies a robust financing plan.

An Urban Mobility Plan is a planning tool which comprises objectives and measures oriented towards safe, efficient and accessible urban transport systems.

A UMP can help reveal the real challenges that the city faces and explain how conditions will change if the city remains on its present course. It can help ensure that transport proposals are grounded in a sound understanding of the existing transport system. The process of preparing a UMP can also help a diverse group of stakeholders rally around a common vision to improve the transport system in their city. In sum, a successful urban mobility plan (UMP) can provide a feasible and powerful strategy to tackle urban mobility challenges.

[1] See also SUTP's publication "Transportation Demand Management", Chapter 5 on 'smart growth and land use policies'. Available in 7 languages: http://www.sutp.org/en-dn-td.

Figure 1: *Daily traffic jam in Moscow, Ilya Varlamov, 2014.* © zyalt.livejournal.com

BOX 1: Sustainable development and sustainable transportation

In the 1980s and 1990s, the concept of sustainable development emerged as an international priority and global mission. While there is no single pathway to achieving or operationalising urban sustainability, we can look to the 1987 Brundland Commission's report that defines sustainable development as "meeting the needs of the present without compromising the ability of future generations to meet their own needs". (WCED 1987). While initially referring to the impact on environmental systems, the concept of sustainability has been expanded to seek a balance between current and future environmental, social and economic qualities. The worth of the discourse of sustainability may be that it has become a method for assigning value to non-economic resources and their distribution among future generations.

Sustainable transportation is the application of sustainable development goals to the field of transportation. How a transportation system is defined links its effectiveness to its performance. The Center for Sustainable Transportation (CST) offers a comprehensive definition — a sustainable transportation system is one that accomplishes the following (CST 2002):

- Allows the basic access needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health, and with equity within and between generations.
- Is affordable, operates efficiently, offers choice of transport mode, supports a vibrant economy.
- Limits emissions and waste within the planet's ability to absorb them, minimises consumption of non-renewable resources, limits consumption of renewable resources to the sustainable yield level, reuses and recycles its components, minimises the use of land and the production of noise.

1.1 Planning for sustainable transport solutions

Traditional transport planning often follows an approach known as "predict-and-provide". Planners estimate future growth in the use of personal motor vehicles based on past trends and calculate the infrastructure requirements needed to accommodate this growth. Today, transport planners increasingly recognise that transport trends are far from inevitable—the infrastructural investment choices that a city makes have a profound impact on the travel behaviour of its residents.

Greater emphasis on sustainable transport modes, such as walking, cycling and public transport, is associated with a wide range of benefits. Travelling more actively (by walking and cycling more often) is not only good for citizens' health. If mobility is planned right, it can improve the access to job opportunities and social services – a prerequisite for sound and sustainable (economic) development of cities and metropolitan areas. At the same time, sustainable mobility patterns directly translate into better air quality and less noise. Cities also have a major role to play in reducing greenhouse pollution. Therefore, a key concern of UMPs is guiding an expansion of these modes. For a city it clearly pays off to invest in sustainable transport solutions, as cities are becoming more attractive for businesses, citizens and visitors alike. At the same time, transport energy consumption and energy dependency typically decreases in the long-term. Both national urban transport policies and urban mobility planning are therefore core elements of any climate, economic and urban development policy.

Figure 2: *Safe and comfortable walking and cycling in Amsterdam.*

Box 2: Traditional urban transport planning vs Sustainable Urban Mobility Planning

While traditional, generalist transport planning approaches focus on the movement of cars by expanding infrastructure, the emphasis should actually be laid on mobility and accessibility for all population groups. The following table compares traditional transport planning with sustainable mobility planning.

Traditional Transport Planning	Sustainable Urban Mobility Planning
Focus on traffic	Focus on people
Primary objectives: Traffic flow capacity and speed	Primary objectives: Accessibility and quality of life, as well as sustainability, economic viability, social equity, health and environmental quality
Modal-focussed (focus on particular transport modes)	Balanced development of all relevant transport modes and shift towards cleaner and more sustainable transport modes
Infrastructure Focus	Integrated set of actions to achieve cost-effective solutions
Sectorial planning document	Sectorial planning document that is consistent and complementary to related policy areas (such as land use and spatial planning; social services; health; enforcement and policing, etc.)
Short- and medium-term delivery plan	Short- and medium-term delivery plan embedded in a long-term vision and strategy
Related to an administrative area	Related to a functioning area based on travel-to-work patterns
Domain of traffic engineers	Interdisciplinary planning teams
Planning by experts	Planning with the involvement of stakeholders using a transparent and participatory approach
Limited impact assessment	Regular monitoring and evaluation of impacts to inform a structured learning and improvement process

Source: Rupprecht Consult, 2014

1.2 Optimising the use of financial resources at local levels

One of the key concerns behind urban mobility planning is how to shift investments from traditional transport investment (oriented on the expansion of infrastructure) towards sustainable transport projects. Since financial resources are always limited, it is important to ensure that the solutions adopted make the most cost-effective use of the funds available. Table 1 presents typical benefit-cost ratios (BCR) of transport projects.

Table 1: Overview of selected studies on the economic viability of sustainable transport measures

Study	Benefit-Cost Ratio results
Congestion charging in London and Stockholm	■ Stockholm: 1.2–7.9 ■ London: 0.6–2.5 ■ (Eliasson, 2009; Transek, 2006; TfL, 2007; Raux *et al.*, 2012; Prud'homme and Bocarejo, 2005)
Expansion of the walking and cycling track network in Hokksund, Hamar and Trondheim (Norway)	■ Hokksund: 4.09 ■ Hamer: 14.34 (up to 32.78 for a large increase in pedestrians and cyclists) ■ Trondheim: 2.94 ■ (Sælensminde, 2004)
Review of 16 economic analyses of cycling and walking infrastructure improvements	■ The median BCR is 5, with a range from 0.4 to 32.5 (Cavill *et al.*, 2008)
Changes to the built environment in Dane County, Wisconsin (construction of sidewalks)	■ 1.87 (Guo and Gandavarapu, 2010)
Cycling infrastructure in Portland, Oregon	■ 3.8–1.2 (Gotschi, 2011)

Sources: TIDE 2013, EVIDENCE 2014

Traditionally, transport planning efforts have concentrated on the realisation of particular large-scale transport projects. Such an approach draws attention from potentially more cost-efficient measures that would significantly improve the performance of the transport system. For example, cost-efficient measures such as new walkways, cycle tracks, pedestrian zones and traffic calming measures can contribute to greater use of non-motorised transport modes. Likewise, the efficiency and attractiveness of public transport can be increased by dedicated bus lanes, priority signalisation and segregated tram or bus corridors. Taxes on fossil fuels and road user charges can support financing for public transport, walking and cycling while at the same time supporting the efficient use of road infrastructure. Urban mobility planning allows to identify cost-efficient measures and also to prioritise worthwhile, but more cost-intensive projects. Contemporary UMPs investigate different transport scenarios and policy options, helping to ensure that planning decisions are based on a complete understanding of potential transport solutions.

Figure 2a: *The BRT system in Instanbul ensures free passenger flow even at times of heavy congestion.*

Box 3: Low-cost measures for urban mobility planning

There is a large number of measures with relatively low or even negative costs, which can be integrated in practically every Urban Mobility Plan. These measures are directed towards comfortable and safe movement of pedestrians and cyclists, towards increasing the operational efficiency and attractiveness of public transport as well as towards reducing the negative impacts of urban motorised traffic (air pollution, space occupation, accidents).

The following non-exhaustive list provides selected cost-efficient measures, which can be implemented by local authorities. In most cases they don't require changes of national regulations.

Economic incentives

- **Parking pricing** (higher prices, where there is high parking demand/limited public space)
- **Road pricing** (congestion charge, inner city-toll)

Regulatory and planning measures

- **Parking management** (clear definition of parking areas and limitation/reduction of parking supply)
- **Walking and cycling-friendly building regulations** (minimum requirements for pedestrian access and parking facilities for cyclists, etc.)
- **Physical restrictions on car use** (*e.g.* bollards, one-way roads, artificial blind alleys, pedestrian zones)
- **Design standards for intermodal integration**
- **Walking and cycling improvement** (*e.g.* pedestrian zones, traffic calming, lower speed limits, planning with special focus on save crossings, safe movement and shortest ways for pedestrians and cyclists, one-way streets with two-way access for cyclists)
- **Public transport prioritisation** (priority signalisation, bus lanes)

Infrastructure measures

Comprehensive improvement cannot be achieved from one day to another, because infrastructure-oriented measures require financial resources. Therefore, smart planning authorities implement the following measures, whenever a new road is constructed or an existing road maintained or renewed:

- **Traffic calming** (*e.g.* narrowing traffic lanes, road surface elevation and speed bumpers at crossings, non-straight street designs)
- **Public transport optimisation and acceleration** (*e.g.* physically segregated public transport corridors, bus lanes, bus stops in cap design, elevated traffic lanes at bus and tram stops for barrier-free access – in combination with security signalling)
- **Cycling improvement** (*e.g.* allocation of car traffic lanes towards cycling, introduction of cycling lanes – more space for cyclists should not take place at the expense of pedestrians)

Figure 3: *Car-free areas are a cost-efficient measure to maintain a high quality of live and support sustainable mobility patterns.*
© Gabrovo (Bulgaria), Mathias Merforth, 2012

1.3 Stakeholder consensus on transport improvements

Transport projects are often politically controversial, in particular on the local level. Concepts, sets of measures or particular interventions influence the way in which traffic is functioning. Changes have factual and putative advantages and disadvantages for particular groups. There are commercial, private and institutional actors as well as transport system users (*e.g.* pedestrians, cyclists, drivers, local businesses) and secondary interest groups like residents and tourists. To a different extent these groups suffer from the negative impacts of traffic, have a general interest in attractive urban environments and efficient, safe and comfortable mobility. Fear of change and uncertainty are further aspects which need to be taken into account.

An integrated and interdisciplinary approach to planning can help generate a broader base of support for transport interventions and is characterised by compromises and the weighting of different interests (as any other area of societal decision-making). Neglecting these multiple interests can lead to injustice (*e.g.* exclusion of poor population groups) or negative impact on economic development (*e.g.* if commercial transport is hampered by congestion) and in the worst-case cause political resistance and rumours.

Public hearings, round tables and other methods of public participation help to clarify mobility needs,

Figure 5: *Protest in Brazil against fare augmentation and poor public transport quality in Brasilia.*
© Eraldo Peres, 2013

Figure 4: *"We want to breathe free – no bus without filter!" protest action at Brandenburger Tor, Berlin.*
© Heiko Balsmeyer, 2014

Box 4: Target conflicts in urban mobility planning

Policy-makers and planners are encountering severe target conflicts and diverging stakeholder interests, needs and expectations when planning transport interventions. Target conflicts in urban mobility planning may relate to the allocation of space between different transport modes or the environmental and health impacts of transport activities. Several target conflicts may occur in the planning of transport interventions. A few examples are listed here:

- Expressway vs the desire for a quiet neighbourhood
- Parking space for cars vs nice café at the roadside
- New cycling tracks or a new tram system vs budgetary constraints
- Safe way to school vs high speed of motorised transport
- Freight and commercial transport vs noise and pollutant emissions
- High density of transport infrastructure vs separation by cutting urban space, residential and recreational areas

expectations and particular interests. A city government that takes input from citizens can achieve a high level of "public legitimacy". Public participation also reduces the risk of opposition to the implementation of ambitious policies. In addition, the quality of transport interventions may be improved through brainstorming carried out by different stakeholders.

Further, urban mobility problems often span administrative boundaries, relate to multiple policy areas, or concern a wide range of departments and institutions. Sustainable urban mobility planning seeks solutions that bridge these boundaries. An UMP is an opportunity to establish a collaborative planning culture across different policy areas and sectors and between different governance levels within a metropolitan area.

1.4 Aligning local activities and societal goals

Transport often requires huge investments and puts enormous pressure on national and local budgets.

Box 5: Policy framework for urban mobility planning

Comprehensive policy frameworks for urban mobility planning are most successful if considering the following aspects:

- Local planning regulations which are subordinated to national and regional transport master planning and policies should aim at harmonising mobility and land-use planning and promote priority for walking, cycling, public transport and sustainable logistics.
- Design and operational norms and guidelines can support cost-efficient maintenance, high operational reliability as well as high safety standards of transport infrastructure and services. In the same time planning guidelines can provide recommendations for planning comfortable and safe walking and cycling infrastructure.
- Transparent decision-making processes can help to achieve a high goal efficiency of transport interventions and to limit corruption. Measures should be developed and priorities should be set by using inclusive and participative approaches.

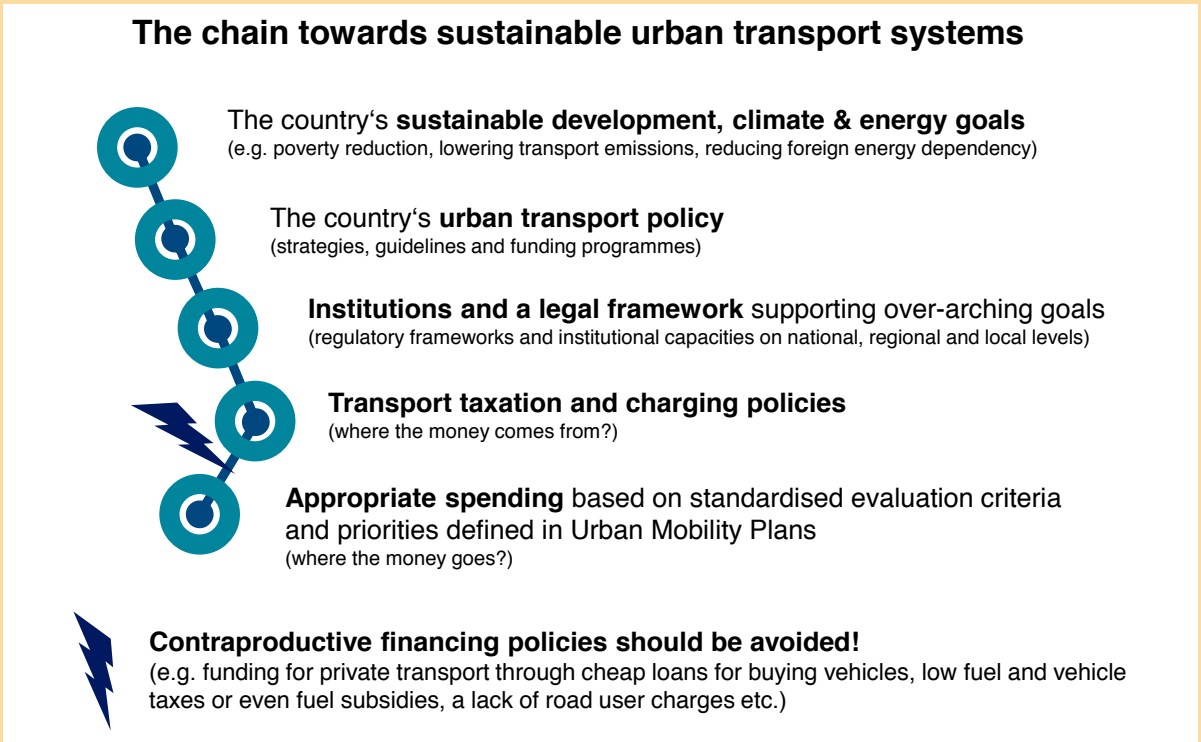


Figure 6: *The chain towards sustainable urban transport systems*

Therefore, it is essential to design urban transport policies in a way that they support sustainable development. Within the context of national policy-making frameworks, UMPs can help establish consistency between national goals and local transport interventions. Such a framework should indicate how transport initiatives relate to national goals in various sectors, including health, energy and the environment. The recent Proposal for Post-2015 Sustainable Development Goals (SDGs) suggests several targets which aim at providing universal access to affordable, clean and safe mobility and at reducing the negative impacts of transport.[2] National governments have corresponding objectives for reducing greenhouse gas emissions, air pollution, road accidents and energy dependency as well as for poverty reduction and sustainable economic development. In this context, national urban transport policies can help guide cities in prioritising investments. Designated funding programmes also can help by providing co-funding for transport projects that are coherent with national policy targets.

[2] Please refer to http://sustainabledevelopment.un.org/focussdgs.html and http://slocat.net/transport-open-working-group-process for further information.

Figure 7: *Modern light rail in Istanbul.*
© Mathias Merforth, 2012

Box 6: National goals and local initiatives in Denmark

In the early 1990s, the Danish Government began a scheme to fund interventions (such as establishing cycling lanes or bus priority intersections) that addressed the growing environmental problems related to increased traffic in Danish cities. To be eligible for program resources, municipal regions were required to develop and officially adopt a plan of action for Transport and Environment (Handlingsplan for Trafik og miljø) that was aligned with national policy targets and local needs. In 1994, Aalborg, Denmark's third largest municipality (197 500 residents) and fourth largest city (120 000 residents) laid down a plan to limit the environmental problems from traffic. Aalborg, long considered a pioneer in sustainable development, later developed a plan of action (2009) that sought to increase the share of trips made by bicycle, public transport and by walking. The plan focused specifically on shifting the short trips that were being made by car to the bicycle or walking, while emphasising public transport for longer trips. While this transport and environment action plan was originally mandated for federal funding, Aalborg leveraged this framework to support small local interventions. Aalborg's action plan included local *urban transformation areas* within the city that were designated for revitalisation and sustainable mobility interventions. For example, a particular area on Aalborg's waterfront was transformed following three general goals of the action plan:

- The capacity of the roadway was limited by reducing the road space from 4 to 2 lanes;
- Minimum requirements for vehicle parking in the Waterfront were lowered compared to general parking standards;
- New bicycle facilities were also established in the area.

1.5 Benefits and objectives of Urban Mobility Plans (UMP)

A common challenge for planners in local administrations is to convince decision makers of the added value of more intensive strategic planning. The development of a UMP allows a city to:

- Analyse and assess local transport problems and challenges,
- identify effective and cost-efficient measures to overcome these challenges,
- understand different development scenarios and policy options,
- understand interests and expectations of transport system users,
- develop a common vision on urban transport development,
- choose and agree an appropriate and feasible set of measures,
- prioritise and schedule measures according to most urgent problems as well as easy-to-achieve quick wins – in line with available budget and implementation capacities, and
- align stakeholder actions and create high acceptance for transport interventions.

CASE STUDY 1

Belo Horizonte (Brazil) – Efficient planning in a rapidly growing metropolitan area

Belo Horizonte, capital of the state of Minas Gerais, is the 6th most populous Brazilian city and has the 5th largest urban GDP in the country. The city was initially designed in the early 20th century for a population of 200 000. However, Belo Horizonte faced tremendous growth and now has 2.48 million inhabitants in just over a century of existence. It has become the core of a metropolitan area with 5 million people, the 3rd largest urban region in the country. Such rapid growth demanded concrete actions from the government to improve mobility and shape appropriate development.

The city government, through its Belo Horizonte transit agency (BHTrans), began the process of developing an urban mobility plan (PlanMob-BH) in 2008, four years before required by Federal Law 12587/2012. Completed in August 2010, the plan outlined actions to reverse the increasing trend of private car trips and to stimulate transit oriented development.

The goals of PlanMob-BH are to:

- make transit more attractive and expand its modal share;
- promote continuous improvements in services, equipment and facilities related to mobility;
- promote road safety;
- ensure that traffic system changes contribute to environmental quality and encourage sustainable transport modes;
- attract new business to the city;
- improve social inclusion through mobility.

PlanMob-BH has a planning horizon of 2020, providing two possible scenarios for the next decade: with or without limiting spending restrictions (see Figure 9 and Table 2 for the desired mobility system without serious spending restrictions). It also includes an intermediate scenario for 2014, as Belo Horizonte was elected as one of the FIFA's World Cup host cities one year before the completion of PlanMob-BH. According to the two financial scenarios, the plan covers pedestrian route treatment, bicycle path implementation, reduced car parking in the central area

Figure 8: *Street view of Belo Horizonte (Brazil).*

and the construction of transit infrastructure. The construction of MOVE, a bus rapid transit (BRT) system, stands out among the various measures, and began operations in March 2014. With a length of 23 km, the MOVE corridor provided access to the football stadium and transported more than 5 000 fans each game (10 % of the stadium's capacity). The national media declared the new BRT system one of the city's greatest successes during the games. Today it serves 340 000 passengers each day and has reduced travel time between suburban areas and downtown by 50 %.

To conform to Federal Law 12587/2012, Belo Horizonte institutionalised PlanMob-BH as its Urban Mobility Master Plan by municipal decree. This same decree created Belo Horizonte's Urban Mobility Observatory (ObsMob-BH), which monitors the implementation of the plan and its results over the short, medium and long term.

The IV. Conference of Municipal Urban Policy is currently reviewing PlanMob-BH. This revision will: (i) extend the planning horizon to 2030, (ii) update the data and targets of the city according to 2012 origin/destination research and (iii) harmonise PlanMob-BH with the Municipal Master Plan.

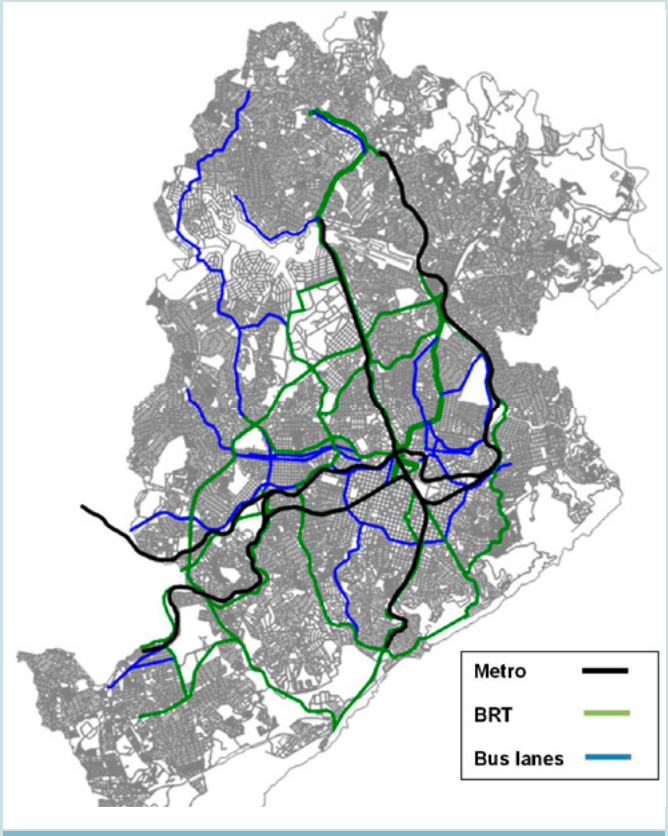


Figure 9: *Belo Horizonte's transit network in 2020 without investment restrictions.*
Source: PlanMob-BH

Table 2: PlanMob-BH 2020 targets

Area		2020 target (without investment restrictions)
Transit	BRT	160 km
	Metro	60 km
	Bus lanes	83 km
Non-motorised transport	Ciclovias	360 km
Environmental	Emissions reduction (from 2010 levels)	20%
Modal split	Transit	57%
	Bicycle	6%

Source: PlanMob-BH

2. Challenges in mobility planning

Mobility planning relies on the availability of accurate data paired with robust modelling techniques. Data gaps and limited administrative capacities for maintaining transport data and using transport demand models will limit the ability of decision-makers to evaluate whether a transport project is beneficial if compared with alternative options. Further, a lack of or old-fashioned development scenarios (based solely on economic development scenarios but not reflecting different policy options) can have the same effect. A lack of reliable data on prevalent mobility patterns (travel behaviour) can reduce the value of non-motorised transport as part of the urban mobility system – consequence are inadequate walking and cycling facilities and thus a possible shift towards motorised transport options.

The following sections describe some common pitfalls experienced in the process of preparing UMPs.

2.1 Accuracy and completeness of transport data

Most UMPs rely on "travel demand models". The typical structure for modelling transport demand identifies four key decisions we make when we travel: how often do we travel, what is our destination, what mode of transport do we use, and which route do we follow. Thus, a four-step model deals with transport network complexities by formulating the transport process via four consecutive steps: trip generation, trip distribution, modal split and assignment (see Figure 10).

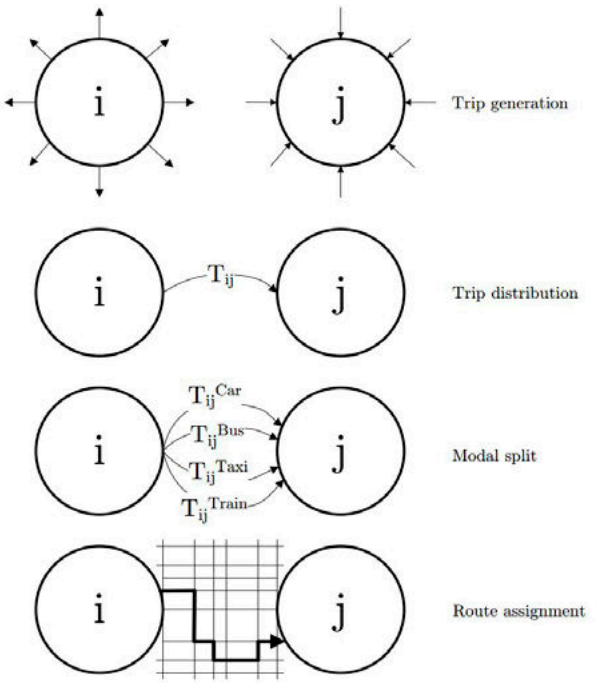


Figure 10: *Four Step Model.*
Source: Van Der Merwe 2011

Complex demand models often run the possibility of reading too much from limited data. The flexibility of complex models can only be harnessed if errors in data collection and modelling techniques are controlled.

Demand estimates are critical to designing transport systems, planning operations, and forecasting the financial viability of new systems. Knowing where and when customers require transport services will help to shape a system that is based, above all, on the needs of travellers. Poor demand data results in inaccurate modelling assumptions that shape transport plans in ways that do not benefit all transport users. Travel demand analysis relies heavily on survey data on existing transport conditions. Hence collecting reliable information is an essential task in estimating demand for potential transport services.

2.1.1 Soundness of survey methods

Household travel surveys are a reliable method for obtaining information about travel characteristics. A survey seeks to estimate a large number of parameters for a population through a limited sampling. To ensure that the travel survey plan is robust and the survey design does not include sample errors or biases, methodological and statistically sound procedures must be deployed. The sample must be representative of the population, and potential biases (such as using a single mode of survey administration, survey non-response, and hard-to-reach populations) must be minimised.

Much attention is paid to reducing sampling errors (increasing measurement precision) by increasing the sample size. However, much less attention is given to increasing sample accuracy via reducing sample bias, which ensures that the right people are being asked the right questions. Sampling bias varies with the type of survey method utilised and with the parameters that the survey seeks to estimate.

Figure 11: *A surveyor interviews members of a household in Nashik (India) to gather travel behaviour information.*
Colin Hughes, 2013

A key element of sampling bias is the degree to which the sample covered in a household survey accurately reflects the income distribution in the population. If the sample includes too many upper income households, the resulting travel behaviour statistics may over-represent private motorised modes that are predominantly used by upper income residents. Sampling techniques must ensure that the income distribution of households surveyed in each zone of the city represents the true income distribution. Given that low-income areas are generally higher in population density, surveyors need to concentrate a large number of samples in these areas, even if these areas represent a small fraction of the total land area in the zone. Income levels should be mapped before fieldwork is initiated in order to inform the distribution of samples across and within different areas of the city.

Sample size is typically dependent on the relationship between each parameter's mean, standard deviation and confidence limit. A sample size may be adjusted during the course of the main survey to overcome any uncertainty in the initial estimate of the standard deviation. If the standard deviation is larger than estimated, a larger sample should be collected to augment the initial sample. A challenge for determining sample size is that very few surveys seek to estimate just one parameter—usually a survey seeks to estimate a large number of parameters. Completing sample size calculations separately for each parameter may result in a broad range of estimates of required sample size. While a reliable procedure is simply to use the largest calculated sample size across all the parameters for the overall sampling rate, the more typical procedure involves a degree of compromise across the parameters. Thus, some parameters will be obtained more precisely than desired, while other parameters will be estimated with less precision.

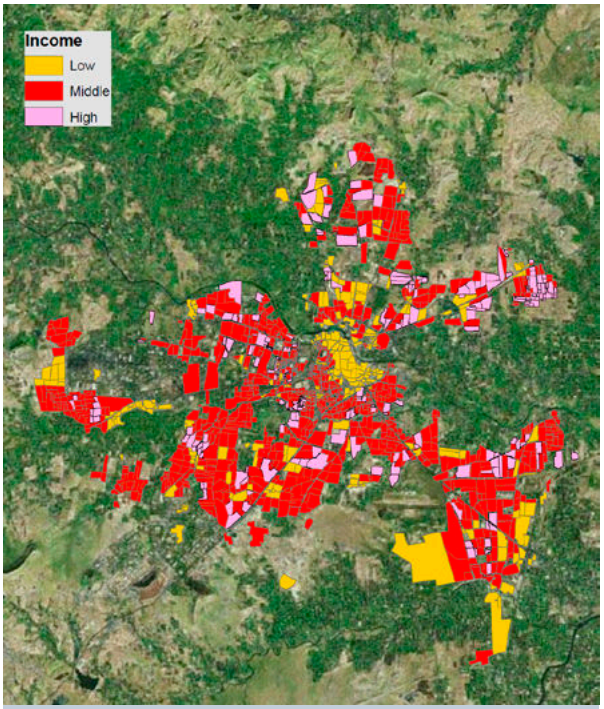


Figure 12: *Classification of income groups in Nashik, India, used to ensure an accurate sampling according to socioeconomic status during a household travel survey.*
Source: ITDP and Clean Air Asia, 2013

2.1.2 *Tendency to ignore short and non-motorised trips*

A common practice in transport planning is to discount short trips or to generally neglect walking and cycling as transport modes. This may have several reasons, but such errors often occur because no comprehensive and methodologically sound travel behaviour surveys have been conducted. Presented figures often focus on easily available data on motorised modes without investigating non-motorised transport or trips that involve a combination of different transport modes.

For example, when the Ahmedabad (India) UMP discusses the city's mode split, trips shorter than 1 km are excluded from the calculations. The apparent assumption is that these trips are accomplished by non-motorised modes and therefore do not place a large burden on the transport network. Under a traditional transport planning framework focusing on personal vehicle mobility, these trips would not factor into decisions about new capacity investments. When Ahmedabad's mode share is calculated without the trips shorter than 1 km, the walking mode share falls dramatically—from 43 to a mere 15 %. When the lower figure is cited in policy and planning discussions, it conveys the impression that walking plays an insignificant role in the Ahmedabad's transport system, while the reality is that residents accomplish nearly half of all trips by foot.

Average trip lengths and the walking mode share are also important indicators of land use patterns. In Ahmedabad, the fact that 34 % of trips are shorter than 1 km indicates that the city fabric is characterised by a fine grain of mixed land uses in close proximity to one another. Future transport and land use planning efforts could seek to replicate this land use pattern as a way of reducing travel demand for the city's residents.

Figure 13: *A safe route to school? Ahmedabad (India).*
© Christopher Kost, 2014

Figure 14: *Although often neglected by planners, the bicycle is a clean and efficient way of transporting goods from A to B.*
© Hanoi (Vietnam), Manfred Breithaupt, 2007

2.2 Model development

Travel demand models can assist planners in estimating and forecasting future urban growth, land use changes and patterns of travel. Unfortunately, the data infrastructure to support travel demand models is not sufficiently developed in most developing cities. Furthermore, it is not always effective to directly transfer transport demand models between countries.

2.2.1 Modelling process complexity

Accurately modelling transport demand and developing feasible future scenarios of transport mode shifts is not trivial, as the analysis of the potential demand for planned transport systems is the foundation for most of the subsequent planning, design and financial work. However, the traditional four-step modelling process has significant disadvantages for contexts that are characterised by short trip lengths and high usage of non-motorised modes.

First, each step in the model has its own behavioural interpretation. These assumptions may be valid in settings with relatively uniform travel behaviour but may be less accurate where travellers choose from a number of modes. Second, the steps are typically not integrated. For example, changes of conditions of routes, modes, and destinations typically are not taken into account at the trip generation step. Third, travel demand models rely heavily on current travel patterns, which may reproduce existing imbalances in transport provision between population groups. Typically, transport models generate suggestions for improvements that benefit highly mobile population groups at the expense of those who are "mobility-poor".

Models that rely on inaccurate data or methodological assumptions may magnify errors, leading to erroneous interpretations of the transport system and inaccurate predictions about the impacts of future transport interventions.

2.2.2 Inadequate care taken in travel demand model calibration

As described above, many UMPs rely on output from four-step travel demand models. A key shortcoming of many such models is the lack of sufficient validation procedures to ensure that the model accurately represents existing travel behaviour before it is used to simulate possible changes in the transport network. For example, calibration techniques employed in the Comprehensive Mobility Plan (CMP) of the city of Pune (India) are limited to the following[3]:

- Comparison of passenger volumes by mode across two screen lines;
- Comparison of observed and estimated trips;
- Average trip lengths for public transport and personal vehicles;
- Comparison of modelled and observed speeds at five locations.

The calibration process outlined here relies heavily on aggregate statistics. The use of two screen lines is wholly inadequate for ensuring the accuracy of the model for a metropolitan region with a population of five million residents covering 1 340 km^2. Ideally, observed and predicted volumes should be observed across many points, such that each public transport line in the city passes through at least one screen line. Read more in Chapter 5.1.

2.3 Scenario formulation and comparison

Decision-makers and planners often lack the necessary experience or up-to-date knowledge about policy options, traffic impacts or the interrelations of transport activities and urban environments. This chapter presents three typical faults which can be observed when analysing transport planning documents.

2.3.1 Absence of alternate scenarios

Many UMPs offer future transport network and urban growth scenarios as estimates. However, creating a set of alternatives is an important first step, but the value of this exercise is in arriving at a preferred pattern of land use and transport system through a transparent evaluation process. Old-fashioned development scenarios often neglect the whole set of possible transport policy interventions. Often, they solely focus on economic development scenarios. Given that there are significant limitations to accurately forecasting travel demand for a specific scenario, analysing a wide range of potential futures for a given region is beneficial.

The city of Bremen investigates five different scenarios in the course of developing its UMP, which reflect a realistic set of possible developments in urban transport (Transport Development Plan Bremen 2025). The scenarios explicitly acknowledge risks like budget constraints and increasing costs of private mobility, see Box 7.

[3] See also Pune, 2008

Box 7: Scenarios investigated during UMP preparation in Bremen

Scenario and main assumptions	Focus of measures
Optimisation of private motorised transport Technological progress increases road safety and performance (intelligent traffic signals, communication between vehicles) and reduces negative impact of car traffic on the city and the environment (noise, emissions).	**Optimisation of the road network for private and commercial transport** ■ Expansion of road network, parking space and traffic control technologies (expansion of traffic management centres and mobile information for end-users); ■ Promotion of electric mobility and upgrade of commercial and public vehicle fleets;
Public transport first strategy The municipality has sufficient financial means to expand public transport.	**Optimisation of the tram, bus and regional train route network** ■ Better modal integration, higher frequencies, faster services (public transport priority) as well as better connections to commercial and industrial centres; ■ Upgrade of urban roads with high amenity values and barrier-free access; ■ Activities for public transport promotion and electric upgrade of the bus fleet;
Efficient walking & cycling The municipality has only limited financial resources for the expansion of infrastructure. Measures for walking and cycling are cost-efficient in relation to other transport interventions. Cost-intensive construction measures are avoided. Electric bikes accelerate cycling and increase the convenience range for using bikes to over 10 km.	**Focus on mobility in close proximity, walking and cycling shall be enhanced effectively with cost-effective measures** ■ Upgrade of urban roads with high amenity values and barrier-free access; ■ Expansion of cycling infrastructure with priority measures, reduction of conflicts between pedestrians and cyclists, expansion of bike + ride and bike parking facilities; ■ Introduction of innovative pedestrian-friendly concepts (shared zones), further traffic calming measures and easier crossing of main roads; ■ Comprehensive automobile parking management;
Optimisation of all sustainable transport modes The municipality has sufficient financial means to extensively support all sustainable transport modes (walking, cycling and public transport). Cost-intensive measures can be realised. Target conflicts between public transport, pedestrians and cyclists have to be resolved.	**Focus on the improvements for public transport, walking and cycling** ■ A combination of measures under scenarios 2 and 3 ■ Extensive promotional activities ■ Use of electric mobility in bus transport, carsharing and cycling (pedelecs)
High mobility costs With increasing fuel prices the costs for mobility will increase, integrated (mixed use) locations will grow. Less trips will be done by car, occupancy rates increase, the attractiveness of living areas with a wide range of local services increases.	**Focus on the better connection of transport modes and electric mobility** ■ Support of carsharing and electric mobility, inter-modality (integration of public transport), multimodality (integration of public and private forms of mobility); ■ Expansion of mobility advisory services for citizens and different target groups.

Adapted from Stadt Bremen, 2013

Figure 15: *Public transport routes through a pedestrian zone in Basel's city centre.*

CASE STUDY 2

(Germany) – The power of analysing and choosing the right scenarios

The case of Dresden shows that careful scenario analysis helps to identify a preferred development direction and to accordingly choose the right measures.

Dresden is the capital of Germany's federal state of Saxony. With about 530 000 inhabitants, Dresden is the growing centre of an urban agglomeration of about 800 000. In contrast to the generally decreasing population of Saxony's rural areas, it is estimated that Dresden will experience a population increase of 6.8 % by 2025.

The existing Dresden transport infrastructure is adequate and in a state-of-good-repair, particularly the public transport system and the road network. It includes a 59 km sub-urban rail network, a 200 km tram network with 12 lines and a 200 km bus network with 28 bus routes. During the day, a 10-minute service frequency is maintained for all tram and most bus routes. Interconnections are available at many stations around the city, with bus and tram times co-ordinated for transferring passengers. For drivers, real-time transport information systems can redirect vehicles in case of blocked roads, and parking guidance systems help to reduce time spent searching for parking space. In 2008, 41 % of all passenger trips were done by private car, 21 % by public transport, 22 % by walking and 16 % by cycling. The strongest increase was recorded for cycling; a share of 10 % in 1998 surged to 16 % in 2008 (see Figure 16).

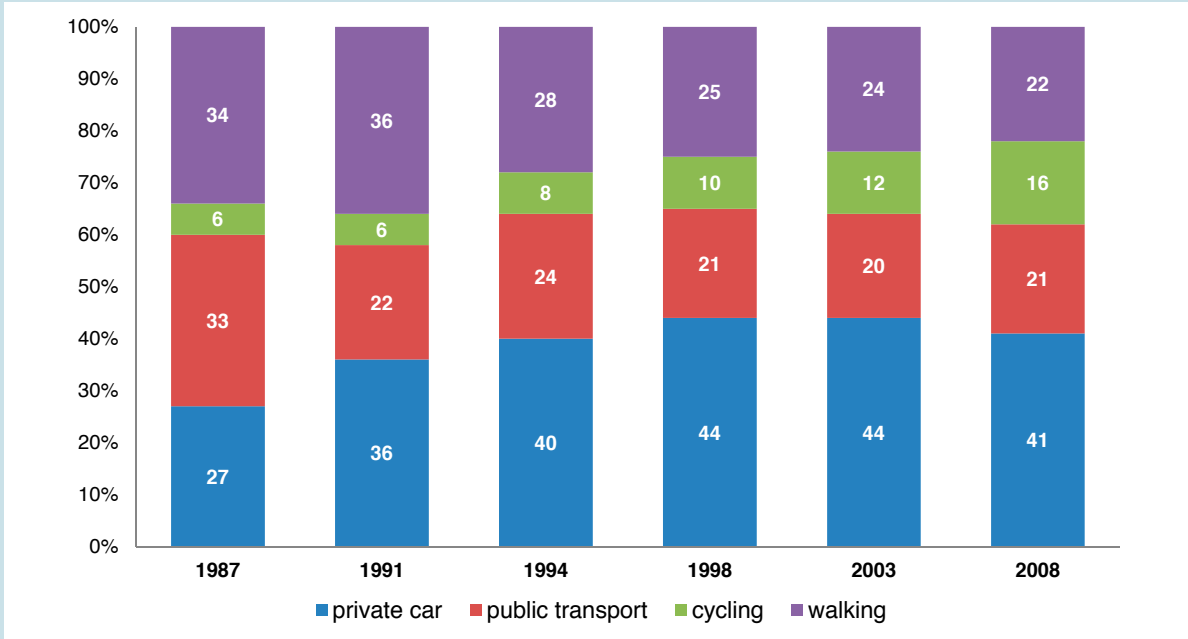


Figure 16: *Development of modal split in Dresden from 1987–2008.*
Source: TEMS, 2014

The work on the UMP in Dresden (in German Verkehrsentwicklungsplan – VEP 2025 plus) began in early 2011. From the outset, transparency and local involvement—both with members of the public and neighbouring municipalities—were considered essential principles. The VEP committee consists of the steering group, the scientific advisory board, the city round table and the round table for the region. The organisational structure of the project is presented in Figure 17. The city's round table includes various stakeholders: members from the city council, public transport operators, businesses, special interest groups, traffic and transport associations and a representative from

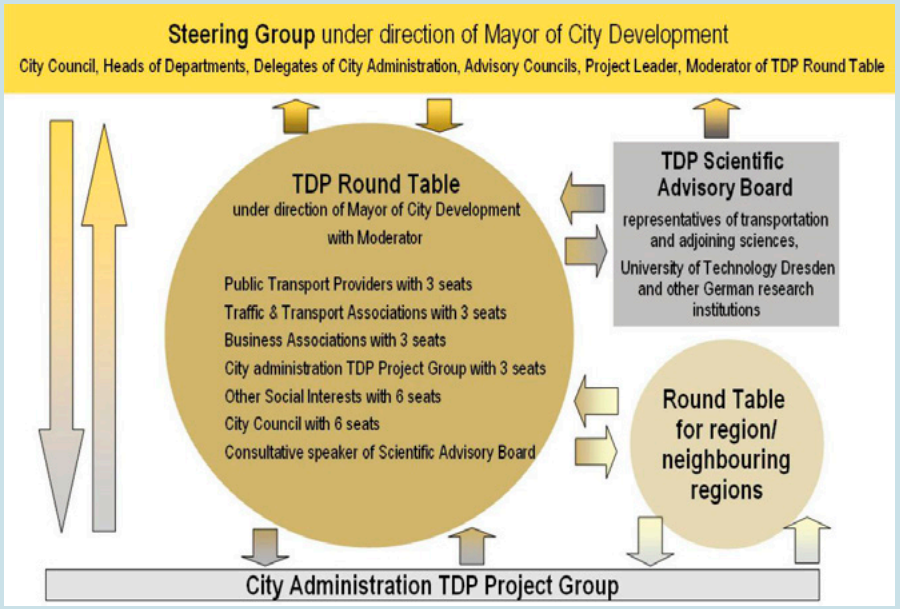


Figure 17: *Organisational structure of the UMP (TDP) working group in Dresden.*
Source: Landeshauptstadt Dresden, 2013

the scientific advisory board. A round table for neighbouring municipalities was also established to ensure co-ordinated planning with the wider region. The wider public has been involved via the so called Dresdner Debatte (Dresden dialogue), which has become an easily recognised brand, featuring public hearings, panel discussions, info centres in the city centre and internet-based dialogues.

The project used a multimodal traffic model to evaluate future scenarios and different possible transport projects. The model was calibrated with traffic flow statistics and data gathered from a household survey. Next to several scenarios for comparison, three possible UMP-scenarios have been developed and analysed, with different areas of focus:

- Analysis 2010: This case represents the transport situation in 2010, and is used for comparison with all future scenarios.
- "Do Nothing" 2025: This is the base case future scenario of the 2010 network structure, including only the completion of all construction projects already underway.
- "Ratified" 2025: In addition to the "Do Nothing" 2025 base-case, this business-as-usual scenario also includes all infrastructure projects already ratified by the city council.
- Scenario A 2025: This scenario builds on "Ratified", while concentrating on the further extensive expansion of the road network in combination with a number of measures to improve cycling and walking conditions.
- Scenario B 2025: This scenario also builds on "Ratified", but transport interventions were instead concentrated on further improvements for walking and cycling, public transport services in Dresden and the wider region (additional service and route expansion) and intelligent transport demand management. Road infrastructure improvements were reduced in comparison to Scenario A.
- Scenario C 2025: This scenario resembles Scenario B, but assumes an even stronger behavioural change towards alternative mobility options, including integrated (mixed-use) living areas.

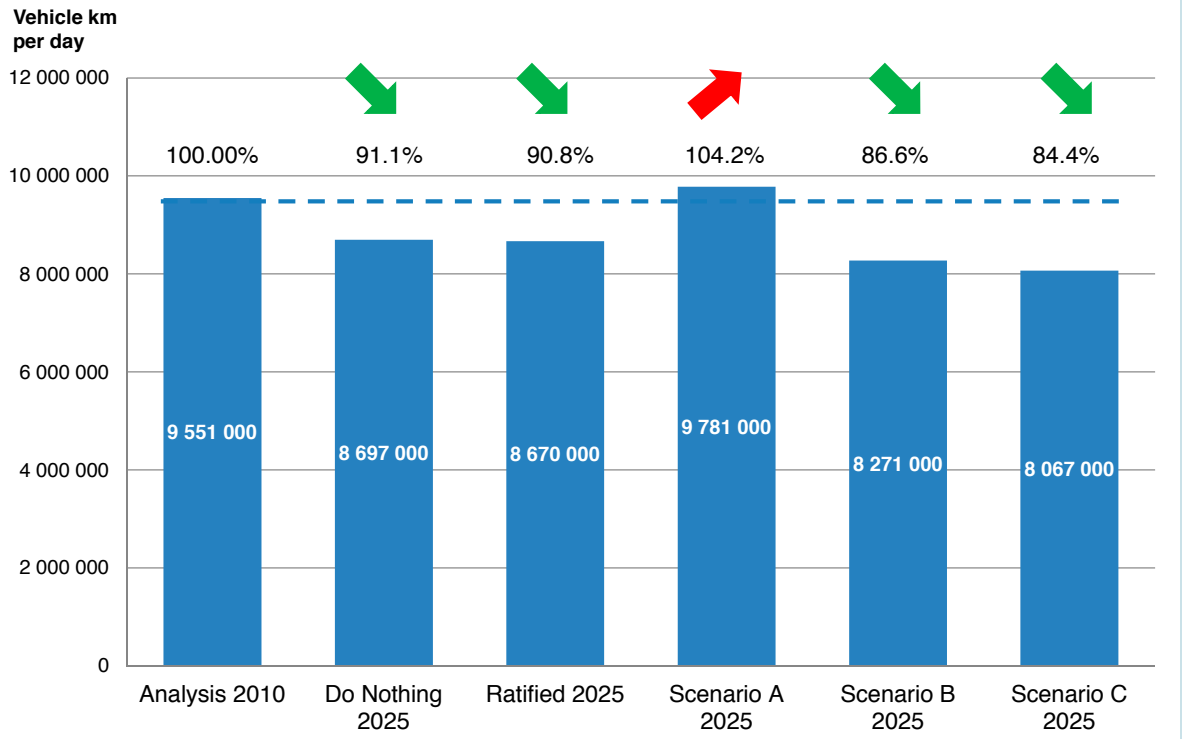


Figure 18: *Projected traffic volume for different VEP scenarios in the city of Dresden (car-km per day).*
Source: Landeshauptstadt Dresden, 2013

Using models based on these scenarios, future traffic volumes for each mode have been forecasted. As shown in Figure 18, private car traffic shall decline by about 9 % even without UMP-measures (the Do Nothing and Ratified scenarios), due to planned structural and expected behavioural changes. Scenarios B and C can reduce private car traffic volumes even further by concentrating on measures for public transport, walking and cycling. In stark contrast, the massive and costly road transport infrastructure expansion in Scenario A would massively hamper progress and reverse the trend towards sustainable mobility. (Landeshauptstadt Dresden, 2013).

Due to its ability to achieve most objectives and its practical feasibility, Scenario B has been chosen as the model for further discussion and planning steps.

2.3.2 Importance of non-motorised transport underplayed

Many cities lack data on non-motorised transport. The importance of pedestrians, bicyclists, cycle rickshaws and other less energy intensive modes is often ignored when planning for mobility improvements in cities. While many UMP frameworks address non-motorised transport, the focus finally given in many UMPs doesn't correspond with the high percentage of trips that are made via these modes. Even in developing cities with strong congestion and parking pressure, priority in terms of investment and urban space allocation is often given to private motorised transport.

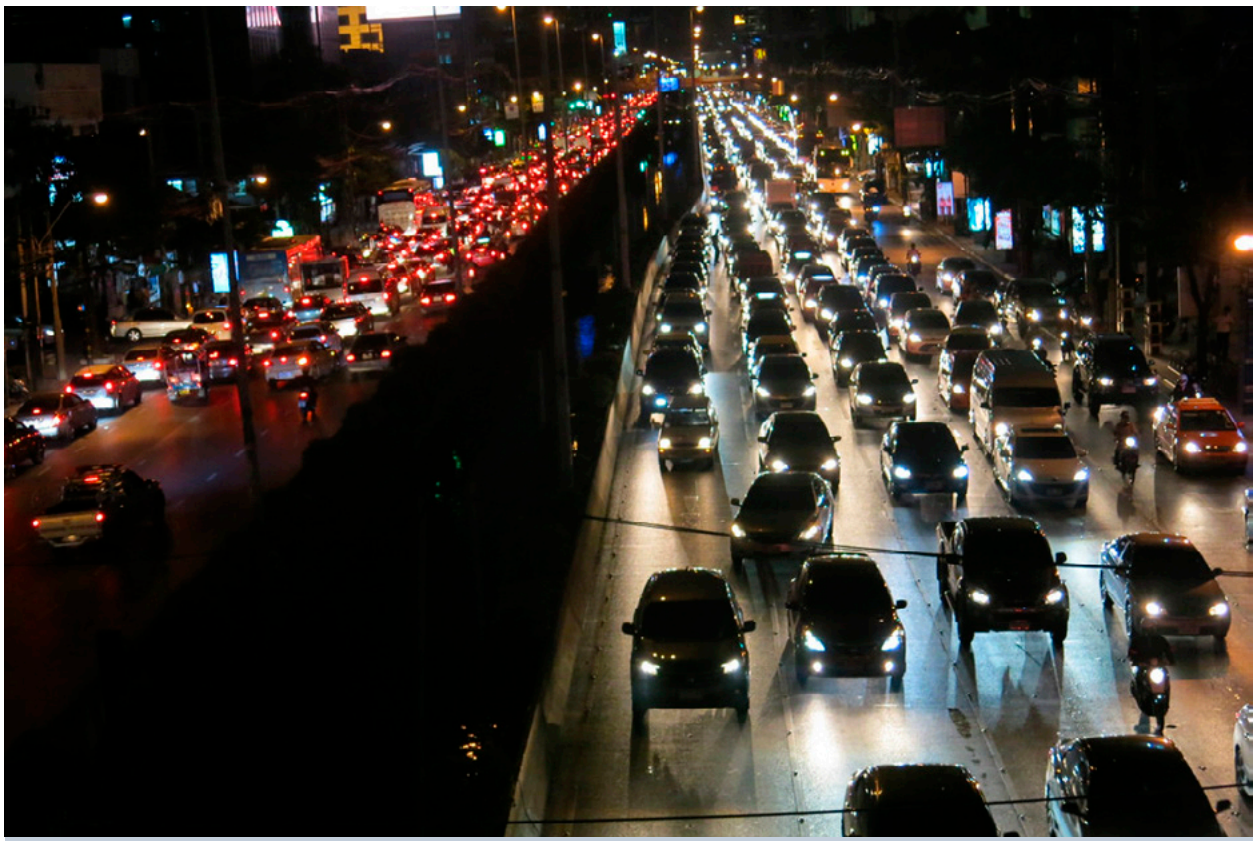


Figure 19: *Congestion in Bangkok.* © Manfred Breithaupt, 2013

In future transport network scenarios the potential impacts of non-motorised transport (NMT) facilities are often not considered. By not sufficiently supporting the future use of NMT modes, high potential for sustainable mobility may be lost for decades. As travel patterns change, inducing users to switch from car-oriented infrastructure and mobility behaviour back to non-motorised modes is much harder than establishing a focus on pedestrians, cyclists and public transport early on—as the experience from many European and some Asian cities shows.

In the review of UMPs of five Indian cities, The Energy and Research Institute noted serious gaps in the approaches to non-motorised transport, even though walking and cycling represent a quarter to half of all trips in these cities[4]. In each case, the UMP failed to give adequate detail about potential infrastructure and management interventions to facilitate and promote the use of NMT modes. In the San Francisco (USA) metropolitan area, the region's long-term transport plan states that "it is hard to accurately gauge the regional investment needed for pedestrian upgrades and safety countermeasures" when explaining why the plan does not contain specific strategies for improving pedestrian. The plan allocates less than 2 % of planned expenditures to NMT modes, which represent 13.4 % of all trips in the metropolitan area.

Figure 20 shows a reorientation regarding priority among transport modes. Applying such a priority scheme in UMPs can support safe, affordable and clean mobility for all, while in the same time minimising the negative effects of transport on urban development and the economy.

[4] See TERI, 2011

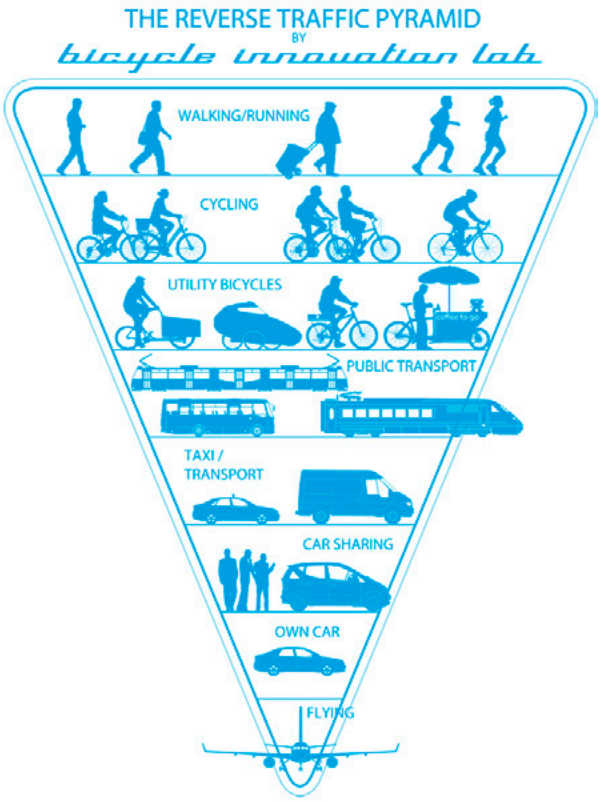


Figure 20: *The reverse traffic pyramid.*
Source: Bicycle Innovation Lab

2.3.3 Neglect of induced travel demand

Transport planners increasingly acknowledge that the expansion of road infrastructure is likely to induce additional vehicle travel. This may result in significant impacts on transport performance, increased downstream congestion, increased road and parking facility costs, accidents, energy consumption, pollution emissions and urban sprawl. However, many UMPs fail

Figure 21: *A new but already congested road in Jakarta; Nevertheless, the BRT system moves passengers save and quick.*
© Daniel Bongardt, 2009

Figure 22: *Barrier-free tram stop in Dresden (Germany), Stefan Belka, 2009*

to take these impacts into account. By ignoring these important impacts on transport performance, a UMP's long-term projections of the benefits of private vehicle infrastructure will not be accurate.

To address induced travel demand, UMPs should offer specific proposals of performance indicators for either the actual number of households owning private vehicles or the number of kilometres travelled by private vehicle each year.

Read more in SUTP's technical paper "Demystifying Induced Travel Demand", available at http://www.sutp.org/en-dn-tp.

2.4 Reconciliation between vision and strategy

Many UMPs set out an idealistic vision for how public transport and non-motorised mode shares should increase. Unfortunately, the inventories of proposed transport projects in the adopted scenario are sometimes not in line with these goals. For example, while UMP visions emphasise more equitable mobility practices (moving people not vehicles), some UMPs emphasise flyovers, elevated roads, junction improvement plans, parking lot expansion, bypasses and expressways. For example, the UMP for the city of Coimbatore (India) claims to give priority to public transport, walking and cycling. However, the plan allocates around 80 % of expenditures to flyovers, ring roads, pedestrian subways, and other projects that primarily benefit personal motor vehicle users.

Figure 23: *Off-street parking in Bangkok.* © Vedant Goyal, 2013

Ideally, UMP proposals should be held accountable to their ambitious goals. A mechanism and oversight framework is necessary to ensure that the numbers add up and that UMPs do support their stated mobility goals. All projects delivering on a UMP should be evaluated with respect to the UMP's stated goals.

Box 8: S.M.A.R.T. targets selection criteria

- **S**pecific – precisely described using quantitative and/or qualitative terms that are understood by all stakeholder.
- **M**easurable – the current situation has been measured and is known. Resources are also in place to measure the changes (qualitative and quantitative) that occur.
- **A**chievable – based or the technical, operational and financial competences available and stakeholder agreements/commitments that have been made.
- **R**elevant –stresses the importance of choosing targets that matter, that drive urban mobility forward and that support or are in alignment with other targets.
- **T**ime-bound – key dates for the achievement of the target are clearly defined.

Source: BUSTRIP Project, 2007

CASE STUDY 3

Milan (Italy) – Innovative mobility measures require clear planning frameworks

With 1.3 million inhabitants, Milan is the second largest city in Italy, and has a population density of approximately 7 000 people per square km (high compared to other European cities). Considerable efforts have been made through mixed land use planning to keep travel distances short within the city. This high population density is beneficial for the efficient operation of public transport services. However, as the centre of a bigger metropolitan area, Milan receives an additional 1 million commuters every day—nearly doubling the city's population.

About 5 279 000 individual trips are generated per day in Milan and between the wider agglomerations. Traffic to and from Milan is responsible for 2 235 000 trips daily, of which 58 % are done by car. Inside the city, the share is more balanced—cars only have a 30 % modal split. With a comparably high car ownership rate of 520 cars per 1 000 inhabitants and prevalent on-street parking, parked vehicles occupy a large extent of the public space. This space occupied by cars increases competition with more sustainable modes of transport—space that could be allocated to pedestrians, cyclists and public transport.

BOX 9: Innovative measures – Milan's congestion charge

In recent years Milano has put in place innovative policies and regulatory measures. A very effective, but in the past also heavily disputed measure is the city's road pricing scheme (called AREA C), which requires car drivers to pay a congestion charge when entering the city centre. Today, AREA C is well consolidated in the planning framework and the public acceptance has increased. The implementation of the congestion charge has been supported by a local referendum and comprehensive stakeholder involvement. The new political majority wanted to send a strong signal of strong policy change after the 2011 elections. The congestion charge system has built up on existing infrastructure of the previous Ecopass charging system (cameras, payment systems, etc.). This system targeted only vehicles with very high pollutant emissions and was therefore not effective in reduction traffic and congestion. The new system has shown to be a highly efficient pricing measure (managed by "technologies" to enforce it).

Area C is supervised and monitored by Milan's transport agency AMAT. One year after its implementation, traffic has been reduced by 28 % and road fatalities by about 25 %. Public transport trips have increased by 12 % for surface public transport and 17 % by underground. The occupation of public space by cars has decreased by 10 %. Emissions have reduced in coherence with traffic reduction. A public survey has shown that the majority of Milan's citizens support the congestion charge.

Figure 24: *Limited access for motorised vehicles to Milan's inner city (AREA C).*
© Comune di Milano, 2012

A new era of mobility planning

Triggered by legal attacks from opponents to Milan's road pricing scheme (called AREA C), Milan updated its Urban Transport Plan (PUT) in 2012 in order to abolish remaining legal uncertainties of the road charging scheme. The actual UMP process started in 2013 with a 2015 finalisation date. Milan's UMP process was launched to solve the city's major transportation challenges: road accidents, air and noise pollution, traffic congestion entering the city and parked cars occupying public space. Citizens, stakeholders, public bodies and institutions, and a scientific committee are contributing to a draft for the future of sustainable mobility in the city. Through this collaborative process, the city aims to increase public approval of its mobility policy.

In its first stage, UMP development has focused on the following ten categories, where policies and specific actions were outlined:

1. Sustainable mobility across the metropolitan region;
2. Public transport quality and efficiency;
3. Integrated rail system and services;
4. Accessibility in new urban development;
5. Road safety, walking and environmental zones;
6. Cycling commuting in the city;
7. Parking policies;
8. Smart mobility;
9. Urban freight logistics;
10. City for all, city without barriers.

Public transport service expansion has been identified as a priority. Possible metro extensions will be chosen on the basis of cost-benefit analyses and will focus on improving connection with the wider metropolitan area. At the same time, more cost-effective transport options are being considered, such as rapid bus services, better intermodal integration of public transport services, tram line prioritisation, improved user information, and electronic and integrated ticketing.

Shared mobility is another priority of the UMP. Bike and carsharing are promoted to stimulate sustainable mobility options, reduce car ownership rates and free up public space. To further encourage sustainable modes, conditions for walking and cycling will be enhanced through infrastructure improvements and 30 km/h traffic zones.

The feasibility of extending the congestion charge area and increasing its pricing scheme was investigated in the first stage of developing Milan's UMP. It has been assessed that the measure is currently very effective, but any extension or significant price increase at the current time could have negative social impacts. Therefore any extension of AREA C or adjustment of prices will most likely be integrated only as a long-term measure in Milan's UMP, not before the extension of Milan's metro system is finalised.

3. International approaches regarding urban mobility planning

Many countries around the world, such as Brazil, India and France have adopted national policy frameworks to encourage cities to develop Urban Mobility Plans. These frameworks range from legal requirements (*e.g.* in France and Brazil) to voluntary guidelines (*e.g.* Italy). Some countries without a legal requirement for municipalities to develop UMPs ensure widespread compliance by making them a prerequisite for receiving national funds for large-scale urban transport projects.

National UMP frameworks vary in their commitment to sustainable transport. Many countries are still using planning approaches that focus predominantly on the provision of private vehicle infrastructure (*e.g.* Ukraine). Countries such as Brazil, Mexico and India have now recognised the need of a more people-oriented approach to urban mobility planning, but are still exploring mechanisms to ensure that UMPs prioritise sustainable transport. This chapter provides an overview of national approaches to mobility planning, including their respective regulatory frameworks, objectives and planning processes.

3.1 National frameworks for urban mobility planning

UMPs are either mandated by the national government or they are a tool voluntarily developed by cities that have long been burdened by ever increasing problems of congestion, pollution, etc. In this respect, the national level is in the lead to implement a national urban transport policy which is coherent with overarching development goals. Many countries de-jure don't oblige municipalities to develop UMPs, but are doing it de-facto by making UMPs a requirement for receiving national funds for large-scale urban transport projects (*e.g.* Germany).

Brazil: Planos de Mobilidade Urbana (PMU)

Brazil's National Policy on Urban Mobility was revised in 2012. Under the new policy, cities with a population over 20 000 inhabitants are required to prepare UMPs, known as Planos de Mobilidade Urbana (PMU). For the first time in Brazil, this legislative framework mandates consideration of motorised as well as non-motorised transport. Further, PMUs must be harmonised with urban development master plans.

3 065 Brazilian cities as well as small urban agglomerations have to submit their PMUs to the Ministry of Cities by 2015; without PMU a city or agglomeration won't receive federal funding for transport investments. Depending on the specific planning area (city or agglomeration), the law sets minimum standards for topics to be covered and further elements of a PMU (*e.g.* requirements regarding stakeholder involvement). PMUs must be updated every ten years.

Figure 25: *New cycling track next to Belo Horizonte's BRT system "MOVE" (Brazil).*

France: Plans de Déplacements Urbains (PDUs)

France's framework for mobility planning mandates cities to prepare UMPs, known as Plans du Deplacements Urbains (PDUs), which specifically address the negative effects of increasing automobile traffic. PDUs are legally binding documents with a time frame of about 10 years for preparation, approval and implementation. PDUs

were first introduced in 1982 and became a legal requirement for cities with a population of over 100 000 under the 1996 Air Quality Act (Loi sur l'Air et l'Utilisation Rationnelle de l'Energie). The 2000 Solidarity and Urban Renewal Act (Loi relative à la Solidarité et au Renouvellement Urbain) made it mandatory for cities to include road safety targets in PDUs. Since 2010 PDUs also became a component of frameworks for climate change. The process of creating a PDU takes between two and four years. As per Air Quality Act, a comprehensive public consultation is required before a PDU can be ratified and implemented.[5]

[5] More details and a deeper analysis of the French experience with the PDU can be found in CERTU, 2012 and CERTU, 2013.

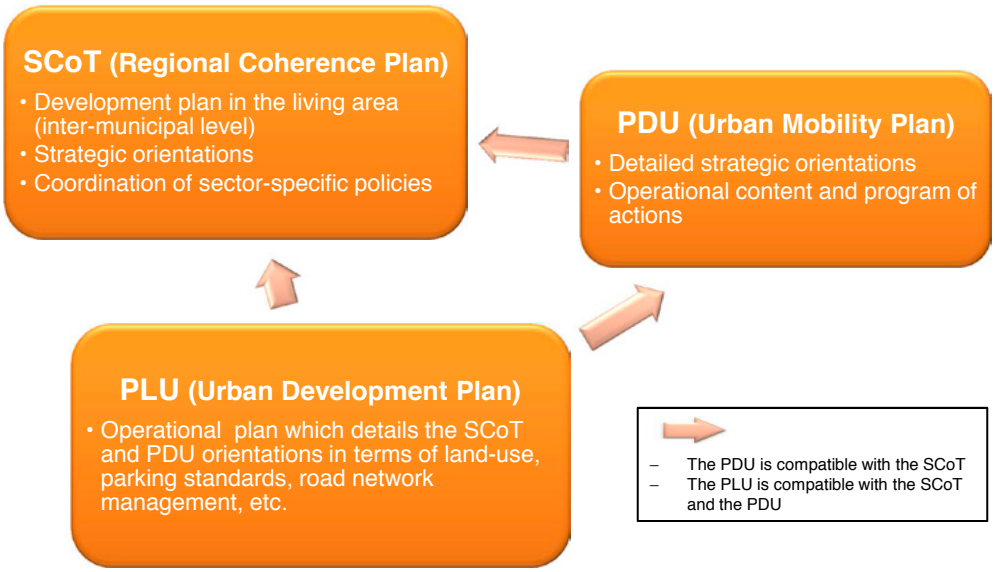


Figure 26: *The PDU in the Hierarchy of Urban Planning in France.* Source: CERTU, 2013

Germany: Verkehrsentwicklungspläne (VEP)

In Germany, the so called Verkehrsentwicklungsplan (VEP, transl.: Transport Development Plan) is the standard mobility planning document on municipal and regional level.

Transport development planning is an integrated, forward-looking, systematic preparation and realisation of decision-making processes with the purpose of influencing movements of people and goods within a planning area by structural, constructional, operational, regulatory, tariff and price political measures towards certain strategic aims.

Source: Ahrens, 2008

While there is no explicit legal obligation to prepare VEPs, certain elements in national legislation make VEPs a de facto requirement:

- Obligatory municipal land use plans, air quality plans, noise reduction plans and public transport plans rely on data and information input from VEPs;
- Federal funding for large-scale urban transport projects is contingent to a VEP;
- The federal law on municipal land use planning constitutes calls on cities to prepare UMPs.

India: Comprehensive Mobility Plans (CMP)

In 2005, the Indian Ministry of Urban Development launched a large-scale urban infrastructure initiative known as the Jawaharlal Nehru National Urban Renewal Mission (JNNURM). Every urban area was required to prepare a Comprehensive Mobility Plan (CMP) prior to applying for JNNURM funding (see Figure 27). Presently, over 50 cities have developed CMPs and many smaller cities, not identified under the JNNURM, are in process of preparing CMPs. CMPs were expected to align with India's National Urban Transport Policy (NUTP), adopted in 2006. The NUTP gives clear emphasis to walking, cycling, and public transport, stating that transport planning should focus on "moving people, not vehicles". The Indian government is currently (as of September 2014) working to update the programme, as JNNURM concluded in 2013.

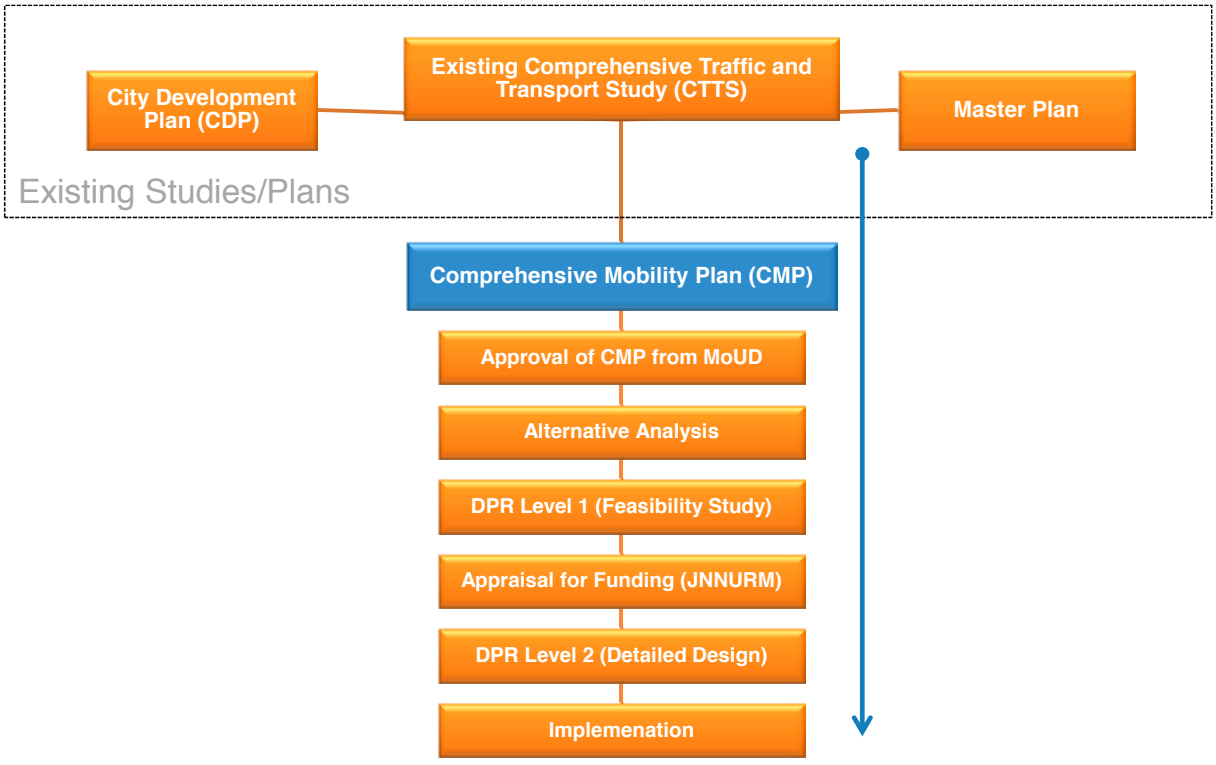


Figure 27: *Role of CMP in JnNURM process.* Source: MoUD, ADB 2013

BOX 10: India's National Urban Transport Policy (NUTP)

In India, an economically diverse and quickly developing country of 1.2 billion people, a landscape of rapid motorisation, in the form of roadways and elevated overpasses, has emerged in response to congested streets and aspirations for increased personal mobility. While Indian cities have historically developed with fine-grained urban forms and dense cores that support modes of transport that are low cost and energy efficient, such as walking and bicycling, Indian cities have recently become more centralised and oriented towards private vehicles (scooters, motorcycles and automobiles). Despite rapid growth in motor vehicle ownership and use, walking and cycling continue to be the predominant modes of transport in Indian cities.

The Ministry of Urban Development (MoUD) announced the National Urban Transport Policy (NUTP) in 2006. The NUTP promotes the use of public transport and non-motorised modes in Indian cities. It also encourages integrated land use and transport planning in order to minimise travel distances and to provide access to markets, employment, education and social services. The NUTP promotes safe, affordable, reliable and sustainable mobility practices. Harmonising national projects and policies are the explicit goal of the MoUD. Targets of the NUTP include:

- Ensuring coordinated planning for urban transport;
- Ensuring integrated land use & transport planning;
- People focused & equitable allocation of road space;
- Investments in public transport & non-motorised modes;
- Strategies for parking space and freight traffic movements;
- Establish regulatory mechanisms that will ensure equitable distribution of resources;
- Innovative financing methods to raise resources;
- Promote intelligent transport systems (ITS), cleaner fuel & vehicle technologies;
- Projects to demonstrate best practices in sustainable transport;
- Build capacity to plan for sustainable urban transport.

Adapted from MoUD, ADB, 2013.

Figure 28: *BRT station in Ahmedabad (India).* © Cornie Huizenga, 2009

Italy: Piano Urbano della Mobilità (PUM)

Italian Urban Mobility Plans, or PUMs, are a voluntary enhancement of the mandatory Urban Transport Plans (PUT; Piano Urbano del Traffico), which have been mandatory for cities with over 30 000 inhabitants since 2000. The National Law 340/2000 promotes the adoption of PUMs for municipalities with more than 100 000 inhabitants as an effective tool to tackle local mobility challenges. While PUTs are a requirement for receiving national funds for urban investments, many Italian municipalities voluntarily prepare PUMs which contain a broader vision and strategy for urban mobility. The Ministry of Transport and Infrastructure released guidelines for PUMs in 2007.[6] PUMs are updated every two years and have a lifespan of ten years.

Mexico: Plan Integral de Movilidad Urbana Sustentable (PIMUS)

Since 2008, the Mexico's National Infrastructure Fund (FONADIN) and the Federal Mass Transit Support Program (PROTRAM) have promoted the preparation of UMPs. PROTRAM focuses on the modernisation of

[6] See Ministero dei Trasporti, 2007

public transport systems in cities with over 500 000 inhabitants. The Urban Transport Transformation Project (PTTU) aims to comprehensively strengthen public transport, non-motorised transport and clean vehicle technologies. To receive funds from the Mexican Development Bank (BANOBRAS) for transport projects in the context of PROTRAM and PTTU, cities are required to develop Comprehensive Urban Sustainable Mobility Plans (PIMUS; Plan Integral de Movilidad Urbana Sustentable).

At present, 42 cities are planning public transport proposals under PROTRAM. The program calls for a transparent, inclusive, and participatory planning process that strengthens trust between the government and society.

Figure 29: *Barrier-free access to BRT bus in Mexico City.*
© Manfred Breithaupt, 2010

Ukraine: Transport Master Plans (TMP)

The process of mobility planning in Ukraine is regulated at the national level by legislation and construction norms that mandate the preparation of transport infrastructure plans. Transport Master Plans are typically developed by municipal or state planning institutes without wider stakeholder consultation and with very limited strategic vision. Ukrainian legislation ostensibly requires the involvement of the public in the preparation of a Transport Master Plan, but public input is rarely incorporated in the final recommendations. The Plan also must be reviewed by an authorised institute.

3.2 Objectives and targets

The objectives of particular Urban Mobility Plan approaches differ from country to country. As stated earlier, the process of urban mobility planning mostly includes the development of a common vision for the development of transport and mobility in a city or region.

In just a few cases it is recognisable that Urban Mobility Plans are used as a tool to achieve overarching policy targets. An effective way of pursuing *i.e.* national energy or climate emission reduction targets are particular requirements to prioritise measures for walking, cycling and public transport, as well as the gathering of mobility indicators (*e.g.* modal split data, road safety figures, air pollution levels). This allows national authorities to assess whether urban transport systems contribute to over-arching policy targets.

Brazil: Planos de Mobilidade Urbana (PMU)

The PlanMob guidelines for the preparation of PMUs call for transformational change rather than interventions that reinforce existing mobility trends centred on private motor vehicles ownership and use. As per guidelines and according to the National Policy on Urban Mobility, a PMU should:

- Identify ways to reduce the number of trips done by private car and increase the trip share of walking and cycling. Cities without a public transport system are expected to prioritise non-motorised transport.
- Reduce energy consumption and emissions of local pollution and greenhouse gases.
- Improve safety, particularly for vulnerable groups (*e.g.*, pedestrians, cyclists, elderly and children).

PMUs are expected to be consistent with other national policies goals in various areas, including environment, energy and health.

To put the before-mentioned targets in practice, Brazil defines basic requirements for a PMU, *i.e.* like setting of modal split targets and environmental goals. Table 3

Table 3: Elements of Urban Mobility Plans in Brazil

Objective	Implications
Modal Split	Modal split targets should be defined, *e.g.* a limitation of trips done by private car or an increase of the trip share of walking or cycling.
Set environmental goals	Reduction targets for energy consumption, pollutant and greenhouse gas emissions shall be incorporated in consistence with national policies targets in the sphere of climate, energy, environment and health.
Integrated mobility systems	The urban transport network shall integrate all forms of transport. Infrastructure and integration measures shall be identified and prioritised according to the local travel demand. The principles of Transit Oriented Development (TOD), and People Oriented Development (POD) shall be followed.
Improving public transport	... by reallocating road space (*e.g.* introducing bus corridors and lanes) the attractiveness and operational efficiency of public transport can be increased, while creating disincentives for the use of private cars at the same time.
Travel demand management	Regulatory, economic and physical measures shall be defined, which support a shift from private motorised transport to walking, cycling and public transport.
Social control	Active communication as well as stakeholder and civic participation shall ensure social inclusion and public control over the implementation of the mobility policy.
Funding	The PMU shall identify financial sources for its realisation (*e.g.* public funds, fees and taxes, public private partnerships)
Setting indicators	... for monitoring implementation process and results of the mobility plan's implementation.
Setting a timeline	... for the project implementation and evaluation
Safety	Fatality reduction targets shall be defined with special focus on vulnerable groups (pedestrians, cyclists, elderly and children).

Source: Boareto, 2008

provides an overview on objectives which have to be addressed in PMUs.

France: Plans de Déplacements Urbains (PDUs)

The PDU is a general mobility planning tool which is used to prioritise and set out how measures will be financed. It is also an important tool to realise objectives and legal requirements on road safety, access to transport for people with disabilities and environmental protection.[7]

Measures specified within PDUs are typically designed to reduce private car trips and to increase the use of transit and non-motorised modes (*e.g.* through transport demand management policies, mobility management schemes, carpooling and carsharing). Further, PDUs dedicatedly specify measures to boost parking management schemes, regulations for urban freight distribution as well as efficient road network management and operation. To assess the effectiveness of these measures, a set of locally selected performance indicators is used.

PDUs are legally binding documents with a time frame of about 10 years for preparation, approval and implementation. Priority is being given to the development of

[7] Source: CERTU, 2012

urban transport facilities, infrastructures and services in already built-up areas in order to support compact and transit-oriented development. As a result of the exhaustive public auditing process and the priority setting process, PDUs have gained political relevance as they also present a future-oriented vision for urban mobility and development. They are seen as highly effective instrument to push transit system upgrades, bus and light rail priority schemes, cycling transport development and parking management.

Figure 30: *Bus and taxi lane in Avignon (France).* © Broaddus, 2007

Germany: Verkehrsentwicklungspläne (VEP)

The main objective of Transport Development Planning in Germany is to balance urban transport with special focus on social and environmental requirements by following an integrated approach to control and influence the development of transport in a municipality or region. The process comprises all modes of transport. Transport development planning shall minimise the risk of heavily increasing mobility costs and increase efficiency

Figure 31: *Priority for cyclists at an intersection in Münster.* © Mathias Merforth, 2013

and effectiveness of transport planning processes in general.[8]

Further objectives of Transport Development Planning in Germany are, *e.g.*

- To coordinate and to provide an integrated database for all sectorial planning processes with relevance for transport (*e.g.* land-use planning, air quality planning, climate change action plans or public transport plans);
- To identify and assess the correlations of measures for different transport modes as well as to evaluate the impacts of different transport development scenarios on environment, economy or health (at the same time reducing the need for expensive impact assessments for individual transport projects);
- To react to changing framework conditions, *e.g.* demographic change or rising energy prices;
- To create the necessary legal security for transport system interventions.

India: Comprehensive Mobility Plans (CMP)

The main objective of a CMP is to develop a long-term strategy to manage the mobility demand of a city in a sustainable manner. Hence, a CMP should:

1. Provide a long-term vision, goals and targets for desirable urban development;
2. Illustrate a basic plan for urban development and include a list of proposed urban land use and transport measures to be implemented within a time span of 20 years or more; and
3. Ensure that the most appropriate, sustainable and cost-efficient urban mobility projects and measures are realised.

The toolkit prepared by the Ministry of Urban Development explains that CMPs should emphasise walking, cycling, and public transport rather than personal motor vehicles. The guidelines state: "As noted by many observers, more roads attract more traffic and new flyovers transfer bottlenecks to neighbouring intersections. As such, road projects will not solve traffic congestion forever".[9] The guidelines further advise that CMPs should seek a reduction in the number of personal motor vehicles by emphasising transit-oriented development and investments in facilities for sustainable transport modes. While the toolkit defines a clear direction for CMPs, shortcomings in the evaluation process for CMPs have meant that few plans follow the spirit of the guidelines.

Here are some of the observed gaps, when reviewing various CMPs prepared by Indian cities:

- A lack of 'ownership', understanding and feasibility of CMPs;[10]
- A lack of political priority-setting;
- The lack of pavements and cycling infrastructure was not properly addressed in most CMPs;
- Greenhouse gas emissions were not sufficiently addressed;[11]

[8] Source: FGSV, 2013

[9] Source: MoUD, ADB, 2013

[10] Many plans were solely developed by consultancy firms without wider stakeholder involvement

[11] The approach suggested for analysing climate change actions under the National Action Plan for Climate Change (NAPCC) is not adopted by the CMP.

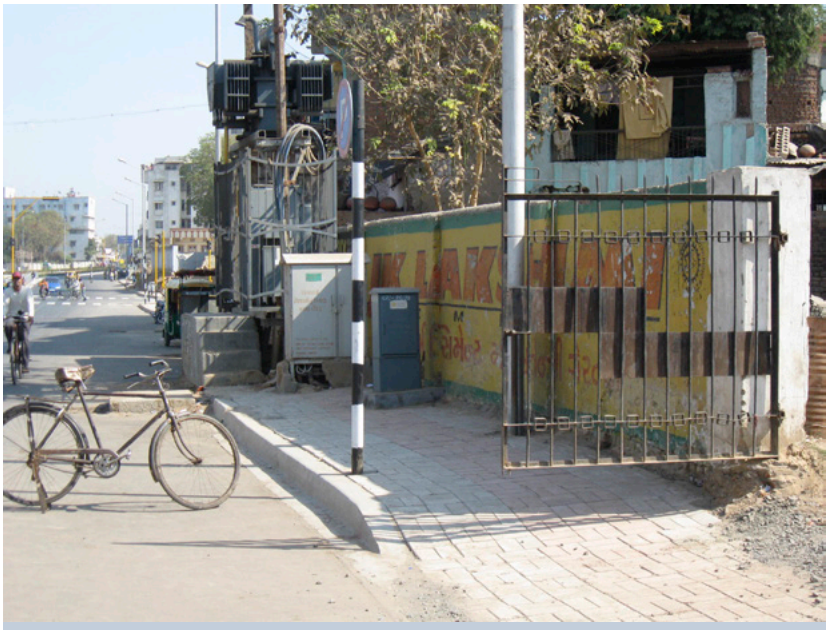


Figure 32: *Inappropriate infrastructure for pedestrians and cyclists should be addressed by Urban Mobility Plans.*
© Ahmedabad (India), Christopher Kost, 2014

- A lack of proper monitoring and evaluation after project implementation makes it hard to assess whether or not goals are achieved;
- Recommendations and mechanisms for periodic revision and updating a CMP were not sufficiently outlined.

Following up the review of CMPs under the JNNURM phase 1, the CMP process has been revised[12]. The revised toolkit more comprehensively addresses environmental issues and the mobility needs of all population groups (especially the urban poor). It promotes elements which were side lined or entirely missing from the previous version more comprehensively.

Italy: Piano Urbano della Mobilità (PUM)

While the prime focus of PUTs was on providing infrastructure, PUMs provide a comprehensive long-term strategy to manage private traffic, public transport, parking, and urban logistics, to implement intelligent transport system (ITS) technologies as well as supporting measures such as mobility management, carpooling, carsharing and bike sharing.

Mexico: Plan Integral de Movilidad Urbana Sustentable (PIMUS)

A PIMUS is expected to develop an integrated mobility and land-use strategy and a plan for greater coordination among administrative units. In addition, a PIMUS must present a holistic evaluation of transport system impacts. Therefore, it is necessary to assess the impact of transport activities on health, environment and the quality of life – not just on economic indicators.

Ukraine: Transport Master Plans (TMP)

The objectives of mobility planning in Ukraine are still characterised by a strong focus on the expansion of road capacity and transport infrastructure. In the same time, the feasibility of projects defined in Transport Master Plans (TMP) is often not adequately considered. Further, the role of sustainable transport modes is not yet widely recognised. So far, traditional TMPs not yet focus on actual mobility requirements in Ukrainian cities.

Figure 33: *Reckless parking hampers the movement of pedestrians; The only solution: comprehensive parking management and effective enforcement; Bus stop in Lviv (Ukraine).*

[12] By the Institute for Urban Transport (IUT) together with UNEP Risoe Centre and Indian Partners (Indian Institute of Technology, Delhi, CEPT Ahmedabad, Indian Institute of Management, Ahmedabad and consultants).

CASE STUDY 4

Nagpur (India) – A common vision with ambitious targets for urban mobility

Nagpur ("Orange City") is the winter capital of Maharashtra state and located in the central part of India. It is the third largest city in Maharashtra state, following Mumbai and Pune, with a 2011 census population of 2.4 million and 3.3 million in the metropolitan area.

The Nagpur Improvement Trust (NIT) commissioned the local Urban Mobility Plan that aims to integrate land use and transport and support the development of safe and sustainable mobility for the people of Nagpur. The UMP's vision is ...

> **... to ensure that Nagpur will have a systematically planned urban transport system for the mobility of people and goods that is safe, efficient, economical and sustainable, which aims to support economic development while improving liveability.**
>
> *Urban Mass Transport Company Limited, 2013*

To ensure that mobility solutions for Nagpur region are effective, sustainable and contribute to a liveable city for residents and visitors, the NIT formulated four high level goals: "develop accessible and efficient public transit"; "ensure pedestrian and cyclist safety and mobility through the design of streets and urban space"; "implement economically viable and environmentally sustainable mobility schemes for efficient and effective movement of people and goods"; and "develop a parking management system that regulates parking and reduces private car use".[1] The goals are paired with a set of quantitative indicators, as shown in Table 4.

While the high-level goals present a progressive agenda of sustainable transport investments, the specific objectives under each goal present a contradictory approach. For example, the objectives call on the city to "develop medium/long term measures such as ring roads, new links, road network development, flyovers, underpasses as well as railway over and under bridges to ease traffic flow along major roads within the city" and "create off-street parking (wherever possible multilevel parking) ... to meet the growing parking demand". Fortunately, the CMP's final investment plan fails to pursue the former objective, as described below.

Table 4: Indicators and targets in the Nagpur Comprehensive Mobility Plan

Index	Description	Formulation	Existing	Target
Average speed of network	Average running speed (km/h)	Average running speed for all vehicles	27	35
Modal share of public transport	Modal share	Public transport trips/total study area trips	10%	30%
Modal share of non-motorised transport	Modal share	NMT trips/total trips	25%	60%
Accessibility	Percentage of work trips with travel time <15min	Work trips with travel time less than 15 min/total trips	8%	40%
Bus supply (Nagpur City)	Bus fleet	No. of buses/100 000 population	8	50
Walkability	Availability & usability of foot paths	Footpath length in km/total road length in km x 100	70%	100%
Bikability	Availability & usability of cycle paths	Cycle path length in km/total road length in km x 100	0%	100%
Fatality rate	Fatal traffic accidents	No of fatalities/100 000 population	9.59 (2012)	0

(adapted from Urban Mass Transport Company Limited, 2013)

[1] Ibid.

There is no singular approach or solution to easily solve the issue of urban mobility. Thus, the UMP for the Nagpur Metropolitan Area employs a multipronged strategic approach. Key among these strategies are the restructuring of main radial roads and the Inner Ring Road as mobility corridors that maximise throughput of people, favouring mass transport and non-motorised traffic over personal vehicles. A combination of LRT (light rail) and BRT (bus rapid transit) systems are proposed for these mobility corridors. In addition, the UMP calls for the augmentation of the city bus fleet; the introduction of supporting infrastructure such as bus shelters and IT-based customer information; and the implementation of a bike-sharing system to improve last-mile connectivity. The UMP also calls for the creation of a comprehensive network of footpaths and cycle tracks.

The UMP includes some elements that run counter stated goals of promoting sustainable transport. In particular, the UMP proposes five multi-story parking structures and even suggests constructing additional underground parking below public parks in the city. The UMP does not present any data, such as existing parking occupancy rates, to justify the parking proposals. Measures for managing on-street parking are discussed briefly but are not included in the final list of project proposals.

The investment programme proposed by the UMP is for the most part consistent with the plan's sustainable transport goals. The majority of funds are devoted to pedestrian, cycle and public transport infrastructure. The five proposed multi-story parking structures notwithstanding, the UMP is largely free of massive allocations toward flyovers, ring roads and other private vehicle-centric infrastructure that are common to many Indian city UMPs.

Despite extensive investments in public transport, the UMP's modelling results indicate that these measures will have little impact on the dominance of private vehicle use in Nagpur. Over a period of 20 years, the public transport mode share rises from 10 to 18 % of motorised trips, well short of the UMP's goal of a 30 % share for public transport. With regard to the goal of increasing the use of NMT to 60 % of all trips, the UMP does not estimate the impact of the proposed pedestrian and cycle projects on NMT use. Meanwhile, the UMP envisions a near doubling of trips by private motor vehicles over the same period. Such an increase would put a tremendous strain on the city's transport network, resulting in slower public transport speeds, increased fatalities from traffic collisions, and greater pollution. Unfortunately, the UMP fails to explore these contradictions.

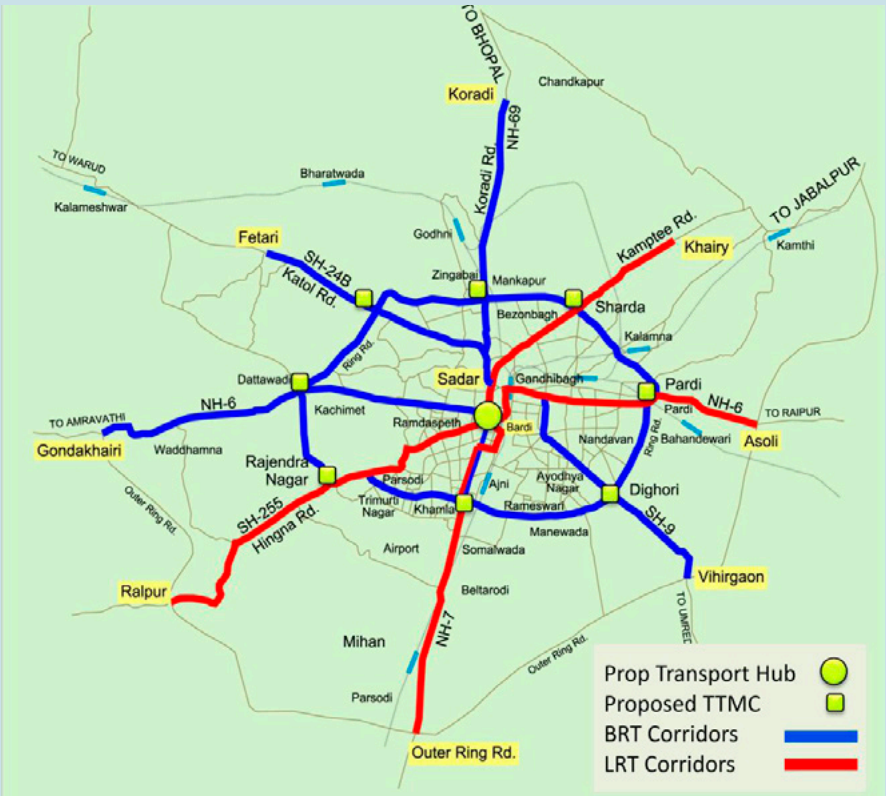


Figure 34: *Planned mass transit system in Nagpur.*
Source: Urban Mass Transport Company Limited, 2013

3.3 Planning processes

The following chapter describes implications for urban mobility planning in the chosen countries. Various countries provide helpful guidance on urban mobility planning to local levels, *e.g.* by the help of designated guidelines. While Germany and France benefit from long-lasting experience in urban mobility planning and overall good institutional environments, other countries close up by improving institutions, evaluating the effectiveness of their policies, updating guidelines (and policies) as well as implementing ambitious capacity building initiatives (*e.g.* Brazil).

Brazil: Planos de Mobilidade Urbana (PMU)

The PlanMob guidelines from 2007 serve as a guide for the preparation of PMUs. They contain a step-by-step methodology for urban mobility planning, but also a set of tools, measures and policies which can be adopted by cities. Further, the guidelines suggest indicators for urban transport development. They are currently being revised to meet the legal requirements of the National Policy on Urban Mobility from 2012. The revised guidelines are expected by the end of 2014.

Figure 35: *Brazil's Guidelines for Urban Mobility Planning*

According to the guidelines, a PMU is expected to begin with a discussion of the transport challenges that the city is facing. The plan must identify objectives for the transport system, thereby addressing the question of "why to do it" before highlighting "what to do". PMUs

Figure 36: *Draft PMU process for the updated PlanMob Guidelines*

Figure 37: *BRT corridor in Curitiba (Brazil).* © Matthias Kiepsch, 2011

must address public transport, non-motorised transport, accessibility, parking, goods movement and project financing. PMUs must set explicit quantitative targets for goals related to the mode split, environmental impacts and other indicators. They must also report on the extent of stakeholder and citizen participation in the preparation of the plan.

The rapid growth of cities and motorisation in Brazil has shown that strategic urban mobility planning is crucial to assure the mobility of people and goods in the long-run. The new law from 2012 presents a wider view on urban mobility and urban development then previously. For additionally building-up the necessary capacities at local administrations, the Ministry of Cities organises local and e-learning courses for planners in coherence with the requirements of the new law. As Brazil is going to invest about BRL 140 billion (EUR 46bn/USD 58bn) for urban transport until 2020, PMUs are intended to support the optimal use of funds.

France: Plans de Déplacements Urbains (PDUs)

A PDU begins with a discussion of the strengths and weaknesses of the area's transport system. Completed studies and on-going projects as well as previous discussions on transport and urban development are taken into account. Strategic objectives are then formulated

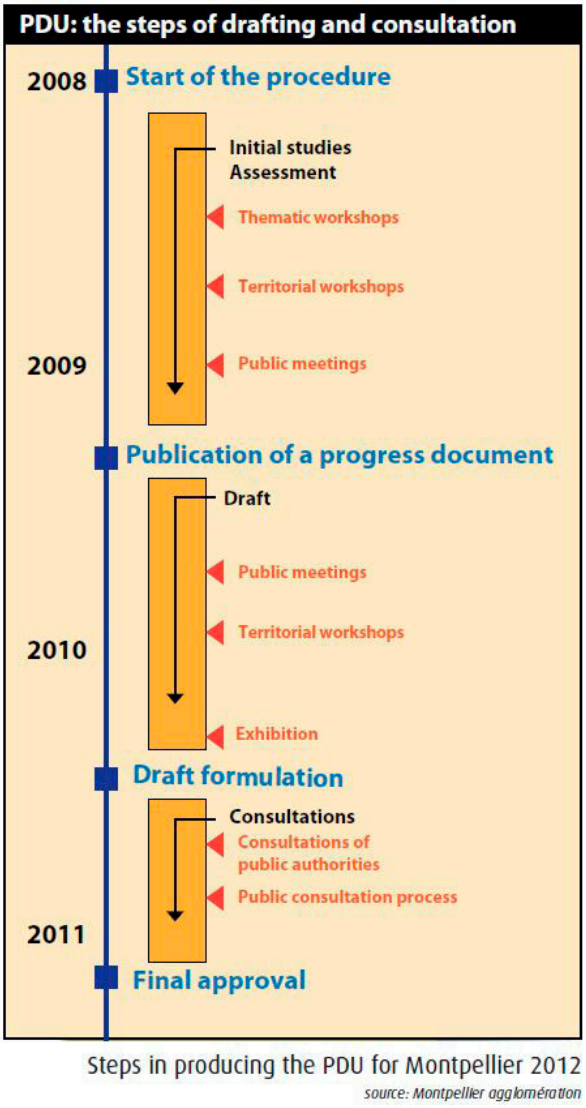


Figure 38: *Steps of drafting and consultation in a PDU process.* Source: CERTU, 2012

to address the identified shortcomings in the city's transport system. The next step is the development and analysis of different scenarios to gauge the impact of different policy choices. To assess the effectiveness of these measures, a set of locally selected performance indicators is used. The most desirable scenario is identified. Then, a first draft is developed which brings together a set of transport measures which serves as input for the following public consultations. A PDU must include a detailed financial plan and implementation timeline. The process of creating a PDU takes between two and four years.

Evaluation and review of the PDU is required every five years. Many authorities have created PDU observatories that evaluate annual progress in the realisation of PDU goals.

BOX 11:
Broad consultation throughout the process: the Grenoble PDU currently being drafted

The air quality law LAURE requires comprehensive public consultation before a PDU can be ratified and implemented. Citizens not only have to be informed about the objectives and measures of the PDU, but consultations also serve to generate critical feedback to decision makers. As citizens are able to articulate concerns and needs as well as to propose alternative solutions, the final mobility plan can be oriented closer on local priorities than without wider civic participation.

The Grenoble Urban Transport Authority (AOTU) consultation is being organised in several different ways: PDU "cafés" (open to all), citizen workshops (around 30 residents discussing the PDU), a committee of 'wise men' (around 15 experts to determine the main issues associated with mobility and offer broad guidelines) and the PDU universities (conferences open to all).

Through national transport legislation, the PDU has evolved into a reference and integrative programming document for mobility, urban development, social cohesion and environmental protection. The French government effectively decentralised power and gave local authorities increased power over urban transport policy (including street usage, parking, access for disabled persons and integration with local planning bodies). Since their creation in the 1980's, PDUs have effectively influenced mobility investments. Priority is being given to compact and transit-oriented development in existing urban centres. Cities have shown decreasing car use, public transport systems developed and more people walk and cycle. PDUs are seen as effective instruments to push public transport upgrades, bus and light rail priority schemes, cycling facilities and parking management.

The EU promotes PDUs as a successful model for a Sustainable Urban Mobility Plan.

More details and a deeper analysis of the French experience with the PDU can be found in CERTU, 2012 and CERTU, 2013.

Figure 39: *Tram in Grenoble (France), Robin Hickmann, 2010*

Germany: Verkehrsentwicklungspläne (VEP)

The VEP process is divided into five stages according to the classical process of target-oriented transport planning: an orientation on existing conditions in the city; identification of transport challenges; evaluation of the potential of measures; a selection of a final investment programme; and a process for implementation and impact monitoring.[13]

Recently, the German Road and Transport Research Association (FGSV, Forschungsgesellschaft für Straßen- und Verkehrswesen) updated guidelines for the preparation of VEPs.[14] The guidelines outline and expand

[13] Source: Ahrens, 2005; FGSV 2001

[14] See FGSV 2013

the scope for VEPs, in line with the framework for Sustainable Urban Mobility Plans adopted by the European Commission.

Figure 40: *German recommendations for transport development planning; See also FGSV, 2013*

There is long lasting experience in transport planning in Germany. Many municipalities have a VEP, and many such plans have been incrementally updated and improved over the decades. Over time, VEPs have transitioned from a focus on infrastructure-based planning to a more comprehensive view on mobility issues. More recent VEPs contain a strategic vision on sustainable urban mobility as well as a set of innovative measures and approaches developed through a participatory stakeholder process.[15] Municipalities in Germany have successfully employed modern instruments of civic participation, such as online platforms and citizen walks.[16] Informed by such stakeholder processes, VEPs can facilitate the development of a shared vision for the mobility system among multiple stakeholders. In this way, the chances for producing a widely accepted planning document with an effective set of measures rises significantly.[17]

Box 12:
The history of transport planning in Germany

Transport planning in Germany evolved over the time in different eras. Beginning with the paradigm of the car-friendly city, planning since the middle of the 1950's focused almost solely on the demand-oriented expansion of road infrastructure and designs pre-dominantly meeting the requirements of private motorised transport (Ahrens, 2008) The methodology of the first "General Transport Plans" (Generalverkehrspläne) slowly changed towards a more target-oriented planning process, largely supported by the first guidelines on general transport planning (published by the FGSV in 1979) which where continuously further developed. A real paradigm shift towards using a variety of measures which can effectively influence transport demand, just took place in the 1980s and 1990s.

India: Comprehensive Mobility Plans (CMP)

The Indian Ministry of Urban Development's guidelines for the preparation of CMPs outline five key elements: identification of the scope of the plan; data collection and analysis of existing transport conditions; overall transport development strategies; mode-wise improvement plans; and implementation timelines and budgets. The various tasks and sub-activities of the revised CMP preparation process are listed in Box 13.

[15] Transport development planning allows coordination of mobility planning with overarching planning documents, neighboring communities and all relevant stakeholders. The experience has shown that insufficiently coordinated public transport plans, air quality plans, noise reduction plans and other documents may create significant additional efforts by repeated planning with possibly counter-productive measures (Source: Ahrens, 2013).

[16] See also BMVI, 2014 – a handbook providing recommendations for civic participation to authorities at local and regional levels.

[17] Adapted from FIS, 2014

Box 13: Tasks and activities of the CMP preparation process

TASK 1: Defining the Scope of the CMP

TASK 2: Data Collection and Analysis of the Existing Urban Transport Environment

- Task 2-1 Review of the City Profile
- Task 2-2 Delineation of Traffic Analysis Zones
- Task 2-3 Review of Land Use Pattern & Population Density
- Task 2-4 Review of the Existing Transport Systems
- Task 2-5 Data Collection Approach – Methodology and Sources
- Task 2-6 Study of Existing Travel Behaviour
- Task 2-7 Review of Energy and Environment
- Task 2-8 Analysis and Indicators (Comparison with Benchmarks)

TASK 3: Development of Business As Usual (BAU) Scenario

- Task 3-1 Framework for Scenarios
- Task 3-2 Socioeconomic Projections
- Task 3-3 Land Use Transitions
- Task 3-4 Transport Demand Analysis
- Task 3-5 Technology Transitions
- Task 3-6 CO_2 Emissions and Air Quality
- Task 3-7 Analysis and Indicators (Comparison with Benchmarks)

TASK 4: Development of Sustainable Urban Transport Scenarios

- Task 4-1 Framework for Scenario
- Task 4-2 Strategies for Sustainable Urban Transport Scenario
- Task 4-3 Transport Demand Analysis of Alternative Strategies for Sustainable Urban Transport
- Task 4-4 Technology Transitions under a Low Carbon Scenario
- Task 4-5 CO_2 Emissions and Air Quality (Refer task 3-6)
- Task 4-6 Analysis and Indicators (Comparison with Benchmarks)

TASK 5: Development of Urban Mobility Plan

- Task 5-1 Integrated Land Use and Urban Mobility Plan
- Task 5-2 Formulation of the Public Transport Improvement Plan
- Task 5-3 Preparation of Road Network Development Plan
- Task 5-4 Preparation of NMT Facility Improvement Plan
- Task 5-5 Preparation of Mobility Management Measures
- Task 5-6 Preparation of Regulatory and Institutional Measures
- Task 5-7 Development of Fiscal Measures
- Task 5-8 Mobility Improvement Measures and NUTP Objectives

TASK 6: Preparation of the Implementation Program

- Task 6-1 Preparation of Implementation Programs
- Task 6-2 Identification and Prioritisation of Projects
- Task 6-3 Funding of Projects
- Task 6-4 Monitoring, of CMP Implementation

Source: MoUD, ADB, 2013

The revised CMP process requires establishing an advisory committee which guides and supervises the entire process. It also specifies roles for external stakeholders. Figure 41 provides an overview of key stakeholders.[18]

[18] It can be argued, that comprehensive stakeholder involvement and public supervision of the development of the plan and its implementation strives for higher transparency of decision-making and particular transport projects. Consequently, public control may reduce corruption incidences.

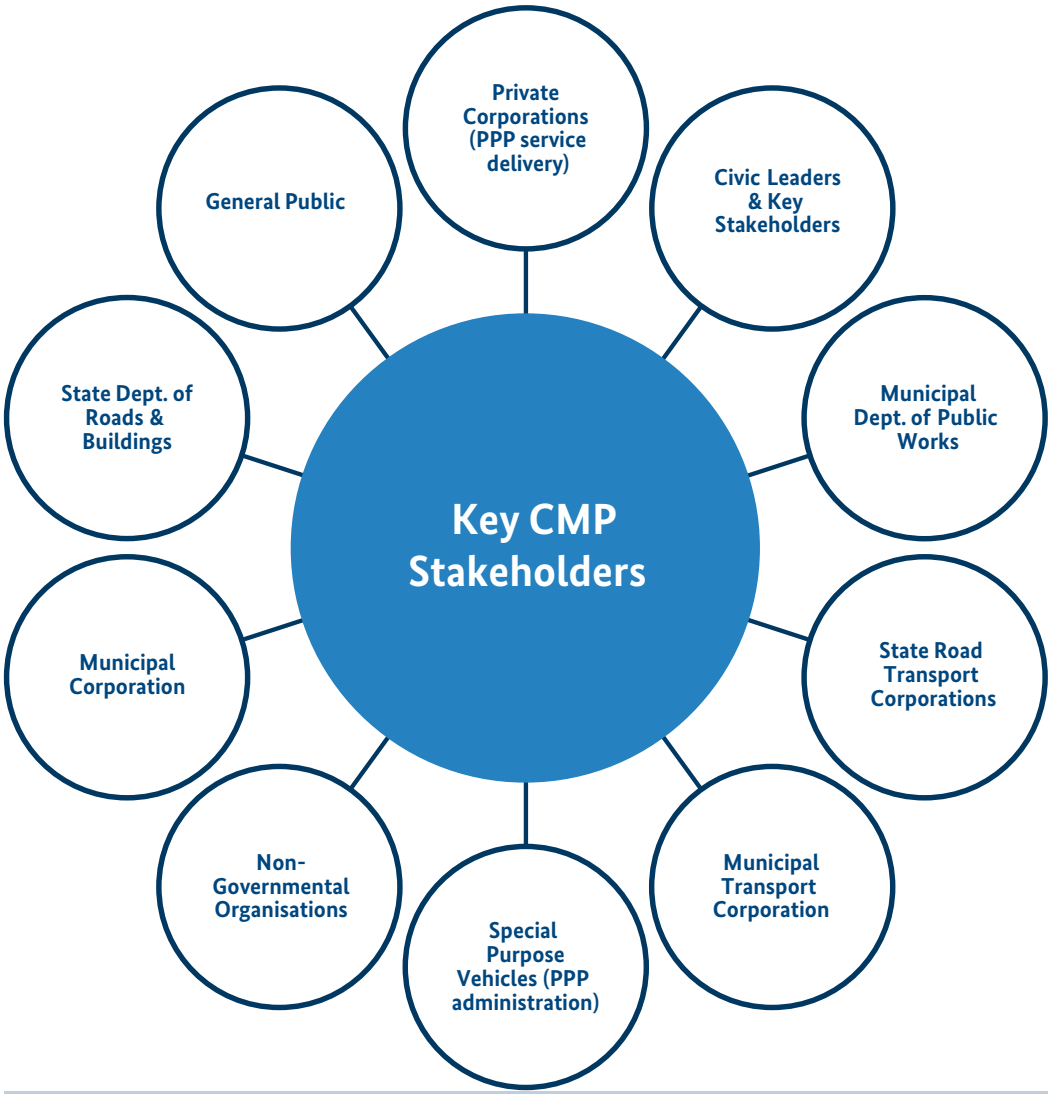


Figure 41: *Key stakeholders of a CMP process.* Source: Jamie Osborne

The key outcomes expected from a CMP are shown in the Figure 42.

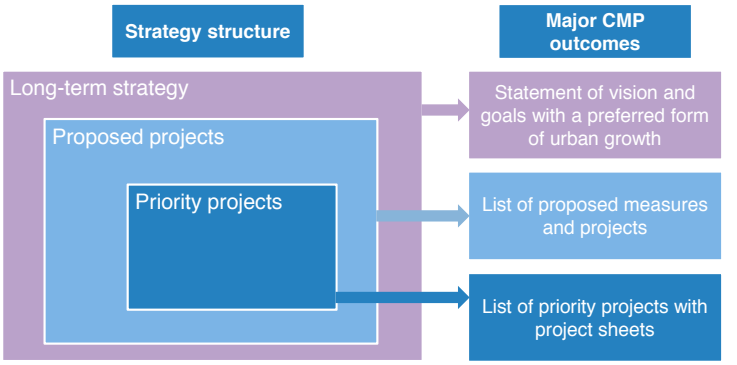


Figure 42: *Key outcomes from a CMP.* Source: MoUD, ADB, 2013

The current approach to CMPs is not yet effective enough. It is very important to revisit what is the ultimate goal for cities in developing a CMP. Is it simply a list of projects to be potentially funded by JNNURM (or any successor program), or does the process challenge cities to think holistically about urban development and transport? Ideally, CMP proposals should be held accountable to their goals. A mechanism and oversight framework must be in place to verify that the numbers add up and that CMP projects do support their stated mobility goals.

Two key issues stand out in current CMP practice:

- CMPs must adopt a rapid and robust methodology for collecting mobility data and accurately estimating demand. Where a CMP employs a complex four-step travel demand model, key assumptions should be corroborated with basic operational statistics such as corridor loads, fleet sizes, and ticket sales to ensure that model results reflect the reality on the ground.
- CMPs must ensure that proposed scenarios are aligned with transport performance goals, as outlined in the National Urban Transport Policy. The impacts of specific CMP proposals must be scored using such performance indicators and compared via the potential environmental, economic and social benefits.

The Ministry of Urban Development is currently in the process of revising the CMP toolkit.[19] At the time of publication, the draft toolkit addressed some issues. For example, the revised toolkit calls for more careful analysis of the mobility needs of underserved population groups (especially the urban poor) and greater attention to air pollution from the transport system. Furthermore, a comparative set of benchmark indicators has been introduced. However, the draft guidelines fail to correct several shortcomings of existing CMP practice, including the lack of sufficient data on NMT, public transport and parking; the need to proactively manage the use of personal motor vehicles; inadequate model calibration techniques; an excessive planning horizon; and the failure to reconcile goals and project proposals. If these problems can be overcome, a CMP can be regarded as a tool for cities to effectively guide urban development.

Italy: Piano Urbano della Mobilità (PUM)

The Italian Ministry of Infrastructure defines the general content and structure of PUMs in order to ensure comparability of results and effectiveness of PUM strategies between different cities.

PUMs should by law be reviewed and updated bi-annually and have a life-span of ten years. Measures defined in a PUM contain policies and measures to discourage private motorised transport, promote of transit, reduce air and noise pollution and improve road safety.

For evaluation purposes, a set of standard indicators has been developed for evaluating the achievement of the objectives for public transport quality and accessibility, air quality and transport noise levels, road safety, infrastructure capacity, sustainable transport travel shares, energy consumption and congestion levels.

PUMs provide a roadmap for all mobility-related issues. In progressive PUMs such as that in Milano, demand side

[19] In cooperation with the Institute for Urban Transport (IUT), UNEP Risoe Centre and Indian Partners (Indian Institute of Technology, Delhi, CEPT Ahmedabad, Indian Institute of Management, Ahmedabad and consultants).

management and regulatory schemes have become the "core" part (in contrast to the strong focus on infrastructure projects in the traditional PUTs).

Mexico: Plan Integral de Movilidad Urbana Sustentable (PIMUS)

A PIMUS is expected to develop an integrated mobility and land-use strategy and a plan for greater coordination among administrative units. During the preparation process, the following elements have to be developed:

a) a long-term vision for urban development and mobility that follows an integrated and inclusive approach,
b) a clear identification roles and responsibilities between the involved institutions,
c) a plan for increasing institutional and administrative capacities for mobility planning, urban development and civic participation,
d) a description of measures and instruments to support the implementation of policies and projects,
e) a strategy to generate a culture of community participation, and
f) financing schemes.

To date, PIMUSs have focused strongly on the development of specific transport projects (*e.g.* BRT projects). As such, they are not sufficiently integrated with urban development and lack a comprehensive approach. Moreover, PIMUS are not obligatory by law. They are usually developed in association with special programs or urban sector development initiatives where they are required to receive national funding. In addition, PIMUSs competes with other planning documents (*e.g.* urban development plans).

Ukraine: Transport Master Plans

The elaboration of a Transport Master Plan follows a strictly regulated procedure:

- The decision on the elaboration of the plan or on its correction by the city council,
- the commitment to provide finance by the city council,
- the selection of the contractor via tender,
- the preparation of the plan by the contractor,
- public hearings following the draft master plan,
- review by an authorised institute,
- approval of the plan by the city council.

Public consultation in transport master planning

Ukrainian legislation requires the involvement of the public in order to consider its opinion in the elaboration of documents relating to city and urban mobility planning. Recently, legal changes were introduced which allow carrying out public hearings before the draft plan is presented. Earlier, public hearings were conducted only after the review through an authorised institute. Requests for implementing changes to the authorised plan were usually not in the interest of the city. Therefore the public consultations played only a very formal role. Still the opinion of many urban and transport planners ("planning should be left to technical experts") shows a lack of understanding of the sense of public involvement.[20]

This shows that the process of preparing TMPs is dominated by old norms that do not allow sufficient freedom and flexibility to address current challenges. Further, the lack of modern planning processes and the absence of software-based transport modelling lead to a suboptimal use of financial resources.[21] In response to a recent upsurge in the popularity of cycling in the country, some reforms have been adopted to expand the role for cycling in transport plans. The government began to update relevant regulations and norms by involving the broader public and international experts. Several cities have gathered first valuable experiences in modern ways of urban mobility planning. However, urgent reforms of many elements of the planning process are still outstanding.

[20] According to Ukrainian Law the cities and the design institutes are obliged to take steps to prevent the disclosure of any information which is regarded a state secrecy or which might be of commercial value for the city or investors. This applies for the elaboration, the approval, and the amendment of urban planning documents, as well as public hearings. In practice the city administrations and design institutes like to interpret this provision very broadly. Only a very small part of the documentation is usually provided for public discussion.

[21] Few cities in Ukraine developed or are developing transport models at the moment. Nevertheless, transport modelling is not yet applied systematically to assess different transport interventions.

Figure 43: *Cycling is getting more popular in Ivano-Frankivsk.* © Mathias Merforth, 2014

3.4 Lessons learned

Studying the urban mobility planning experience of various countries can help to improve policy and planning frameworks and to avoid common mistakes. Some of the essential lessons learned are:

(1) National policy frameworks, funding schemes and guidance for urban mobility planning can enforce inclusive and strategic planning process all over a country.

(2) Policies and practice should be evaluated and regularly updated to remain effective and being able to react on factual challenges on local levels.

(3) Urban Mobility Plans should be developed within inclusive stakeholder processes, organised by the local or regional authorities. Plans developed by external consultants may not provide an effective solution to the factual mobility challenges, lack feasibility and understanding.

(4) Inclusive planning processes and civic participation increase the trust between citizens and authorities as well as the acceptance of transport interventions.

(5) Local authorities require sufficient capacities (educated personnel and technical equipment) and access to funding options for developing and implementing Urban Mobility Plans.

(6) Measures for urban transport have various side effects on urban environments and transport systems and their users. Therefore, transport interventions require impact assessment; a set of carefully selected side measures may increase the effectiveness of transport interventions and limit/reduce negative impacts.

4. Sustainable Urban Mobility Plans (SUMP): An initiative by the European Commission

Urban mobility in Europe's cities – a home to 70 % of the 507 million EU inhabitants – is still heavily reliant on the use of conventionally-fuelled private cars. Some good progress is being made in shifting towards sustainable urban mobility modes. To further stimulate the shift towards cleaner and more sustainable transport in urban areas the European Commission adopted the **Urban Mobility Package** (Together towards competitive and resource-efficient urban mobility) in December 2013. The Urban Mobility Package aims to reinforce the support to European cities for tackling urban mobility challenges by:

- Sharing experiences, show-casing best practices and fostering cooperation;
- Providing targeted financial support;
- Focussing research and innovation on delivering solutions for urban mobility challenges;
- Involving the EU Member States and enhance international cooperation.

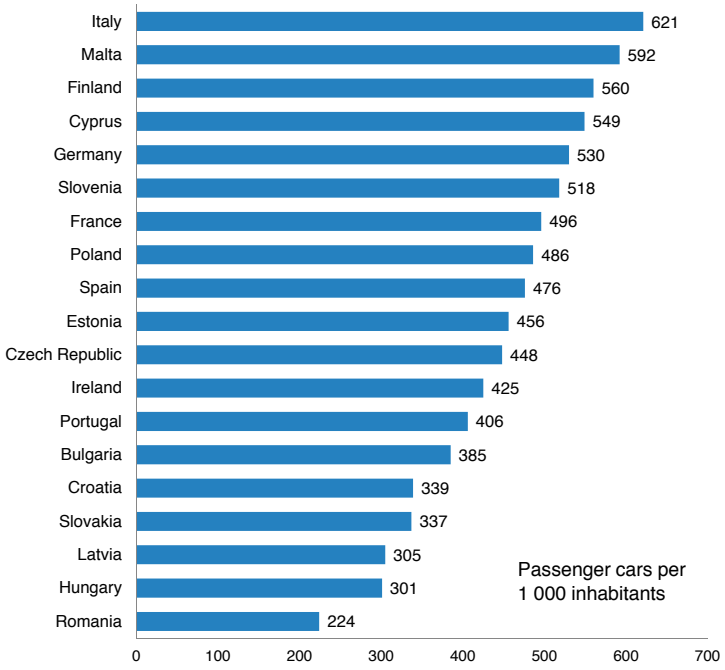


Figure 44: *Motorisation rate in selected EU countries (passenger cars per 1 000 inhabitants); 2012 data.* Source: Eurostat

The European Commission is actively promoting the concept of sustainable urban mobility planning, as a key area in the Urban Mobility Package alongside urban logistics, urban access regulations, deployment of Intelligent Transport System (ITS) solutions in urban areas and urban road safety. The package is complemented by a document that sets out the concept for Sustainable Urban Mobility Plans (SUMP) that has emerged from wide exchange between stakeholders and planning experts across the European Union. The concept reflects a broad consensus on the main features of a modern and sustainable urban mobility and transport planning practise.

Figure 45: *Bike parking and service station in Muenster (Germany), Mathias Merforth, 2013*

In 2009 the European Commission adopted the Action Plan on Urban Mobility, which proposes twenty measures to encourage and help local, regional and national authorities in achieving their goals for sustainable urban mobility. Action 1 addresses to accelerate the large scale uptake of SUMPs by local and regional authorities. With the Action Plan, the European Commission presents

for the first time a comprehensive support package in the field of urban mobility. Also the European Council of Ministers "supports the development of sustainable urban mobility plans for cities and metropolitan areas". It:[22]

- "supports the initiatives ... to adopt an integrated policy approach",
- "recognises that policies ... can be conducted most efficiently through a cooperation between competent public bodies",
- "considers that public participation processes favour the inclusion of stakeholders including all social groups", and
- "encourages the coordination of transport infrastructure and service planning with town and country planning, including land use planning".

The White Paper on the future of transport in the EU released in March 2011 by the European Commission sets the general framework for future activities in the transport sector.[23] This strategic document calls for cities to follow a mixed strategy involving land-use planning, pricing schemes, efficient public transport services and infrastructure for non-motorised modes and charging/refuelling of clean vehicles to reduce congestion and emissions. It specifically encourages cities to develop Urban Mobility Plans bringing all these elements together.

The Urban Mobility Package sets out how the Commission will strengthen its actions on sustainable urban mobility. SUMPs are given special attention in the document as a means to stimulate a shift towards cleaner and more sustainable transport in urban areas. The Commission itself cannot turn SUMP into a legal obligation for European cities, only the respective EU member countries can decide on policy frameworks and legal obligations for Urban Mobility Planning. Therefore, the Commission relies on other supporting mechanism to promote SUMP – like the fostering of an EU-wide policy debate, research and innovation projects as well as the provision of targeted financial support. A main activity is the set-up of a European platform for Sustainable Urban Mobility Plans to further coordinate EU cooperation on

Figure 46: *White Paper of the European Commission on the Future of transport; See also European Commission, 2011.*

the development of the SUMP concept and tools, and to foster broader exchange.

In parallel, the European Commission released the Guidelines: Developing and Implementing a Sustainable Urban Mobility Plan. These SUMP guidelines are based on a thorough consultation process with professional planners, policy makers and stakeholders from a very wide spectrum and from all over Europe. They are intended for urban transport and mobility practitioners and other stakeholders involved in the development and implementation of a Sustainable Urban Mobility Plan. It reflects the fact that urban mobility planning is a challenging and complex task. Planners need to manage many, sometimes conflicting demands and requirements on the local level and even beyond if considering multi-dimensional problems existing on the local level. The complexity increases in case of political change and, as is currently the case in many European countries, severe financial constraints.

[22] Council of the European Union (2010)

[23] See European Commission, 2011

Box 14: SUMP guidelines in seven languages

The SUMP Guidelines that explain the essential steps involved in developing a Sustainable Urban Mobility Plan (SUMP) have been published by the European Commission in seven languages. Available in Bulgarian, English, Hungarian, Italian, Polish, Romanian and Spanish, the guidelines include good practice examples, tools and references that illustrate each step to help urban mobility and transport practitioners prepare, develop and implement SUMPs.

All language-versions are available for free download at http://mobilityplans.eu/index.php?ID1=8&id=8

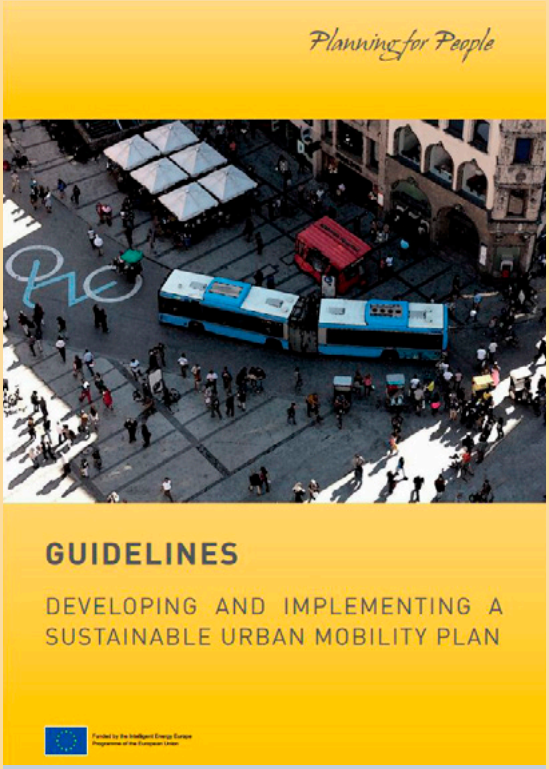


Figure 47: *Guidelines Cover.* See Rupprecht Consult, 2014

4.1 Main characteristics of a SUMP

Both documents, the Guidelines on Sustainable Urban Mobility Planning and the Annex of the Urban Mobility Package provide the basic information about the main idea of the concept, the characteristics and the essential requirements for sustainable urban mobility planning.

A Sustainable Urban Mobility Plan (SUMP) is a strategic plan that is designed to cater to the mobility needs of people and businesses in cities and their surroundings for a better quality of life. It builds on the existing planning practices and takes due consideration of integration, participation and evaluation principles.

Source: Rupprecht Consult, 2014

A SUMP tackles transport related problems in urban areas more strategically. It is the result of a structured planning process that comprises status analysis, vision building, objective and target setting, policy and measure selection, active communication, monitoring and evaluation – and the identification of lessons learnt. The basic characteristics of a SUMP are:

- Long-term ***vision*** and clear implementation plan;
- ***Involvement*** of stakeholders and citizen participation;
- ***Balanced development*** of all relevant transport modes, which encourages the shift towards more sustainable modes;[24]
- High level of integration and ***cooperation*** between administration and politicians, policy sectors, neighbouring cities;
- ***Assessment*** of current performance and identification of transport problems leading to the setting of targets, which are concrete and ambitious, but

[24] Sustainable urban mobility planning should not focus solely on the promotion of public transport and non-motorised modes but consider the best solution under given circumstances with an integrated perspective on all modes. Different countries are following different concepts, *e.g.* PDUs are specifically targeted on the reduction of car traffic.

Table 5: Basic Characteristics of Sustainable Urban Mobility Planning

Characteristics	Explanation
Vision	■ for transport and mobility development for the entire urban agglomeration, ■ for public and private, passenger and freight, motorised and non-motorised, moving and parking, ■ contains a plan for the short-term implementation of the strategy, including an implementation timetable, a budget plan, a clear allocation of responsibilities, resources required for the implementation of policies and measures set out in the plan.
Involvement	■ transparent and participatory approach, which brings citizens and other stakeholders on board throughout the plan development and implementation process, ■ a prerequisite for citizens and stakeholders to take ownership of the Sustainable Urban Mobility Plan and the policies it promotes.
Balanced development	■ a set of actions to improve performance and cost effectiveness with regard to the declared goals and objectives, ■ actions include technical, promotional and market-based measures and services as well as infrastructure.
Integration & Cooperation	■ a commitment to sustainability, *i.e.* balancing economic development, social equity and environmental quality, ■ consultation and cooperation between departments at the local level to ensure consistency and complementarity with policies in related sectors (transport, land use and spatial planning, social services, health, energy, education, enforcement and policing, etc.), ■ exchange with relevant authorities at other levels of government (*e.g.* district, municipality, agglomeration, region and Member State), ■ coordination of activities between authorities of neighbouring urban and peri-urban areas (covering the entire 'functioning city' defined by major commuter flows).
Assessment	■ thorough assessment of the current and future performance of the urban transport system, ■ a comprehensive review of the present situation and the establishment of a baseline against which progress can be measured, ■ identifies specific performance objectives, which are realistic in view of the current situation in the urban area, as established by the status analysis, and ambitious with regard to the objectives of the plan, ■ sets measurable targets, which are based on a realistic assessment and identifies specific indicators to measure progress.
Monitoring	■ implementation of the actions is monitored closely, ■ progress towards the objectives of the plan and meeting the targets are assessed regularly based on the indicator framework.
External costs	■ contain a review of costs and benefits of all transport modes.

Source: Rupprecht Consult, 2014

achievable, relevant, time-bound and a result of a dialogue process;
- Regular ***monitoring***, review and reporting;
- Consideration of ***external costs*** for all transport modes.

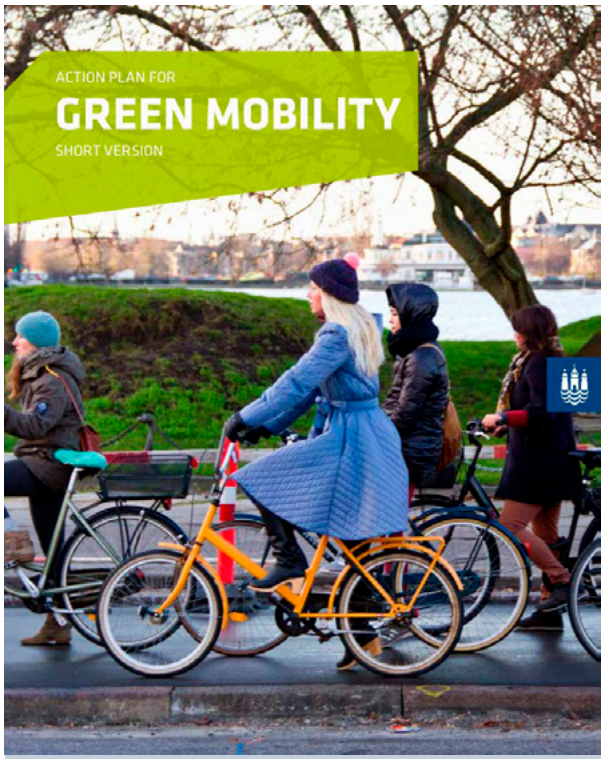


Figure 48: *Urban Mobility Plan for Copenhagen (Denmark).*
© City of Copenhagen, 2013

Figure 49: *Barrier-free bus in Berlin.*
© Daniel Bongardt, 2013

4.2 Sustainable urban mobility planning process

The guidelines describe the process of how to prepare a Sustainable Urban Mobility Plan. This process consists of eleven main steps made up of 32 activities. They should be taken as part of a regular planning cycle in the sense of a continuous improvement process.

Table 6: Steps of Sustainable Urban Mobility Planning

Planning Steps		Actions taken/organised by the city administration
Preparation	Step 1	Provide an overall framework for the planning process and plan implementation.
	Step 2	Define the scope of the plan, work plan and management arrangements.
	Step 3	Analysis of the current mobility situation and scenario development of possible future mobility situations.
Goal setting	Step 4	Develop a common vision of mobility.
	Step 5	Specify objectives, which indicate the type of change desired; select a well-thought-out set of targets that focus on selected areas.
	Step 6	Identify and select measures, which can meet defined objectives and targets.
Elaboration	Step 7	Determine clear responsibilities; elaborate the implementation and budget plan.
	Step 8	Develop tracking tools and evaluation processes.
	Step 9	Ensure acceptance of the plan by the public and prepare the adoption of the plan by the political representatives.
Implementation	Step 10	Define a structured approach to refine targets and to plan, detail, manage, communicate and monitor the implementation of measures.
	Step 11	Check progress and feed results back in the process.

Source: Rupprecht Consult, 2014

4.3 Transport planning practise in Europe

A Sustainable Urban Mobility Plan (SUMP) is a strategic document designed to contribute to meeting the European climate and energy targets. It builds on existing planning practices and takes account of integration, participation and evaluation principles, which have been already put into practise in different EU Members States (see also France, Germany and Italy in Chapter 3).

European countries showing comprehensive transport planning procedures similar to sustainable urban mobility planning include:

- ***Belgium***, where the regions provide a SUMP related framework guidance. In Flanders 308 of the 311 cities and municipalities have a mobility plan. From 2013, the construction of a mobility plan, with a focus on promoting sustainable mobility, is obliged for all cities and municipalities.
- ***England & Wales***, where the "Local Transport Plan", the LTP is mandatory for local authorities to develop. London is made up of 33 Boroughs and each Borough must produce a LIP – Local Implementation Plan for transport. The legal basis for LTPs is the Transport Act 2000, amended from the Local Transport Act 2008
- ***France and Germany***, where "Plans de Déplacements Urbain" (PDU) and "Verkehrsentwicklungplan" (VEP) are well defined and established for many decades (see Chapter 3).

While the policy framework for urban mobility planning in some of the EU Members States is quite elaborated in terms of the SUMP requirements, other member

Figure 50: *The SUMP planning cycle.* Source: Rupprecht Consult, 2014

states still require amendments.[25] In some of the EU member states, *e.g.* countries in Central and Eastern Europe, planning processes are either rudimentary or simply outdated in order to sufficiently meet quality and requirements which consider the needs of all transport system users. Besides the requirements for an integrated planning in many European member states an excellent thematic planning is common practice. For example, in Germany or Poland mandatory public transport plans have to be drawn up. Increasingly, specific cycling plans are set up in European cities. Figure 51 shows the differences of planning standards among EU members.

[25] Please find further information on the situation among EU member states in European Commission, 2011 and also here: http://mobilityplans.eu/docs/file/eltisplus_state-of-the-art_of_sumps_in_europe_sep2011.pdf.

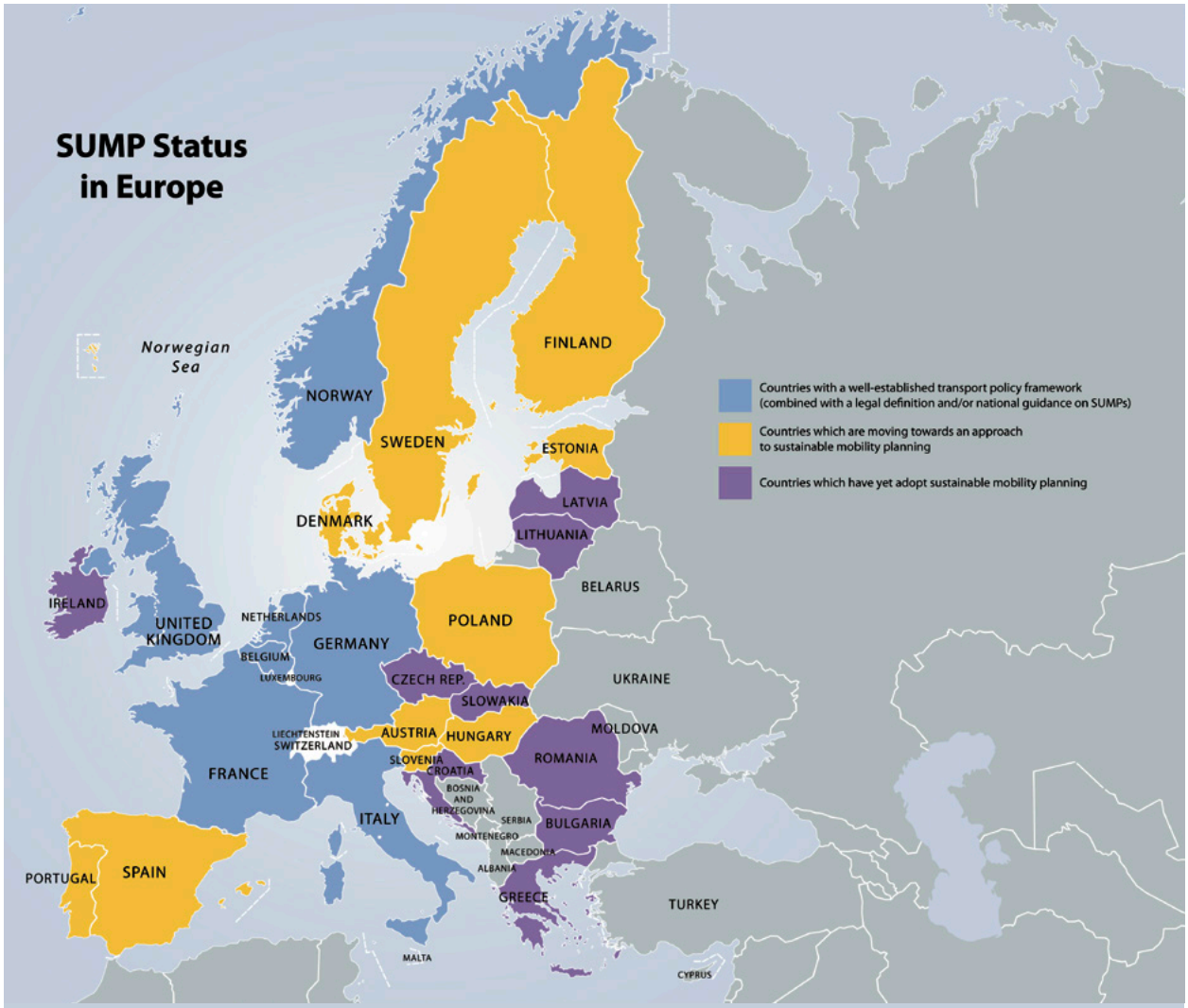


Figure 51: *State of SUMP adoption in European Countries.* Source: Rupprecht Consult, 2012

Developing and implementing a Sustainable Urban Mobility Plan should not be seen as an additional layer of transport planning, but should be done in compliance with and by building on present plans and processes. The concept should become part of the daily planning practice in European cities and municipalities and should replace outdated and "traditional" planning processes, which do not have the potential to cope with the comprehensive transport planning requirements nowadays.

CASE STUDY 5

Berlin (Germany) – Reversing the trend of rising car use by integrated planning

Urban transport in Berlin has experienced different phases of development since the German reunification in 1990. As the city was divided into West and East for almost 40 years, the 1990s were characterised by a spirit of optimism, followed by a more difficult phase of structural changes and transitions in the 2000s. A new dynamic of urban growth and development can be observed in recent years. Today the city has 3.4 million inhabitants, while a total of 4.3 million people live in the metropolitan region.

In the decade following reunification, urban transport was characterised by the challenges of a formerly divided city, including different infrastructure systems and types of mobility, and interrupted linkages between West and East Berlin. Therefore, infrastructural development was of prime importance to bridge the quality levels and to link both sides of Berlin as well as its surrounding regions.

Figure 52: *Berlin's public transport system is well integrated.* © Sven Wedloch, 2012

However, the results of the first phase of transport development were sobering: almost none of the transport development objectives adopted in the early 1990s were achieved. Despite extensive investments in public transport networks and infrastructure (including light rail, metro and regional rail), the usage of public transport services declined while car traffic increased. Air and noise pollution became serious problems in the densely covered city centre. A political decision was made in 2000 to develop a comprehensive mobility strategy to address these problems. Based on Berlin's experience over the past decade, some key insights were gathered for the new strategy:

- Growing levels of private car traffic arose from a combination of increasing wealth, a desire for individual liberty and urban sprawl.
- Proper management of automobile traffic is the key to limit its negative impacts on urban quality of life.
- Promotion of public transport is not enough to positively influence mobility patterns; measures restricting the use of private cars are likewise required.

Intensive consultation was carried out with crucial stakeholders in order to identify problem areas and investigate their cause, find common interests and goals and to establish public agreement with the plans. The planning process for the new mobility strategy was finished two years later in 2002, resulting in the Urban Transport Development Plan Berlin (Stadtentwicklungsplan Verkehr Berlin or SteP Verkehr). The plan connects a long-term mission statement for transport with specific objectives, strategies and measures (see Figure 53). Its goals and objectives for transport have been derived from the over-arching mission-statement for urban development. While urban mobility is important for the functionality of a city, it has to fulfil quality standards in regard to the city's living space. Central measures aim to reduce noise, climate and pollutant emissions.

The strategies and measures to achieve these goals were refined:

- Central measures of the SteP aim to limit increasing number and length of trips (*e.g.* restricting suburbanisation by encouraging transit-oriented development and mixed land use).

- Organisational and soft measures (such as priority signalling for public transport modes, dynamic transit information systems and mobility management) were favoured over further infrastructure expansion.
- Parking management (*e.g.* increasing parking fees or limiting available lots) was strengthened.
- Measures for improving public transport, cycling and walking aimed to reallocate urban space in the inner city to support a mode shift.

By the end of the 2000s, the measures in the SteP helped reverse the trend of rising car use. The use of public transport has been increasing continuously, and walking and cycling has been growing considerably. Private car traffic and traffic-related pollution was especially reduced in the city centre.

In 2011 the SteP Verkehr was revised to account for continued population growth and the increasing importance of energy issues, including stricter EU environmental regulations. Changes include an update of objectives, a realigned strategy and added measures. More emphasis has been placed on improving infrastructures for walking, cycling and public transport, as well as supporting multimodal integration of all transport modes.

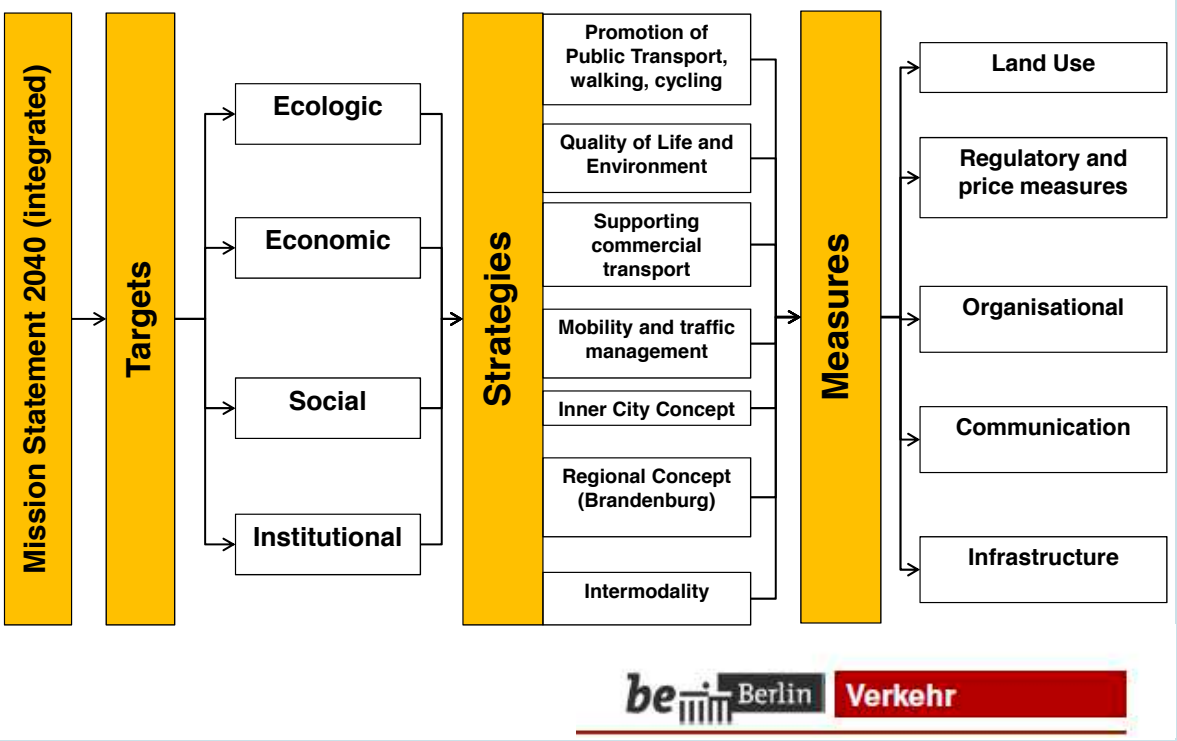


Figure 53: *From vision to practice in Berlin's VEP.*
Source: Kunst, 2013

4.4 Common challenges of urban mobility planning in Europe

Cities frequently face major barriers while creating their own Sustainable Urban Mobility Plans. On the basis of previous experiences and projects in the European Union, four major challenges[26] have been identified. The process-oriented implications in this chapter complement the practical and technical recommendations in Chapter 5.

4.4.1 Participation: Actively involving local stakeholders and citizens in mobility planning processes

Participation reflects the overall integration of citizens and groups in planning processes and policy decision-making and consequently the share of power. In particular, transport planning and transport relevant measures are often the subject of controversial discussions within the urban community. The concept of Sustainable Urban Mobility Planning establishes the principle that the public should be involved from the very beginning of the transport planning process and not only when the plans are largely completed and only minor amendments can be carried out. This makes it necessary for public authorities to open-up a highly specialised and complex subject area for debate and prepare for participation as part of the planning process. In order to ensure participation throughout the process it is helpful to develop a communication plan that includes an engagement strategy and timeline as well as an overall strategy for PR activities (including media involvement). The information of the public (*i.e.* authorities approaching the people and not the other way round) and involvement of the key stakeholder groups should be proactive. The integration of hard to reach groups (*i.e.* ethnic minorities, impaired people, people with low literacy, apathetic groups) should be paid special attention to. Chapter 5.5 provides further implications for stakeholder participation.

[26] In the EU co-funded project CH4LLENGE (2013–2016), nine European cities and eight supporting organisations have teamed up to tackle the four most pressing challenges in sustainable urban mobility planning (www.sump-challenges.eu).

Example: Bottom-up mobility visioning: the transition management in Gent, Belgium

The City of Gent started to engage stakeholders in mobility planning from the 1990s onwards. Until the early 2000s, the communication was one-way, from the city to citizens. Step by step, a two-way process of communication has evolved. The city began to consult citizens about their opinion on specific mobility projects, for example, by inviting them for discussion nights. A change of mentality in the city administration started with the realisation that they had moved away from the "we know what is good for citizens" attitude to facilitating, instead of steering, transport planning processes. The city administration also needed to learn how to deal with the wide range of different opinions given by citizens and stakeholders. This mutual learning process for both the administrative staff and also the groups involved needed much time to evolve.[27]

4.4.2 Cooperation: Improving geographic, political, administrative and interdepartmental cooperation

Institutional cooperation in the context of Sustainable Urban Mobility Plans (SUMP) can be understood as the pragmatic cooperation with actors and the take up of ideas, principles and policies that help to deliver a SUMP that is accepted and effective in practical and financial terms. Without institutional cooperation on SUMP objectives and the means of achieving them, a SUMP will be partial and deliver fewer benefits. There are likely to be a multiplicity and diversity of actors involved in developing and implementing a SUMP. Institutional landscapes will vary across cities developing SUMPs but are likely to involve issues of vertical and horizontal cooperation and also "internal cooperation" (between disciplines within the authority) and "spatial cooperation" (at the agglomeration/regional level).

There will be cases where an overarching transport authority leads the SUMP planning, but with the consent and cooperation of local authorities. In other places, there could be a number of authorities in a conurbation with each developing their own separate plan. In all cases the SUMP partners will need to work under the

[27] Adapted from CH4LLENGE, 2014

regulations and guidance set by law, and with the influence of other private and non-governmental actors who have interests in transport.[28]

Example: Active cooperation in Odense (Denmark)

The City of Odense has focused on interaction with the district level, for instance to develop a mobility plan for the campus area including a new university hospital. The super cycle highways will be linked and coordinated with neighbour municipalities. The transport department is in contact with other departments: land use planning, environment, health, social inclusion, safety, energy, business, children and education, senior citizen and labour force. The mobility action plan has been discussed in more than 20 meetings with different departments.

[28] Adapted from CH4LLENGE, 2014

Figure 54: *Painted cycling lanes at road intersections is an effective measure to improve the visibility of cyclists; Copenhagen.*

4.4.3 Measure selection: Identifying the most appropriate package of measures to meet a city's policy objectives

Once a city has specified its objectives and identified the problems to be overcome, the next step is to identify possible policy measures; this is sometimes referred to as "option generation". The resulting long list of possible measures then needs to be assessed for appropriateness, resulting in a shortlist of more promising measures. This selection and prioritisation of measures can be undertaken with the help of expert consultation processes or/and scenario techniques based on modelling if available. Sustainable transport options need to be specified in more detail for application to the city in question and then assessed in more detail. These stages involve a process of "option appraisal", which should consider effectiveness, acceptability and value for money. For example, a social cost-benefit analysis (SCBA) adds up all positive and negative impacts of projects, expressed as monetary values, to a comprehensive measure of overall welfare impacts of interventions on society. However, a significant shortcoming of SCBA is the necessity to provide monetary values for impacts that have no market price, in particular impacts on environment and equity.

The most promising measures will be considered for implementation at a later stage in the SUMP process. While individual measures may be implemented on their own, it is more common for a SUMP to result in a package of measures, in which individual measures reinforce the effectiveness, acceptability or value for money of one another. The development of packages can start in the option generation step, but is more commonly addressed once a shortlist of measures has been developed. Potential packages can then be appraised using the same procedures as for option appraisal for individual measures.[29]

Example: New measure selection processes in Budapest (Hungary)

The Municipality of Budapest approved a complex development plan for the transport system of Budapest in 2001. The plan was revised in 2009 in the spirit of

[29] Adapted from CH4LLENGE, 2014

regional integration. Another review of 2013 was undertaken to harmonise measures of the SUMP with its goals and objectives for transport development. The measure selection process had to be repeated for the following reason:

The measure selection was based on social cost-benefit analysis (SCBA) and multi-criteria analysis (MCA). Unfortunately, the results were heavily influenced by (political) factors which made the results of the MCA and SCBA obsolete. The review of 2013 took into account international best practice and was done in a joint process of public authorities, civil associations and professional organisations. Project priorities were finally redefined to meet the goals and objectives of the plan.[30]

[30] Adapted from CH4LLENGE, 2014

Figure 55: *Electric car-sharing vehicle in Paris.*
© Daniel Bongardt, 2013

4.4.4 Monitoring and evaluation: Assessing the impact of measures and evaluating the mobility planning process

Evaluation and monitoring activities are important steps in the implementation of Sustainable Urban Mobility Plans (SUMPs) that serve the purpose of timely identification of success or the need for readjustment of a SUMP and its instruments. They provide regular information to decision makers, potential funding bodies and local stakeholders to assess whether a SUMP has or will deliver benefits to the community, provides value for money, is worth continuing or requires modifications to be successful. Monitoring and evaluation are closely related and share many elements such as data sources and objectives. Monitoring aims at providing information for potential adjustments and re-planning during the course of a SUMP in order to improve outcome and thus occurs at shorter periodic intervals. In contrast, the evaluation is of a more strategic nature and provides information to learn from and improve future plans. As such, evaluation occurs less frequently, generally after specific planning phases of a SUMP. It is important to note that any larger intervention should undergo an evaluation after implementation. Many of the elements of monitoring and evaluation such as objectives, targets and indicators should be consistent with the ex-ante appraisal of plans. However, in order to carry out an appraisal, additional methods for data generation through modelling and scenario generation as well as specific assessment methods are necessary.

Crucial steps for the realisation of monitoring and evaluation is the performance of a data audit (what is available? where are gaps?) and if necessary develop a data collection strategy (quantitative and qualitative indicators). Also the determination how monitoring and evaluation will be integrated in the Sustainable Urban Mobility Plan, with the help of a work plan for monitoring and evaluation activities that is integrated with the project schedule, is important.[31]

[31] Adapted from CH4LLENGE, 2014

CASE STUDY 6

Lille Métropole (France) – Joint mobility planning for 85 municipalities

Lille is a town of 228 000 inhabitants in northern France and is the centre of an urban agglomeration of 1.2 million people covering 85 municipalities. The aim of the Lille region's Urban Mobility Plan 2010–2020 is to reduce the trip share of private cars from 56 % in 2006 to 34 % in 2020, to increase the bicycle share from 2 to 10 % and public transport from 12 to 20 %. The UMP also targets a decrease of 40 % GHG emissions through additional energy efficiency.[1]

Background

The Lille UMP project contains a total of 170 specific actions which are organised in the following 6 categories:[2]

1) An "intensive city" and mobility: The first category promotes sustainable development and urban form through a better integration of policy making and urban design throughout the Lille region. This includes the expansion of a rail-based public transport network as the backbone of urban development. The UMP envisages developing so-called micro-UMPs in specific areas—as well as a number of related actions, such as the construction of eco-neighbourhoods which serve as models for the region.
2) A network of public transport: The Lille region will invest heavily in the enhancement of its existing public transport infrastructure. The UMP calls for better inter-modality and connection with other jurisdictions, allowing a more complete service for users.
3) Sharing the street with alternative modes: The third category combines a set of measures to incite a more reasonable use of road space. One significant objective is to redistribute road space in favour of sustainable modes and optimising the existing road network. Walking and cycling will be promoted through in comprehensive manner. Parking strategies will be in line with the UMP objectives.
4) Freight transport: Actions on freight transport in the UMP area are based on a report produced earlier. Although freight transport is crucial to the economic life of a city, it is also a source of congestion and emissions. The authorities are seeking to encourage alternatives to road freight transport through the development of a global strategy, reinforcement of inter-modality, and clearer integration of transport in the promotion of economic activities. Specific attention will be paid to urban freight transport. A strategy will be developed, followed by a number of coordinated experiments to assess the strategy.
5) Environment, health and safety: To better integrate environmental issues in urban planning, an environmental impact assessment became obligatory for all UMPs after the adoption of the European Directive 2001/42/CE in French law in 2005. Following completion of the Lille region's assessment, a number of direct objectives and actions were defined in the UMP to protect the environment, health and safety of citizens. The first goal is to reduce energy consumption and the atmospheric impacts of transport on the environment and human health. A number of actions are included to reduce road noise pollution and create a safe environment for all users of mobility services.
6) Realisation, monitoring and evaluation: Monitoring and evaluation of the planning process and the implementation of specific measures are crucial to the effectiveness of the plan. Assessment mechanisms help to identify and anticipate difficulties in the preparation and implementation of the UMP, and, if necessary, to "repackage" measures in order to achieve targets more efficiently and within the available budget. They also provide evidence of the effectiveness of the plan, and justify the cost of particular measures. Evaluation should also feed back into the public debate, thus enabling all actors to consider the necessary corrections (*e.g.* if targets are achieved or if measures appear to be in conflict with one another). The monitoring and evaluation mechanisms should be defined early and become an integrated part of the plan.

[1] Source: ENDURANCE, 2014

[2] Source: Vanegmond, 2014

Figure 56: *Congestion charge check points deliver useful data for planning and policy evaluation, Stockholm.* © Manfred Breithaupt, 2006

Example: Arranging for monitoring and evaluation in Toulouse (France)

The new transport plan (PDU) of the agglomeration of Toulouse sets up a number of initiatives that should assure an accurate monitoring of the plan and regular evaluation of its results. They comprise the following activities: Establishment of a "partnership" monitoring commission, installation of an "urban development/ mobility commission", continuation of the PDU observatory, creation of a mobility cost account and the development of balanced score cards. The revision of the PDU permitted the agglomeration to engage a large number of public and private stakeholders. In the framework of the "partnership" monitoring commission, all institutions, associations and mobility-related organisations meet at least once a year to discuss the progress made, if possible making use of the intermediate evaluation results provided by the PDU observatory, which follows the progress made in Toulouse's Urban Mobility Plan.[32]

[32] Adapted from Rupprecht Consult, 2014

4.5 A European mobility planning approach – applicable for other cities worldwide?

The SUMP concept will most likely stay on the European transport agenda for the next decade in order to contribute to European environmental and economic targets. A major boost in the mainstreaming of SUMP in European cities would be if SUMPs are required to receive EU funding. The principle of "conditionality" is de facto put already into place as EU tendering procedures call for SUMP-like planning practices. Also international banks (*i.e.* European Bank of Reconstruction and Development – EBRD) are demanding urban mobility plans, which are consistent with good planning practice stipulated by the EU as a condition for providing financial assistance. National policy can play a major role in the promotion of SUMP if they are prerequisite for the allocation of urban transport funds. Even outside of Europe cities can benefit from the concept as the need for more strategically and systematically planning processes is high. The methodology comprising: 1) status analysis and baseline scenario; 2) definition of a vision, objectives and targets; 3) selection of policies and measures; 4) assignment of responsibilities and resources; 5) monitoring and evaluation arrangements helps to follow clear routines and to cope with this comprehensive planning processes. On the other hand the concept is adaptable and flexible to local circumstances because it is a process framework rather than a prescriptive predefined action plan. Without question the concept is rather challenging but suitable for tackling cross-sectorial, multidimensional urban problems and promoting mobility dialogue at the local level.

Figure 57: *A cargo tram ride in Dresden replaces 3 lorry trips through the city centre, Dresden.* © DVB AG, 2011

CASE STUDY 7

Ivano-Frankivsk (Ukraine) – First steps of Sustainable Urban Mobility Planning in Ukraine

Ivano-Frankivsk is an attractive economic and cultural centre of Western Ukraine with about 240 000 inhabitants.

The goals of the city's development strategy are to become an attractive investment location, to support small and medium enterprises, to improve living conditions for its citizens, and to make Ivano-Frankivsk a centre of tourism in Western Ukraine. The city administration has acknowledged that modern, European-style transport and mobility planning is an essential step for the city's future development.

The overall transport conditions in Ivano-Frankivsk are similar to other Ukrainian cities:

- Increasing car ownership and use;
- A complex public transport system with limited operational efficiency;
- Lack of an integrated database on structural, transport and mobility data;
- Responsibilities concerning transport—in both planning and execution—are not clearly allocated.

Ivano-Frankivsk shows that sustainable urban mobility planning can be implemented even within difficult environments. In 2009, the city restricted car traffic in the heart of the city centre. To access the area, drivers have to pay a fee of approx. USD 5 (residents get a discount). This has helped to reduce traffic and parking in the historic centre and positively affects urban quality of life.

Through an international development partnership, the city administration of Ivano-Frankivsk is supported in the elaboration of an integrated concept for sustainable urban mobility. The project "Ivano-Frankivsk Mobil" is jointly funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) and the implementing companies PTV Transport Consult and Dreberis.

The following steps in the Ivano-Frankivsk Mobil project have been taken so far:

- A working group was established, consisting of different city departments and key stakeholders involved in transport management and planning;
- The city started to develop a bicycle strategy with the support of local cycling activists;
- A survey on mobility patterns and interests as well as comprehensive traffic counts were conducted by the city;
- A transport model was developed and handed over to the city. The city hired additional personnel for the utilisation and further development of the model within the city administration;
- A public workshop on the vision and development priorities for the city's mobility concept was held in May 2014;
- A study trips of city delegates to Germany and regular exchange with other Ukrainian cities.

An urban mobility plan document will summarise the analysis of the current situation in Ivano-Frankivsk and provide recommendations for measures in administrative processes as well as in the specific action fields of automotive, public, bike and pedestrian transport. It will be further developed with the city administration and discussed in a 2nd public workshop in the end of 2014. It is clear that this document will be the first step in a long-term development.

Figure 58: *Public hearing in Ivano-Frankivsk (Ukraine).*

5. Urban mobility planning: Practical recommendations

Going forward, it is essential that UMPs incorporate evidence regarding existing transport conditions and the impact of proposed transport interventions. This chapter presents practical recommendations that have been derived from the experience with UMPs, particularly in developing cities. These elements include data collection approaches; validation of scenario outputs; integration of land use and transport; civic and stakeholder participation, the time frame of a UMP and the evaluation of different alternatives. The information presented in this chapter complement the process-oriented recommendations for SUMPs in Chapter 4.4.

5.1 Complete data collection, evaluation and representation

Good transport planning requires good evidence, which includes detailed descriptions of the performance of the existing transport system as a whole that reflects the opportunities and constraints for all users. Transport system data must be collected for all modes, including walking, cycling and public transport. These data must be presented at a disaggregate level. For example, a UMP should present the mode shares of walking, cycling, paratransit, and city buses separately rather than combining these into broader categories such as "non-motorised transport" and "public transport".

Too often, UMPs rely on highly technical descriptions of transport systems, steeped in jargon and complex statistics. To expand access to the wealth of information in a UMP, it is essential to simplify the presentation of transport data. Usage levels for public transport, walking, and cycling should be presented on easy-to-read maps, using graphical representations to convey complex travel demand information. For example, the UMP should present the number of public transport passengers per hour on corridors where public transport demand is high. Similar diagrams should be presented for cyclists and pedestrians. Elements of public transport system performance, such as on-time performance of bus services, should be presented in a similar manner.

All UMPs should contain the following minimum data on the transport system:

- Street network:
  - Footpath presence and width.
  - Cycle track presence and width.
  - Right-of-way of major streets.
- Street management:
  - Locations of regulated parking.
  - Locations of existing public off-street parking lots.
  - Occupancies of on- and off-street parking areas in major business districts.
  - Key crash locations/black spots.
- Public transport systems:
  - Major bus corridors.
  - Major paratransit corridors.
  - Rapid transit corridors.
  - Peak hour public transport frequencies per direction on major corridors (including bus and paratransit).
  - Peak hour occupancy counts per direction on major corridors (including bus and paratransit).
  - Buffer showing areas within a 5-minute walk of frequent public transport service.
  - Buffer showing areas within a 5-minute walk of rapid transit service.

Figure 59: *BRT and regular buses in Jakarta (Indonesia).*

Detailed demand modelling exercises can yield a comprehensive account of the transport system and the impacts of potential interventions. However, a robust evaluation process is required to ensure that the model accurately reflects the reality of the transport system. The following data should be employed to calibrate the model.

- For all vehicles:
  - Predicted vs observed screenline vehicle counts.
- For public transport:
  - Predicted vs observed screenline vehicle counts.
  - Predicted vs observed screenline passenger volumes on public transport modes.
  - Predicted vs observed boardings per route on public transport modes.
  - Operated public transport km vs vehicle-km in the model.
- For non-motorised transport:
  - Predicted vs observed screenline pedestrian and cyclist counts.

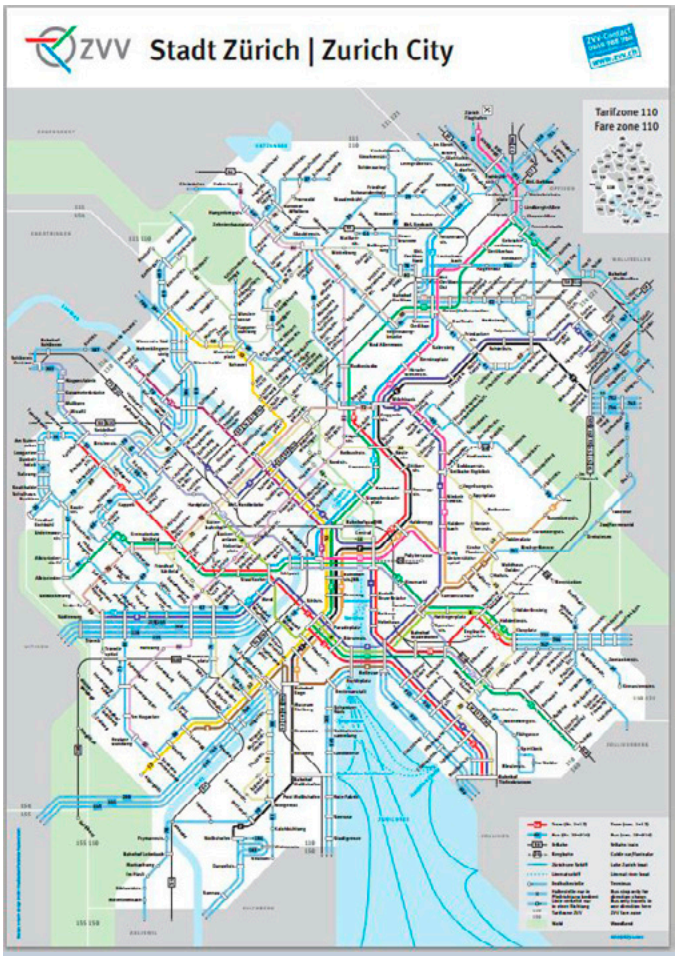


Figure 60: *Public transport network map of Zurich city as part of ZVV transit alliance – showing commuter rail, tram, bus, funicular and waterway connections.*

5.2 Integrating land use

Compact development with a good mixture of social and economic functions can minimise the need to travel. Locating such development around high quality rapid transit systems can ensure that most motorised trips can occur by public transport (transit-oriented development). On the other hand, low-density developments increase trip lengths and favour a higher share of automobile trips. Thus, land use planning not only shapes city structures, but also determines the community's mobility and energy consumption patterns.

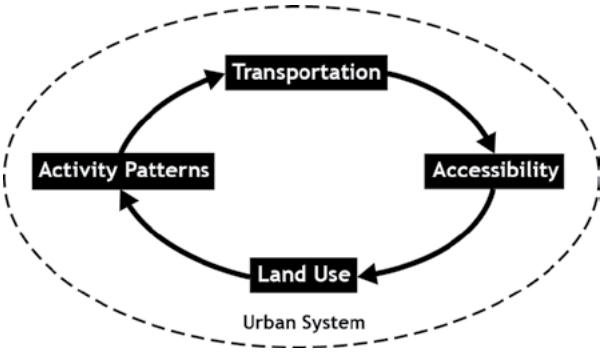


Figure 61: *Relationship between transport and land use.*

Urban land use patterns result from a combination of private and public decisions. A city's public transport system is intimately woven into the existing demographic, economic, environmental, social and political conditions. In the context of UMPs, it is important that integrated urban planning models are utilised to predict the land use impacts of transport investments. Demographic figures on population, population densities, and future population projections will be key inputs into the transport modelling process. It is important that UMPs explore ways to coordinate development patterns with transport investments—rather than assuming that current land use trends are inevitable. UMP scenarios can

Box 15: Mobility and Accessibility

Transport planning deals with the key concepts of mobility and accessibility. Mobility represents an individual's capability to move through space and time. Mobility is measured in terms of "how far do we go" and "how quickly do we get there". The demand for mobility can be attributed to the spatial separation between different types of land uses; however, enhanced mobility can also be seen as a driver for increased separation of land uses. Accessibility is the extent by which cities and transport networks enable us to reach our destinations. Accessibility (or access) describes the ability to reach social and economic opportunities, and reflects the generalised costs (in terms of time, money, discomfort and risk) needed to reach them.

When planning transport infrastructure and services, it is important to differentiate between mobility and accessibility. For example, in cities with high levels of congestion, citizens who travel by automobile may experience relatively poor levels of mobility (slow travel speed, low individual travel mileage). However, the cities themselves may be economically successful due to their accessibility (cumulative number of opportunities, activities that are clustered together, many travel options, overall low cost of travel). Transport systems exist to provide economic and social connections—travel is rarely an end in itself. Thus, a "good" transport system provides more accessibility per unit of mobility.

aid in the evaluation of how land use regulations, such as densification of rapid transit corridors, can facilitate the use of sustainable transport modes.

Integrating land use and transport planning means striking a balance of mixed uses (residential, educational, employment, recreational, retail and services, etc.) that recognises the value of the spatial proximity, layout and design of those uses. Considering the long term impacts of land use decisions on the natural and built environment, including transport systems and facilities, is critical. Implementing such a balance through a UMP will require strong partnerships and significant coordination between municipal transport agencies and the various regional authorities that are involved with creating plans for economic growth, urban development, and other programs that may impact land

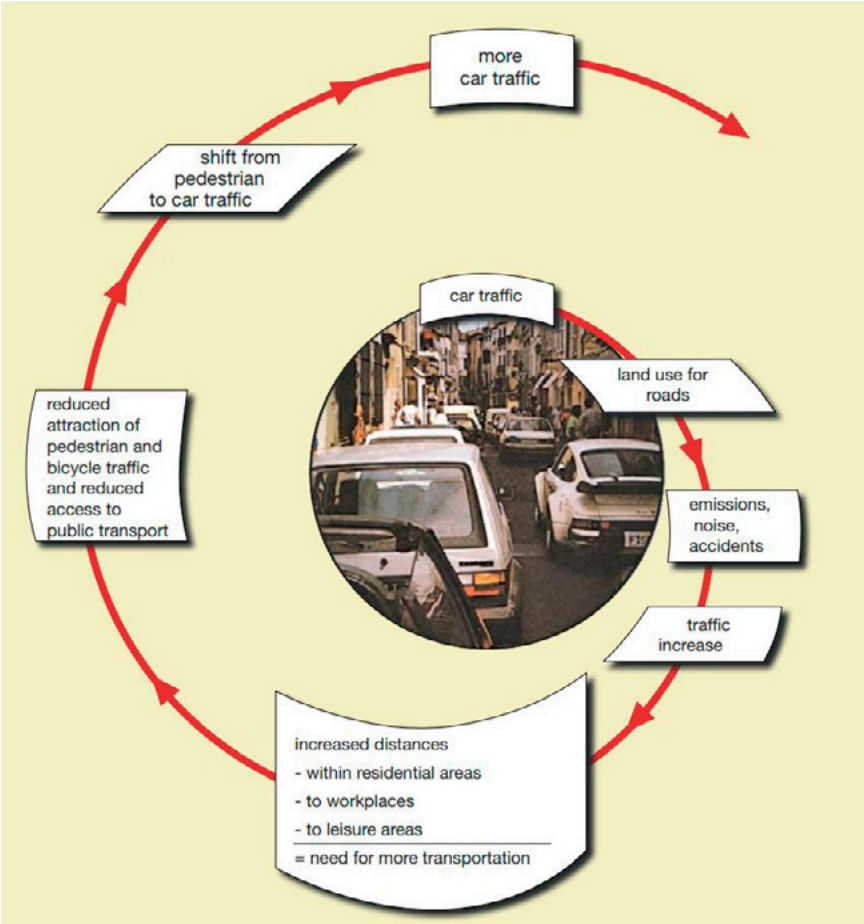


Figure 62: *Vicious circle of automobile dependence.* Adapted from Vivre en Ville, 2011

use. Thus, UMPs should require that all such plans be explicitly identified and compared with transport plans, and that all future regional land use strategies, policies and plans are harmonised with transport studies, plans and programs.

Figure 63: *Bike sharing and the provision of bicycle parking facilities increases the catchment area of (mass) public transport services; Metro station in Beijing.*

Figure 64: *Land use plan of Ivano-Frankivsk (Ukraine).*

CASE STUDY 8

Chihuahua (Mexico) – Mobility as integrated part of urban development planning

A requirement for receiving funds from Mexico's PROTRAM program is the creation of an urban mobility plan (The Mexican PIMUS) or an equivalent document. In the case of Chihuahua, urban mobility-related issues have been included in the Urban Development Plan 2040 (UDP 2040). Chihuahua's Municipal Planning Institute (IMPLAN) developed the Sectorial Plan for Sustainable Urban Mobility (PSMUS) as part of the UDP 2040 planning process. A participatory process including residents and experts has been applied during its development.

Figure 65: *Urban Development Plan logo for Chihuahua (Mexico).* Source: Ayuntamiento de Chihuahua, 2014

The initial assessment process for Chihuahua's PSMUS is particularly notable because of its thorough and holistic diagnosis. Several characteristics and challenges in urban transport were comprehensively analysed:[1]

- **Urban Diagnosis** – Chihuahua concludes that urban density and compactness, urban green space, and government investment are important factors in determining quality of life. Particular challenges were identified.
- **Roadway Diagnosis** – A roadway diagnosis was conducted to assess road quality with a special focus on traffic safety.
- **Public Transport Diagnosis** – While public transport in Chihuahua provides wide spatial coverage, upgrading service quality has been identified as number one priority for the further development of urban mobility.
- **Mobility Behaviour Diagnosis** – A household mobility survey was developed to gain insight from the population's mobility patterns.

Based on the city's vision and the diagnostic work, Chihuahua elaborated two strategies: a) a strategy for the development of an integrated public transport system with high service quality and b) a comprehensive strategy for the development of cycling as a mode of transport.

[1] Further information: http://www.implanchihuahua.gob.mx

5.3 Evaluating alternative scenarios

If UMPs do have the power to shape urban transport futures, the question arises: What kind of future is desirable for urban and metropolitan areas? No matter what method is used to generate travel demand estimates in a UMP, a critical step is measuring the outcomes. Policy-making requires evaluating sets of proposals for discrete changes—whether they be physical infrastructure or the elaboration of a new set of operating rules. Some proposals may require one-time, capital investments, while others may produce long-term costs for operation and maintenance or need extensive behavioural and political groundwork. Evaluation criteria are factors or standards that are used to analyse the costs and benefits of each proposal to support this decision-making.

Evaluation criteria can play summative (judging a project's relevance, effectiveness, or success), or formative (improving a particular project as it develops) roles. In the UMP's context of prioritising transport plans and effectively allocating resources, evaluation criteria can be utilised to assess and appraise the effects of alternative plans, and as justification for selecting a preferred alternative.

Figure 66: *Modern tram in Strasbourg's city centre.* © Robin Hickmann, 2014

BOX 16: Measuring land use and transport changes in Barcelona

The Metropolitan Transport Authority of Barcelona developed El Pla Director de Mobilitat (PDM), a master mobility plan for the 50 municipalities and 64 regional centres of the Barcelona Metropolitan Region (BMR). One of the PDM's aims in coordinating urban development and mobility is to stop the rise in the *average distance of journeys* in the BMR. This metric helps evaluate both land use patterns (*e.g.* the growth of dispersed, low density patterns of urban development that require longer distance trips) as well as transport system features (*e.g.* if streets provide safe and convenient access for pedestrians and cyclists, residents may be able to meet daily needs in close proximity to their homes).

5.3.1 Harmonising UMP indicators with sustainable transport goals

Ideally, metrics are developed to support a specific set of goals and objectives of a transport agency or planning institution, and to harmonise with federal or state laws, policy and regulations. In India, the National Urban Transport Policy (NUTP) emphasises moving people, not vehicles. The NUTP emphasises the need to expand public transport service and improve the safety of non-motorised transport modes. The choice of indicators is a key means of ensuring that the projects identified in the UMP help to support these goals. The following list contains a choice of essential indicators on which data should be collected when preparing an UMP:

- Mode share of walking, cycling, public transport and private motorised transport;
- Fraction of households with access to high frequency public transport;
- Fraction of low-income households with access to high frequency public transport;

- Efficiency of public transport routes, measured as the number of passenger-km divided by vehicle-km for the respective route (*e.g.* bus passenger-km divided by bus-km);
- Car ownership (per income-class and household, spatial distribution);
- Vehicle kilometres travelled (VKT) for personal motor vehicles;
- Emissions of local pollutants and greenhouse gases (GHGs);
- Road accident figures (in total, by cause, by location).

5.3.2 Transparency in evaluation metrics

Project evaluation exists within a political process and is performed for decision makers, not technicians. Thus, a UMP must be transparent in methodology so that the analysis is clear to a variety of stakeholders. The evaluation process should include public decision-making techniques to build consensus and enhance the skills and capacities of participants. It is important to maintain a focus on the basic vision and goals of the UMP rather than conducting an overly technical discussion that distracts from the key issues at hand (*i.e.* how to generate higher use of sustainable transport modes in the most efficient manner possible). The evaluation should be presented in a manner that makes it possible to understand and justify political decisions that are in the interests of all citizens.

5.3.3 Data reconciliation

The evaluation of transport scenarios must reconcile the proposed transport solutions and the expected outputs in terms of passenger ridership and other variables. Data reconciliation helps to confirm that the proposed transport solutions have sufficient capacity for the expected demand. This doesn't mean that road design has to meet the total demand for private car transport, but that the overall mobility demand is managed in an efficient manner, considering all available transport modes. Read more in SUTP's Technical Document "Transport Demand Management", available at www.sutp.org.

Figure 67: *A bus hub in Kathmandu (Nepal).* © Vedant Goyal, 2014

5.4 Time horizons and monitoring

Due to the rapid transformations in developing cities, it is important to be wary of long-term projections. Instead of 20-year time frame, it is recommended that UMPs are more conservative (and incremental) and focus instead on 5 to 15-year horizons, depending on prevalent development dynamics. It is advised to provide detailed procedures for implementing the measures proposed, including time lines, approximate budget, and to identify responsible units and further stakeholders that have to be involved.

Continual updates on proposals and reporting on the implementation progress is important to react on the discrepancies between plan and reality. Therefore, UMP data should be updated on a regular basis, and indicators of success should be monitored continuously.

5.5 Stakeholder participation in UMP preparation

Planning processes without adequate inclusion of citizens and affected interest groups can cause delays, long-lasting court proceedings, and cost overruns in the implementation of Urban Mobility Plans. In Germany and other European countries, citizens are no longer willing to accept expensive investment decisions in the absence of adequate public consultation. Although most countries have legal obligations regarding the involvement of citizens in most countries, participation is often too limited and too late in the process to make a difference. Citizens might simply not know where, when, and how to get access to planning documents, and in what way they can express their concerns and make suggestions.

There are different levels of participation, ranging from the dissemination of information about on-going planning projects to active decision-making (*e.g.* through a referendum). Basic forms of participation include surveys gathering public opinion on mobility issues; roundtable discussions with representatives of important interest groups; public consultations in person and through internet platforms; and creative methods such as citizen walks.

One of the important lessons learned is that participation should be carefully planned beforehand. Who will participate? How people can engage? What are the legal and organisational limits of the particular participation process? How the feedback of people will be addressed and incorporated in decision-making processes?

Participation is a process that requires both capacities on the side of the administration as well as budgetary efforts. Most cities regard these efforts as worthwhile given the potential to save time and money in the mid- to long-term. In general, an early and participatory decision on the "right direction" reduces the potential for subsequent conflicts, as interests become clear at an early stage. The participation process can also reveal less cost-intensive measures that can achieve mobility goals.[33]

Chapter 4.4.1 presents further implications for civic participation.

[33] The CIVITAS ELAN project – Citizen Engagement has compiled the experiences of five European cities in one document, covering case studies on participation processes in projects like the development of comprehensive cycling strategies, re-developing a main train station area, designing a congestion charging scheme or an entire Urban Mobility Plan. You'll find the document under: http://www.civitas.eu/content/lessons-learned-citizen-engagement.

Box 17: Lessons learned on citizen engagement

The CIVITAS ELAN project – Citizen Engagement has compiled the experiences of five European cities in one document, covering case studies on participation processes in projects like the development of comprehensive cycling strategies, re-developing a main train station area, designing a congestion charging scheme or an entire Urban Mobility Plan. You'll find the document at: http://www.rupprecht-consult.eu/uploads/tx_rupprecht/CIVITAS_ELAN_-_Citizen_Engagement_in_the_Field_of_Mobility.pdf

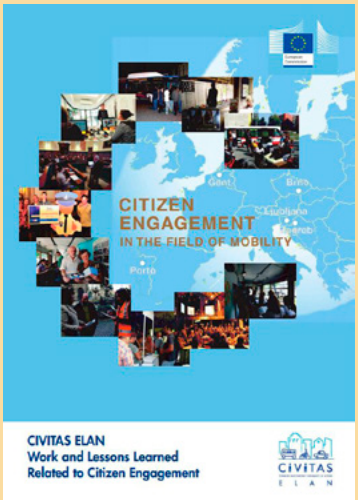


Figure 68: *Civitas Elan Report Cover; See Staffordshire County Council, 2011*

CASE STUDY 9

Florianópolis (Brazil) – Public participation on a regional scale

Located in southern Brazil, Florianópolis is the capital of the state of Santa Catarina. It has a population of 453 285 and the best Index of Human Development score (0.847) of all Brazilian capital cities. The metropolitan region is composed of 12 smaller cities, totalling over 1 million inhabitants.

Most of Florianópolis is located on an island with just one bridge to the mainland. This unique topography causes severe traffic bottlenecking for the many daily commuters to and from the urban island.

To address this problem, the state government partnered with the Brazilian Development Bank (BNDES) to secure financing for the region's UMP, called PLAMUS (Plano de Mobilidade Urbana Sustentável Da Grande Florianópolis). This was the first time BNDES financed a regional mobility plan. The National Law on Public Policies for Urban Mobility, n. 12587/12 had to be observed; this law requires the principle of social engagement to be followed during and after the process of creating the mobility plan.

The group in charge of social participation in PLAMUS used the World Café methodology[1] and divided the cities into 4 major groups headed by the hub cities:

1. City of Florianópolis
2. City of São José
3. Group of Palhoça: Cities of Palhoça, Aguas Mornas, Angelina, Anitápolis, Rancho Queimado, Santo Amaro da Imperatriz, São Bonifácio and São Pedro de Alcântara
4. Group of Biguaçu: Cities of Biguaçu, Antônio Carlos and Governador Celso Ramos

Process

The city's project team organised meetings and invited public servants and community leaders to be part of PLAMUS. The biggest challenge was establishing trust in the project team, as public authorities had a record of unfulfilled promises in past years.

Consultation workshops were held on Fridays for public servants and Saturdays were open to all citizens. The World Café methodology was used to discover the people's major desires and expectations regarding mobility for the metropolitan region. Around 35 people gathered at each meeting. In addition, a project launch with about 115 participants was held. In the end, 395 different people participated.

Consultation workshop methodology

Attendees were divided into working groups of ten people, each group with a moderator. The first task was to identify the social actors who were not in the room and to assess which resources they could add to the discussion. The second task was to identify the major problems regarding mobility in their city. The group then had to determine main problems, along with its causes and consequences. After choosing one problem, the group had to find a way to solve it, which included writing a plan with indicators, objectives, expected findings, etc. The moderator of each individual workshop reported to the technical team to incorporate the findings with the final report and remarks of PLAMUS.

Work in progress

Work on PLAMUS Florianópolis started in January 2014, and finalisation is expected by December 2014. The consultation workshops were part of the first stage, which further included a comprehensive diagnosis, including data collection on transport system characteristics and mobility patterns. A draft plan is currently being prepared with information from the initial data analysis, proposed measures and the results of the public consultations.

Figure 69: *Planning session with citizens for Florianópolis' PLAMUS Project (Brazil).*
© Daniely Votto, 2014

[1] For more information see http://www.plamus.com.br/noticia.php?id=6

6. Conclusion

Cities around the world are searching for better alternatives to provide greater accessibility and mitigate the negative impacts caused by the dependence on personal motor vehicles. Urban Mobility Plans that are currently being adopted have expanded the scope of traditional planning processes by strategically focussing on overarching policy goals as well as on the mobility needs of all population groups. Comprehensive and inclusive mobility planning has proven to be an effective way for identifying the right priorities and measures for achieving a safe, efficient and accessible urban transport system which is serving the needs of the population and the economy. At the same time, Urban Mobility Plans can identify financing options and support the optimal use of public funds. In many countries, *e.g.* in Brazil their development is required for receiving national funding for transport infrastructure. Both the inhabitants of cities, due to the provision of sustainable mobility options and hence improved liveability in urban areas, as well as regional and national entities will benefit from the wide application of Urban Mobility Plans.

Recommended Reading

Guidelines for Developing and Implementing a Sustainable Urban Mobility Plan (SUMP)

The SUMP Guidelines that explain the essential steps involved in developing a Sustainable Urban Mobility Plan have been published by the European Commission in seven languages. The guidelines include good practice examples, tools and references that illustrate each step to help urban mobility and transport practitioners prepare, develop and implement SUMPs.
Download here: http://mobilityplans.eu/index.php?ID1=8&id=8
(Available in Bulgarian, English, Hungarian, Italian, Polish, Romanian and Spanish)

The State-of-the-Art Report of Sustainble Urban Mobility Plans in Europe

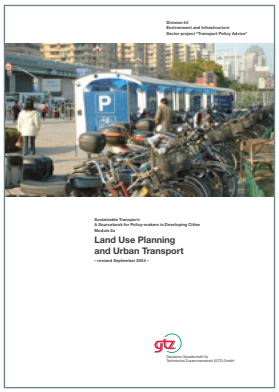
This report is intended to serve as a reference and guidance document for urban mobility professionals. Different approaches to sustainable urban mobility planning exist throughout Europe. The report describes the situation regarding Sustainable Urban Mobility Plans, including current levels of awareness as well as training needs, in more than thirty European countries. Furthermore, it proposes a common Europe-wide definition and sets out the essential requirements for the preparation of a good quality Sustainable Urban Mobility Plan (SUMP).
Download here: http://mobilityplans.eu/docs/file/eltisplus_state-of-the-art_of_sumps_in_europe_sep2011_final.pdf
(Available in English)

Ch4llenge

CH4LLENGE (2013–2016) addresses the four most pressing challenges in the development and implementation of Sustainable Urban Mobility Plans. Nine European cities will test innovative and transferable solutions in participation, cooperation, measure identification as well as monitoring and evaluation. CH4LLENGE kits, as the key outputs of the project, will recapitulate the lessons drawn from the cities' pilot schemes and the results of the project's training activities to facilitate the take-up of SUMPs in Europe.
Read more: http://www.sump-challenges.eu

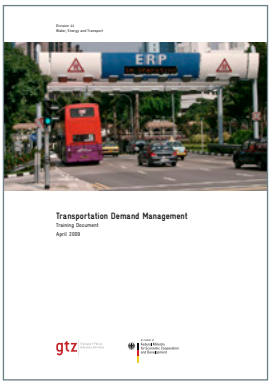
White paper 2011 – Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system

The European Commission adopted a roadmap of 40 concrete initiatives for the next decade to build a competitive transport system that will increase mobility, remove major barriers in key areas and fuel growth and employment. At the same time, the proposals will dramatically reduce Europe's dependence on imported oil and cut carbon emissions in transport by 60% by 2050.
Read more: http://ec.europa.eu/transport/themes/strategies/2011_white_paper_en.htm
(Available in English, Spanish, German, Italian and Polish)



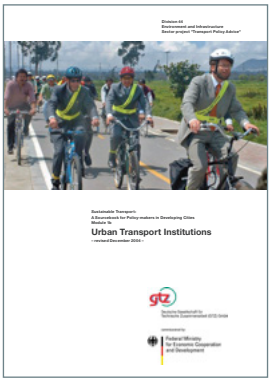
SUTP Module 2a: Land Use Planning and Urban Transport

Which cities have succeeded in establishing land use patterns which support the more environmentally-friendly and efficient modes of transit, walking and cycling? What are the benefits of better land use planning for developing cities? What are the key components of a successful land use and transport planning program in a developing city? How should urban transport and land use be organised? What can developing cities do to address increasing problems of urban sprawl and automobile dependency? This module addresses all of these questions and provides policy recommendations, with several case studies from developing cities.
Download here: http://www.sutp.org/en-dn-th2
(Available in English, Spanish, Chinese and Indonesian)



SUTP Training Document: Transportation Demand Management

Transportation Demand Management (TDM) aims to maximise the efficiency of the urban transport system using a wide range of measures, including Congestion Pricing, Public Transport Improvement, Promoting Non-motorised Transport, Fuel Taxation and Parking Management. This document presents an overview on international practices, approaches and supports the design of a TDM strategy.
Download here: http://www.sutp.org/en-dn-td
(Available in English, Spanish, Chinese, Indonesian, Ukrainian and Vietnamese)

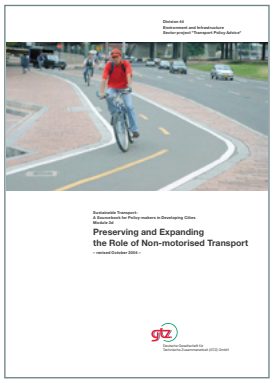


SUTP Module 1b: Urban Transport Institutions

This module presents an analysis of urban transport institutional successes and failures in developing cities. It considers several in-depth case studies in a range of countries, explaining how institutional shortcomings have arisen and manifested. The module draws conclusions from the case studies in the form of recommended policy approaches required for effective urban transport institutions.
Download here: http://www.sutp.org/en-dn-th1
(Available in English, Spanish, Chinese and Romanian)

SUTP Module 1f: Financing Sustainable Urban Transport

This Sourcebook module provides detailed information on available options for financing urban transport. It presents different financing instruments and ways in which they can be best used, and how to optimally combine them. This module is dedicated to policy makers, financial sector specialists and urban planners/practitioners working on key challenges related to financing urban transport systems.
Download here: http://www.sutp.org/en-dn-th1
(Available in English, Chinese, Spanish, French, Indonesian, Portuguese and Vietnamese)



SUTP Module 3d: Preserving and Expanding the Role of Non-motorised Transport

This module starts by outlining the benefits of non-motorised transport (NMT). It considers the different forms of regulation to which NMT is subjected, and describes the non-motorised transport planning process and the steps involved, drawing from an example pilot study conducted in Surabaya. Successful measures in cities such as Bogotá, and in European cities, are described with the intention of applying them in developing cities. It is complemented by a training course on Non-motorised transport and a Handbook on Cycling-Inclusive Policy Development.
Download here: http://www.sutp.org/en-dn-th3
(Available in English, Chinese and Spanish)

Financing Sustainable Urban Transport – International Review of National Urban Transport Policies and Programmes

The study on "Financing Sustainable Urban Transport – International Review of National Urban transport Policies and Programmes" presents an analysis of a variety of financing and planning practices world-wide in order to help decision-makers identify suitable elements for their local context. While focusing on decision-makers in the People's Republic of China, the study is also relevant for other countries facing similar challenges. It presents insights into financing arrangements for urban transport in eight countries: Brazil, Colombia, France, Germany, India, Mexico, The United Kingdom and the United States of America.
Download here: http://sustainabletransport.org/financing-sustainable-urban-transport-international-review-of-national-urban-transport-policies-and-programmes
(Available in English and Chinese)

The TOD Standard

Transit-oriented development (TOD) is an answer to the unsustainable, car-dependant, and transit-poor urban sprawl that has characterised the growth of cities around the world in the last century. It also contrasts with transit-adjacent development that fails to foster the strong walking and cycling environment needed to complement and actively support the use of transit.
The TOD Standard is a powerful tool to help shape and assess urban development. It focuses on maximising the benefits of public transit and non-motorised mobility while placing the emphasis firmly back on the users: people.
Download here: https://www.itdp.org/tod-standard
(Available in English, Russian and Portuguese)

10 Principles of Sustainable Urban Transport (Prezi)

Sustainable transport needs comprehensive approaches: Following 10 principles of sustainable urban transport and all the corresponding measures GIZ transport colleagues from the People's Republic of China designed a new info graphic and made a PREZI out of it. Have a look on how the Avoid-Shift-Improve approach is now presented in new formats:
Explore here: http://prezi.com/7ufnp8crzc1l/10-principles-sut

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List of abbreviations

AMAT	Milan's transport agency
AOTU	Autorité Organisatrice des Transports Urbains
AQP	Air Quality Plan
BANOBRAS	National Bank of Public Works and Services, Mexico
BAU	Business as Usual
BCR	Benefit-cost ratio
BHTrans	Belo Horizonte transit agency
BMR	Barcelona Metropolitan Region
BMZ	German Federal Ministry for Economic Cooperation and Development
BNDES	Brazilian Development Bank
BRT	Bus Rapid Transit
CBD	Central Business District
CDP	City Development Plan
CEPT	Center for Environmental Planning and Technology
CMP	Comprehensive Mobility Plan (India)
CST	Centre for Sustainable Transportation
CTTS	Comprehensive Transport and Traffic Study (Mexico)
DPR	Detailed Project Report
EU	European Union
FGSV	Forschungsgesellschaft für Straßen- und Verkehrswesen
FONADIN	National Infrastructure Fund (Mexico)
GHG	greenhouse gas
HLJ	Helsinki Region Transport System Plan
IMPLAN	Chihuahua's Municipal Planning Institute (Mexico)
IPT	informal public transport
ITS	Intelligent transport systems
JNNRUM	Jawaharlal Nehru National Urban Renewal Mission (India)
LAURE	Loi sur l'Air et l'Utilisation Rationnelle de l'Energie (France)
LIP	Local Implementation Plan for transport (United Kingdom)
LOTI	Loi d'Orientation des Transports Intérieurs (France)
LTA	local transport authority
LTP	Local Transport Plan
MCA	Multi-criteria analysis
MoUD	Ministry of Urban Development (India)
NAPCC	National Action Plan for Climate Change
NIT	Nagpur Improvement Trust
NMT	Non-motorised transport
NMV	Non-motorised vehicles
NRP	Noise Reduction Plan
NUTP	National Urban Transport Policy
ObsMob-BH	Belo Horizonte's Urban Mobility Observatory
O-D	origin-destination
PDM	Pla Director de Mobilitat (Barcelona)
PDU	Plans de Déplacements Urbains (France)
PIMUS	Mexico Comprehensive Urban Sustainable Mobility Plan (Mexico)

PLAMUS	Plano de Mobilidade Urbana Sustentável Da Grande Florianópolis (Brazil)
PlanMob	Guidelines for Urban Mobility Planning (Brazil)
PlanMob-BH	Urban Mobility Plan for Belo Horizonte (Brazil)
PMU	Planos de Mobilidade Urbana (Brazil)
POD	People Oriented Development
POP	People Oriented Development
PROTRAM	Federal Mass Transit Support Program (Mexico)
PSMUS	Sectoral Plan for Sustainable Urban Mobility (Mexico)
PTP	Public Transport Plan
PTTU	Urban Transport Transformation Project (Mexico)
PUM	Piano Urbano della Mobilità (Italy)
PUT	Piano Urbano del Traffico (Italy)
RTP	Regional Transport Plan
SACOG	Sacramento Area council of Governments
SCBA	Social cost-benefit analysis
ScoT	Territorial Coherence Scheme (France)
SEDESOL	Ministry for Social Development (Mexico)
SITP	Integrated Public Transportation System
SRU	Loi relative à la Solidarité et au Renouvellement Urbain (France)
StEP (Verkehr)	Urban (Transport) Development Plan (Berlin)
SUMP	Sustainable Urban Mobility Plan
TDP	Transport Development Plan (German: Verkehrsentwicklungsplan, see 'VEP')
TMP	Transport Master Plans (Ukraine)
TOD	Transit Oriented Development
UMP	Urban Mobility Plan
UNEP	United Nation Environment Programme
UTP	Urban Traffic Plan
VEP	Verkehrsentwicklungsplan (Transport Development Plan, Germany)

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Marina Gil
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Manfred Breithaupt
Daniel Bongardt
Andrea Henkel
Vedant Goyal
Sven Wedloch
City of Milan
Dresdner Verkehrsbetriebe (DVB) AG

Published by
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
GIZ Bonn and Eschborn, Germany

Sector Project 'Transport Policy Advisory Services'
Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Germany
Tel. +49 (0) 6196 79-1357
Fax +49 (0) 6196 79-801357
transport@giz.de
www.giz.de/transport

Authors
Susanne Böhler-Baedeker
Christopher Kost
Mathias Merforth

Managers
Manfred Breithaupt, Senior Transport Advisor

Design and layout
Klaus Neumann, SDS

Photo credits
Cover photo © Mariana Gil, Belo Horizonte, Brazil, 2014

As at
November 2014

GIZ is responsible for the content of this publication.

On behalf of
Federal Ministry for Economic Cooperation and Development (BMZ)
Division Water; Urban development; Transport

Addresses of the BMZ offices
BMZ Bonn
Dahlmannstraße 4
53113 Bonn, Germany
Tel. +49 (0) 228 99 535 – 0
Fax +49 (0) 228 99 535 – 3500
poststelle@bmz.bund.de — www.bmz.de

BMZ Berlin
Stresemannstraße 94
10963 Berlin, Germany
Tel. +49 (0) 30 18 535 – 0
Fax +49 (0) 30 18 535 – 2501