



# What Cities Want

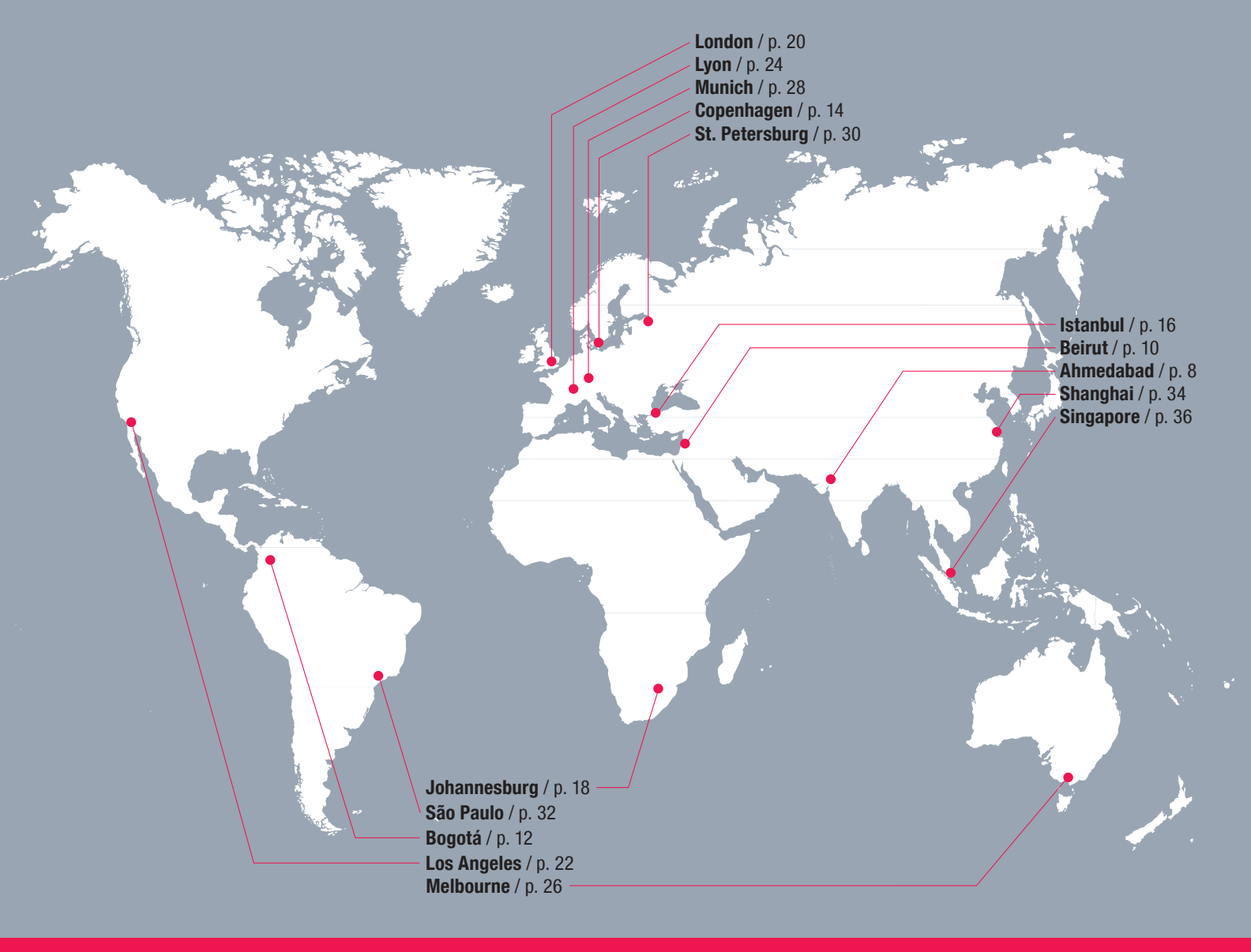
How cities plan future mobility.

A study by the Technische Universität München and MAN

Engineering the Future – since 1758.  
**MAN Group**







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# WHAT CITIES WANT: THE MOBILITY SOLUTIONS OF THE FUTURE

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Since the year 2009 half the world's population has been living in a city, as shown by statistics from the United Nations. And the trend is ongoing. By the year 2050 it is thought that the number of city dwellers will increase by 85 percent to reach 6.3 billion – that is, two thirds of the world population will then be living in cities. This means that cities will have to absorb the bulk of future population growth.

The challenges associated with this development are most evident in connection with infrastructure issues. Transport facilities, power and water supplies and waste disposal all have to keep up with the growth that is anticipated. But we often get the impression that cities are being driven by events – just responding to uncontrolled growth, rather than acting with foresight.

At the same time, urbanization does harbor opportunities for cities. For exam-

ple, an attractive metropolis acts as a lure for business enterprises of both national and global significance. If companies choose a city as a location for their group headquarters, responsible for the coordination and integration of international production processes, that city will be making a notable contribution to the future shape of globalization. For “global cities” of this class it is an ongoing challenge to present an attractive prospect for companies, their employees and potential workers – and to continue to do so. Indices assessing the quality of life of a city reflect the global competition between cities in the attractiveness stakes. In this competition, mobility policies play a crucial role. Urban planners need to find solutions for traffic congestion, vehicular air pollution and problems associated with the massive use of public spaces for trans-

port purposes, if their city is to continue to appeal.

## **Mobility is a decisive factor in the attractiveness of cities**

In the light of these challenges to passenger transport, MAN and the Technical University of Munich (TUM) have conducted a study entitled “What Cities Want”. The study investigates how cities plan to organize future mobility, and what challenges they are faced with. The authors of the study started by analyzing the drivers and influential factors that are significant for the shaping of mobility in cities. Based on Frederic Vester's approach to system analysis, the complex interaction of different aspects was first examined. This was followed by a workshop involving some 20 representatives of different industries – finance, real estate, automotive, trend research,



logistics and transport – where the initial findings were investigated in depth. Here it emerged that while each city is individual and unique, all of them are at the same time subject to the same “generic code”. Three controlling loops were identified which are of fundamental significance for urban development. These fall under the headings of industrial development and urbanization, environmental stress and climate change, and strategic implementation. Only when they succeed in systematically controlling the effects of their industrial development, keeping local environmental stress to a low level and at the same time meeting national and international climate targets, can cities aspire to a viable form of future mobility which will make a positive difference to their attractiveness as a location.

### **City strategies for urban and transport planning**

On the basis of the “city” system model, a questionnaire was developed to inquire into strategies, drivers and obstacles for urban transport planning and mobility policy. The fifteen cities selected for the survey were Ahmedabad, Beirut, Bogotá, Copenhagen, Johannesburg, Istanbul, London, Los Angeles, Lyon, Melbourne, Munich, St. Petersburg, São Paulo, Shanghai and Singapore. These cover a wide range in terms of size, annual population growth rates and population density, the balance of the different modes of transport in transport overall and the degree of industrial development. The strategies chosen by a city for the planning of its future mobility will be significantly dependent on the already existing infrastructure, the quality of its municipal administration and the current state of its economy.

Heads of urban and transport planning departments in the various cities were selected as professionally qualified experts to consult. The study “What Cities Want” thus reflects the strategies which are being developed in cities by urban and transport planners, and implemented as a matter of political priority. In terms of transport planning, 14 out of the 15 cities are pursuing the objective of improving the quality of local public transport services, followed by the upgrading of the local public transport infrastructure and improved mobility

for all their citizens. This should now have been achieved, seeing that most of the cities have already improved their road network, increased the capacity of their roads and for the most part have also introduced access restrictions. The principal objective of local public transport is seen as being that of highlighting alternatives to the passenger car and offering mobility services to all city dwellers. But at the same time those cities and regions which have low population density in certain areas are faced with a dilemma in keeping public transport services cost-effective. Consequently, the majority of those interviewed are also aiming at an urban development which will be tailored to the needs of local public transport. In addition, almost all the participants want to encourage walking and cycling.

When it comes to the successful realization of the planned transport projects, the municipal budget, transport governance and economic development are the crucial factors. The influence of politics on transport planning and the realization of transport projects can be understood either in a positive or in a negative sense. Strong and consistent political leadership can be effective in shaping the future mobility of a city. Frequent changes in public transport strategy, on the other hand, are likely to hamper the development of future-capable mobility solutions and prevent them focusing on clearly defined targets.

The financial situation of the cities, above all, explains the success of “Bus Rapid Transit” (BRT) solutions in recent decades. Systems of this kind have their own infrastructure, which gives the buses priority in road traffic. Their frequency is approximately the same as that of rail-based systems, so that an appropriate level of capacity utilization can be achieved. In the selection of a transport strategy, it has emerged that the conventional city bus remains the basis today for any effective urban transport system. Rail-based systems, by contrast – apart from the traveling time involved and the question of service quality – have the strongest influence on mobility patterns, while the environmental awareness of users hardly affects their choice of transport. This goes some way to explain the renaissance of the bicycle. With

the low average speed of motorized transport and the lack of parking spaces for passenger vehicles, the bicycle frequently offers a speedier and cheaper alternative for door to door travel in the city.

### **Partnership of public and private players based on trust**

The results of the questionnaire were discussed with urban and transport planners from the 15 cities in the course of a two-day workshop. Here it was found that mobility forms an essential foundation for progress at local level – one that needs to be harmonized with the challenges of globally sustainable development. The proactive promotion of reliable transport systems – especially in local public transport, but also in smaller scale networks for pedestrians and bicycles – is an essential condition for making cities attractive and accessible and raising the quality of life. Cities must focus their development on these transport systems with a view to avoiding traffic queues and environmental pollution. This calls for a coordinated regional planning and transport policy, which should involve as many of the important players as possible. Both public and private sectors need an appropriate institutional framework if they are to develop a partnership based on trust, with a view to the realization and joint financing of the successful projects of the future.

In addition to this, the attitude and mobility habits of the population are another crucially important factor. User-friendly information and communication systems, backed up by systematic mobility management, can contribute to maximizing the efficiency and capacity utilization of existing transport systems. Technological innovations on their own, however, will not resolve the problems of urban mobility. Mobility management and experimental approaches to a solution may help to bring about a change of perspective. In the interest of sustainable development, it is essential to keep open a wide range of options with a view to dealing with future processes of change. //

# THE “GENERIC CODE” OF MOBILITY IN CITIES

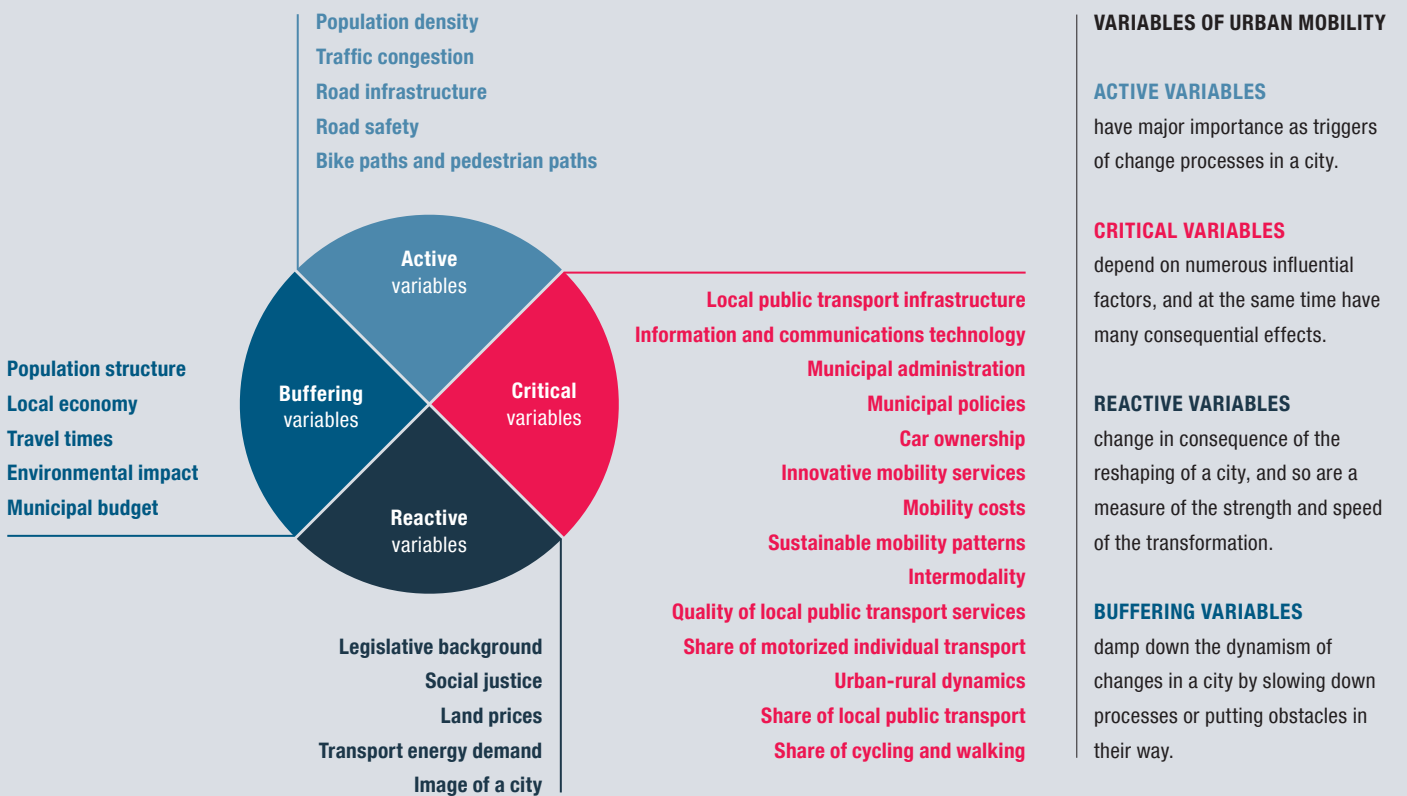
Every city in this world is unique. There is no doubt about that. Each city has its own identity, its own unmistakable character, an individual spirit, and inhabitants with certain definite characteristics and behavior patterns. If just one of these elements were missing or came to be replaced, the city would no longer be itself.

But although every city has this kind of unique identity, at the same time cities are not just distinguished by their differences – we can also make out features that they have in common. For example, we find the same issues being discussed in many different places when the future of

cities is at stake – like how to deal with increasing urbanization, increasingly frequent traffic congestion and rising environmental pollution. So the question suggests itself whether we may not be able to find quite similar mechanisms and dependencies at work in different cities all over the planet – in spite of the obvious differences between one metropolis and another. Every city, certainly, has its own specific conditions and seems to follow its own logic of development; but maybe we can still find the same processes influencing this development in all sorts of different cities, all around the globe.

## How cities can be successful in facing their challenges

Cities are complex and dynamic systems. They are developing all the time, but they can also undergo abrupt changes. In some respects they can completely reinvent themselves, while at the same time retaining a high degree of stability – along with the capacity for self-organization and for adapting to changing conditions. A city’s power to maintain itself and its resilience are at their highest when its citizens do not just aim to maximize their individual benefits as city-dwellers, but also devote themselves to the common good. When it is a



matter of getting a city onto a stable path of development, what is important is not just coordinated governance at the highest level, but the behavior patterns of the individual players.

The factors that determine the mobility of the inhabitants of a city form a basis for urban development. This fact can already be inferred from the Egyptian hieroglyph meaning “city”, which resembles an X. The symbol is designed to show that a city is created at a place where roads cross. Points of contact between transport routes, intersections and possibilities of connection, and in the last resort the situation and accessibility of the place – these things have always been crucial to the creation and development of urban structures. Today the reverse is also true: it is the properties of an urban center, like its density and social mix, which influence mobility patterns and everyday transport operations.

Numerous cities today are faced with the challenges associated with rising population and ongoing urbanization. In parallel to their growth and their industrial development, traffic places an increasing strain on the system. The increase in car transport not only makes demands on an ever greater share of public space for road building, it also leads to higher energy consumption, plays a considerable part in local environmental pollution and contributes to global climate change. So it is a matter of great significance what strategies and measures are adopted by cities all over the world to confront this development, and what goals they pursue.

Other questions are also important. What future-capable development paths can be identified? What players and what forces are an influence on development? What effect do mobility issues in urban centers have if urban development is to be sustainable?

### **Understanding complex processes of interaction**

Success in the development and realization of future-capable strategies of mobility in cities will only be possible when we identify and take into account the many and varied factors that are involved in the urban system. This study therefore endeavors to present the properties of the different mobility elements in cities, and to understand

the modalities of their interaction. Based on Frederic Vester’s system analysis, a workshop of experts identified 29 variables which characterize the systemic structure of urban mobility on a comprehensive scale. By assessing the direct interrelations between these variables with the help of a matrix, we can recognize the role that the different system elements play – in other words, the position of the variables in the system overall (see illustration on left). Based on this, we can then describe generally valid connections in the effects of these factors – a kind of “generic code” of mobility in cities.

### **The different variables of urban mobility and their effects**

Factors like the urban structure, the transport infrastructure and the degree of traffic pollution thus turn out to be active control variables for a city – variables, that is to say, that have major significance as triggers of processes of change. Then we have critical variables, which depend on a plethora of influential factors and at the same time have numerous consequential effects. Conspicuous examples are the dynamics of relations between the city and its surrounding countryside, and the competence of municipal administration. Likewise the ratio of motorization, the quality of local public transport services, technological innovations and the level of transport interconnections have a considerable influence on the mobility patterns of the inhabitants and the resulting balance in the different modes of transport. Cost and safety aspects are also crucially important, both as a social factor and as the trigger of technological innovations and political decisions. Economic development, along with the social, industrial and cultural background of the urban population, influences the stability of the system overall to a notable degree.

Buffering effects, on the other hand, result from the availability of public funds and the legislative conditions prevailing. These serve to damp down a city’s developmental dynamism. From a cybernetic point of view – with an eye, that is, to the processes of control and regulation – the time people spend on roads in a city has a very important part to play. This is because restricted facilities and resources under-

line the limits of growth. The ecological and social effects – in particular, the energy consumption caused by traffic – are reactive variables. These change over the course of a city’s development. Land and real estate prices likewise play a reactive role. This makes them suitable criteria of successful change. The image of a city is another indicator of successful development – at the same time as triggering increasing activity in the political arena.

Against the background of the conclusions drawn from the systemic structure, we were able to formulate the following questions with a view to investigating the cities taking part in the study:

- » How do economic factors affect urbanization and mobility patterns?
- » What part is played by energy consumption, climate change and environmental impacts when it comes to local transport policies?
- » What concrete challenges are the cities faced with?
- » What transport and urban development strategies have the cities adopted?
- » How can the players concerned be successful in realizing these ideas?

### **Interdependencies of effects and future prospects**

In what follows, we offer a picture of 15 cities. The information given here has been essentially based on that presented by the city’s representatives over the course of the workshop, in municipal records, and the questionnaire put to the city’s representatives in preparation for the workshop. The study then proceeds to conduct an evaluation across the board, with a view to identifying common challenges, strategic priorities and concrete areas for action. In conclusion we hope to be able to identify common connections, draw generally valid conclusions and highlight future prospects for the long-term and sustainable development of mobility in cities. //



# AHMEDABAD (IND)



POPULATION: 5.6 million inhabitants  
 POPULATION GROWTH: 2.4%  
 AREA: 475 km<sup>2</sup>  
 POPULATION DENSITY: 11,728 inh./km<sup>2</sup>

GDP: €11,774 per capita  
 UNEMPLOYMENT: no data supplied  
 PRIVATE CARS: 36/1,000 inh.  
 MOTORCYCLES: 218/1,000 inh.

FATAL ACCIDENTS: 267 p.a.  
 INJURIES: no data supplied  
 DIESEL: €0.72/liter  
 PUBLIC TRANSPORT: €0.144/trip

**Facing rapid growth, Ahmedabad must combine transport policy with urban development**



## TRANSPORT MODE SHARE

How inhabitants and visitors to the city get around (number of trips)

- Motorized individual transport 42%
- Public transport 16%
- Cycling 14%
- Walking 22%
- Other 6%

## TRANSPORT INFRASTRUCTURE

City buses .....	549 km
Bus Rapid Transit .....	85 km
Long-distance buses .....	2,110 km
Motorized rickshaws .....	60,000
Regional trains .....	377 km

Ahmedabad is the fifth biggest metropolis in India. It is also the city with the third highest rate of industrial growth worldwide. The city currently has 5.6 million inhabitants, and is registering a 2.4 percent annual growth rate. This means that by the year 2030 the population can be expected to rise to more than eight million.

The local public transport system in Ahmedabad consists of conventional bus services backed up by a recently developed Bus Rapid Transit (BRT) system. Together these carry more than a million passengers every day. In addition there are around 60,000 motorized rickshaws – taxis with two or three wheels, which following an initiative by the authorities are now only allowed to operate on Compressed Natural Gas (CNG). This step is making a crucial contribution to improving the air quality of the city. In the greater metropolitan region the public transport system consists of long distance buses, operated by public and private companies, as well as regional trains which connect Ahmedabad to several local railway lines. All together, these modes of transport carry around 250,000 passengers daily.

Thanks to this transport infrastructure and as a result of investments in improved facilities for pedestrians, today public or non-motorized means of transport are used for 58 percent of the

trips in the city. Ahmedabad is hoping to expand its BRT system considerably. And it is reported that plans for a subway network will soon be complete, after which construction will be set to begin.

In order to cope with these major projects, the city makes use of smart financing models. For example, authorities skim off 14 percent of the increase in real estate value when the price of properties in development zones rises due to improvements in local public transport facilities.

## Long-term planning as a solution for headlong economic and population growth

Ahmedabad has drawn up a detailed plan for urban development and the future of transport. Nonetheless, new settlements with low population density are increasingly springing up in the surrounding countryside. These could present a challenge to the city's development strategy and transport system. Moreover, non-motorized transport is less favored by the population than it was in the past.

The planning authorities are pursuing a two-track approach for development. On the one hand they want to ensure that the development of new city areas remains sustainable; on the other they are consistently endeavoring to strengthen the existing urban area by improving public transport and developing new transport services. //



“ TO EASE THE FUTURE URBAN MOBILITY, TRANSPORTATION PLANNING SHOULD AIM AT ACHIEVING SUSTAINABLE PLANNING AND IMPROVING THE LIVES OF THE PEOPLE. ”

Neela Munshi, Senior Town Planner, Ahmedabad Urban Development Authority

## QUALITY OF LIFE AND SUSTAINABILITY

The authorities of Ahmedabad have taken on a lot with a view to the future of the metropolis. Their supreme targets: “An Ahmedabad that is a livable, environmentally sustainable and efficient city for all its citizens; a city with a robust social and physical infrastructure and a distinct identity; a globally preferred destination.”

This vision of a future-capable city has been the basis of the general development plan for the Ahmedabad region, of which the Integrated Mobility Plan (IMP) for the city and the surrounding country forms a part. The area to which the IMP applies consists of around 7,100 square kilometers in total. The guiding ideal for the future of mobility is an easily accessible, efficient and green city.

### Plan puts faith in local supply and local public transport

The primary goal of the IMP is in harmony with India’s national transport strategy dating from 2006, which aims to promote public transport and improve road traffic with the help of efficient, energy-saving vehicles. With a view to reducing air pollution and traffic queues, the IMP not only relies on public transport – it likewise recommends that local mobility like cycling and walking should be encouraged. The mobility plan also envisages the development of new settlements along major transport corridors, so as to make it possible to connect them more efficiently to local public transport networks. Another part of the plan involves local supply facilities, compact residential and business quarters and park and ride services.

#### ↑ STRENGTHS/POTENTIAL

Long-term and effective planning system. Well-developed transport services for all modes of transport. High environmental standards and quality of life for residents and visitors.

#### ↓ WEAKNESSES/THREATS

Headlong growth of population and the economy. Transport growth is taking place above all in the motorized sector.

The IMP aims to link the different means of transport in the region more effectively. So as to simplify the transition from one mode of transport to another, Ahmedabad is hoping to set up new transport nodes and transfer facilities capable of coping with a large volume of passengers.

The IMP’s network planning also contemplates setting up green areas alongside transport axes, and the networking of recreation and leisure areas with residential and commercial districts. The basic idea is the establishment of an urban system which supports both development and a high quality of life, while at the same time aspiring to ecological sustainability.

#### Concrete projects:

- » Expansion of the Bus Rapid Transit system
- » Construction of a subway network.

## HOW AHMEDABAD WANTS TO CHANGE

- = transport planning priorities
- = urban development priorities

### Highest priority

- Extend local public transport infrastructure
- Reduce travel times
- Reduce congestion
- Improve access to destinations within the city
- Reduce air pollutant emissions from transport
- Reduce greenhouse gas emissions from transport
- Reduction of traffic congestion
- Improve public transport service quality
- Enhance and protect green and open space areas
- Mixed land use in order to reduce transport demand
- Transit oriented development
- Limiting urban sprawl
- Compact urban growth

### High priority

- Improve transport safety
- Improve walkability
- Improve mobility options for all citizens

### Medium priority

- Improve bicycle friendliness
- Improve transport organization
- Foster secure and safe places
- Highly attractive public spaces
- Focusing urban development in community centers

### Low priority

- Reduce noise emissions from transport

### Lowest priority

### Integration of area use and transport planning

The planning process of the Ahmedabad Urban Development Authority (AUDA) has been based on a three level approach.

- 1. Development plan** (region of Ahmedabad): a regional plan which aims to consider the city and surrounding countryside in an integrated way. Top level transport and development axes will be defined.
- 2. Urban development plan** (Ahmedabad and the city of Gandhinagar): combined view of the development of urban transport facilities, involving the establishment of a city-wide ring and radial system for motorized transport, as well as a concentrated grid network for local mobility based on bicycle and pedestrian access.
- 3. Planning of intersection points** (urban districts): individual plans for the centers of urban districts, with a view to developing them as places with a high quality of life and mixed use.



# BEIRUT (RL)



POPULATION: 450,000 inhabitants (2003)  
 POPULATION GROWTH: 8.3%  
 AREA: 21.4 km<sup>2</sup>  
 POPULATION DENSITY: 21,028 inh./km<sup>2</sup>

GDP: no data supplied  
 UNEMPLOYMENT: 12%  
 PRIVATE CARS: 400/1,000 inh.  
 MOTORCYCLES: 20/1,000 inh.

FATAL ACCIDENTS: 22 p. a.  
 INJURIES: 743 p. a.  
 DIESEL: €0.97/liter  
 PUBLIC TRANSPORT: €1.67/trip

Population growth and dominance of car transport are Beirut's challenges



## TRANSPORT MODE SHARE

How inhabitants and visitors to the city get around (number of trips)

- Motorized individual transport 73%
- Public transport 7%
- Cycling – no data supplied
- Walking – no data supplied
- Other 20%

## TRANSPORT INFRASTRUCTURE

- City buses ..... Yes  
(no data on length of network)
- Minibuses ..... Yes  
(no data on length of network)

Beirut, one of the oldest human settlements in the world, is the capital and the biggest city of the Republic of Lebanon. The city itself has a population of 450,000; the Greater Beirut Area (GBA) has almost two million inhabitants – more than half the population of the country. With an area of just 21.4 square kilometers, the city of Beirut has an exceedingly high population density. Notwithstanding this, the share of motorized individual vehicle use in transport overall comes to around 73 percent, making it comparable with cities with a significant urban sprawl like Los Angeles and Melbourne.

In relation to its area and the number of inhabitants, Beirut has an enormous number of private cars which commute into the city on a daily basis. In view of the immense growth of population expected – with a current annual growth rate of 8.3 percent – and the associated potential increase in road traffic, the situation is likely to become even more critical in future.

Public transport in Beirut is based on buses and consists of just a few lines, which are operated by the municipal authorities and private companies. Services are thought to be irregular, uncomfortable and unreliable. Taxis and minibuses play a more important role. The railway was destroyed in the Lebanese civil war and has not been rebuilt. In view of the high volume of mo-

torized vehicles on the roads, and the lack of consideration shown to non-motorized road users, walking is seen as an unattractive option, and cycling is practically unheard of.

## Lack of consistent administrative conditions an obstacle to planning

A significant problem in Beirut is the lack of a consistent legal framework. The clear definition of responsibilities is likewise lacking. When it comes to the transport sector, spheres of competence overlap in many instances. Responsibility may be vested in the city of Beirut or in the administrative district. It may equally rest with the Lebanese Department of the Interior, the Department of Public Works and Transport, the Council for Development and Reconstruction or the public transport authorities.

Although the municipal council of Beirut has the power to pass resolutions, executive power is in the hands of the Governor of Beirut, who is appointed by the national government. This makes it difficult for the council to put its plans into practice. Another difficulty with the planning and control of transport is that transport relations go well beyond the administrative boundaries of the city. In recent decades there have been major investments in road building, but little has been done for local public transport. //





“ WE WANT TO GIVE THE CITY BACK TO PEDESTRIANS. ”

Rachid Achkar, Head of the Beirut Transport Committee

## CREATING ALTERNATIVES TO THE CAR

Beirut’s vision for the future of mobility consists of establishing a more balanced transport system, while strategically opting for the development of local public transport services. In this way the city is hoping to achieve two main goals. It aims to improve the quality of public spaces, while at the same time providing mobility services that offer all citizens an alternative to the car.

### Private car transport to be better regulated and public transport promoted

So as to be able to shape transport in the light of its vision of the future, Beirut must first ensure that it is actually possible for the necessary political and administrative decisions to be made. Therefore, one aspect of the city’s transport strategy is the decentralization of the political system with a view to transport planning, with the Lebanese government scrutinizing and monitoring this process as it unfolds.

Another pillar of the city’s transport strategy is to reduce dependence on motorized transport. To this end, Beirut is first hoping to expand the infrastructure for non-motorized transport – by investing in the construction of attractive pedestrian and bike paths, for instance. At the same time the city plans to encourage public transport with appropriate investments. Here it is receiving help from the central government. Beirut and the Lebanese government are concerned above all with boosting the attractiveness of public transport. This also includes the control and regulation of available parking spaces, whereby the city is hoping to monitor the use of private cars.

#### ↑ STRENGTHS/POTENTIAL

The exceedingly compact structure of the city offers good conditions for non-motorized transport.

#### ↓ WEAKNESSES/THREATS

In view of the overlapping of spheres of responsibility, the city lacks a framework for transport policy planning. No long-term transport development exists, nor is any budget assigned to it.

### Concrete transport development projects in Beirut:

- » Charles Helou, a station linking different modes of public transport in the city, is designed to be the central transport hub for the entire area of Greater Beirut – with car parking spaces for people from the surrounding countryside, and connections for long distance and overland bus services, as well as a planned tram network
- » Pilot urban planning project with a focus on non-motorized transport
- » Expansion of managed car parking facilities
- » Improved organization of taxi transport
- » Investment in several new multi-storey car-parking blocks

## HOW BEIRUT WANTS TO CHANGE

- = transport planning priorities
- = urban development priorities

### Highest priority

- Reduce congestion
- Extend public transport infrastructure
- Improve public transport service quality
- Improve transport organization
- Highly attractive public spaces
- Enhance and protect green and open space areas

### High priority

- Improve mobility options for all citizens
- Improve access to destinations within the city
- Improve regional accessibility to the city
- Reduce travel times
- Reduce air pollutant emissions from transport
- Improve transport safety
- Improve bicycle friendliness
- Improve walkability
- Foster secure and safe places
- Mixed land use in order to reduce transport demand

### Medium priority

- Reduce noise emissions from transport
- Reduce greenhouse gas emissions from transport
- Compact urban growth

### Low priority

- Focusing urban development in community centers
- Transit oriented development
- Limiting urban sprawl

### Lowest priority

### Pilot project works out standards for future urban and transport development

Beirut is currently launching a pilot project designed to promote “soft modes of transport” (i.e. cycling and walking) in the city. Technical advice and financial assistance is being provided by the French region of Île-de-France. The target of the pilot project is to work out technical standards and norms for urban and transport development which can later be implemented on a city-wide scale. The city hopes this will both provide an expanded infrastructure for sustainable mobility and raise the quality of urban spaces.

The district with which the pilot project is concerned is the Damascus Road area, close to St. Joseph University. It is hoped that this can be reshaped into an attractive urban area. The result will serve as a model for the reshaping of other urban districts.

# BOGOTÁ (CO)



POPULATION: 7.9 million inhabitants  
 POPULATION GROWTH: 0.9%  
 AREA: 1,776 km<sup>2</sup>  
 POPULATION DENSITY: 4,990 inh./km<sup>2</sup>

GDP: €8,210 per capita  
 UNEMPLOYMENT: 9.5%  
 PRIVATE CARS: 187/1,000 inh.  
 MOTORCYCLES: 37/1,000 inh.

FATAL ACCIDENTS: 544 p. a.  
 INJURIES: 2,776 p. a.  
 DIESEL: €3.88/liter  
 PUBLIC TRANSPORT: €0.66/trip

The city's Bus Rapid Transit system is thought to be one of the best in the world, but these days it is often overloaded



## TRANSPORT MODE SHARE

How inhabitants and visitors to the city get around (number of trips)

- Motorized individual transport 17%
- Public transport 44%
- Cycling 5%
- Walking 28%
- Other 6%

## TRANSPORT INFRASTRUCTURE

- City buses ..... 661 lines
- Bus Rapid Transit ..... 87 km
- Bike lanes ..... 344 km

**B**ogotá is the capital of Colombia. With 7.9 million inhabitants and an area of 1,776 square kilometers, it is the biggest city in the country. In the heart of the city we find a ratio of 18,000 residents to one square kilometer – making it one of the most densely populated cities in the world.

Between 2003 and 2006 Bogotá experienced annual economic growth in the region of 10 percent. Today the city is responsible for almost a quarter of the national Gross Domestic Product. In recent decades the influx of new residents from rural areas has contributed to the growth of the capital, especially in the peripheral zones. Because many citizens on a low income live in the heavily populated districts on the periphery but find work in the city center, they have to commute considerable distances every day.

In the 1990s the public transport system in Bogotá was on the point of breakdown. In response the city developed one of the world's most successful Bus Rapid Transit (BRT) systems, under the name of TransMilenio. Today this system consists of eleven corridors with a total length of 87 kilometers. The express bus system carries 43,000 passengers per hour. This makes TransMilenio the highest capacity BRT system worldwide.

The BRT system has made a major contribution to the significance of local public transport

in Bogotá. At the same time, economic growth and the rise in car ownership have resulted in an increase in the number of trips being made by private car. Although Bogotá has introduced some congestion-avoidance strategies – like vehicle registration-based access restrictions at peak hours – traffic queues remain one of the city's persistent problems.

A combination of the introduction of car-free Sundays, construction of bike paths and marked bicycling strips, and imposition of restrictions on parking have made the roads more pedestrian friendly and have helped raise the share of bicycle transport significantly.

### Expansion of BRT system TransMilenio taking longer than planned

As a result of the rapid growth of the city, where the population is expected to reach 13 million inhabitants by 2050, it is becoming harder to offer quality transport services. Although the BRT system proved to be an attractive and cost-effective solution, its expansion has been delayed. The system has already overstepped the limits of its capacity. The original plan envisaged that by 2032, TransMilenio should cover a total length of 288 kilometers. Up until 2008, development went according to plan. Since then, however, only eight of the originally planned fifteen lines have been constructed. //



“BOGOTÁ IS IN URGENT NEED OF A LEGAL BINDING FRAMEWORK THAT ENSURES THE DIRECTION OF THE TRANSPORT POLICY.”

Carlos Moncada, transport specialist, National University of Colombia

## REACHING DESTINATIONS FASTER

Bogotá is aiming at an integrated transport system which meets the needs of the population and provides a basis for sustainable social and economic growth. The city's "Human Mobility" strategy for the years 2012 to 2016 focuses on the citizen, and is designed to combat social, geographical and cultural marginalization.

### Modern infrastructure, new connection points, more exchange of information

Bogotá's mobility master plan is a combination of several distinct strategies. For example, the city wants a fully integrated public transport system – both in relation to the infrastructure and operation of transport services, and in terms of the fare structure.

One aspect of the plan is the establishment of transport corridors for the operation of high capacity routes. These are to be supplemented by lines with medium to low capacity. In addition, Bogotá is hoping to set up an attractive infrastructure for pedestrians and cyclists throughout the city. So-called intermodal hubs, like park and ride stations, will create additional incentives for the inhabitants to cross over to public transport.

Bogotá is also planning a traffic control center to provide an integrated information system covering the city and the entire region. The aim is to intensify communication and the exchange of information between users of different modes of transport. It is hoped that this will make different destinations in the city more easily accessible and cut travel times. Moreover, the city aims to reduce traffic congestion and improve safety standards for road users.

#### ↑ STRENGTHS/POTENTIAL

Successful BRT system and a compact residential structure, encouraging the use of non-motorized transport.

#### ↓ WEAKNESSES/THREATS

Too little investment in the expansion of the BRT system. Insufficient integration of the local public transport system in the past. Lack of political strategy for the future of the transport system.

### Concrete projects:

» Bogotá's integrated public transport system (Sistema Integrado de Transporte Público / SITP) is designed to integrate the different providers of public transport services in a single operating network with a consistent fare structure

» Two cable car lines are being planned, with a view to providing better connections for low income residents living in regions with difficult access to the TransMilenio system

» The doubling of the length of the current bicycle network to 700 kilometers is scheduled to take place over the next 20 years

» Subway system with a length of 29 kilometers, 28 stations and a capacity of 800,000 passengers per day

» Intelligent transport systems (ITS), including the modernization of traffic signal facilities and ongoing information for users and authorities

## HOW BOGOTÁ WANTS TO CHANGE

- = transport planning priorities
- = urban development priorities

### Highest priority

- Improve transport organization
- Improve access to destinations within the city
- Improve mobility options for all citizens
- Reduce congestion
- Reduce travel times
- Improve public transport service quality
- Compact urban growth
- Foster secure and safe places
- Enhance and protect green and open space areas
- Focusing urban development in community centers

### High priority

- Extend public transport infrastructure
- Improve walkability
- Improve bicycle friendliness
- Improve regional accessibility to the city
- Reduce greenhouse gas emissions from transport
- Reduce air pollutant emissions from transport
- Improve transport safety
- Limiting urban sprawl
- Highly attractive public spaces

### Medium priority

- Reduce noise emissions from transport
- Mixed land use in order to reduce transport demand

### Low priority

### Lowest priority

- Transit oriented development

### Politics is holding up the expansion of the Bus Rapid Transit system in Bogotá

Following the collapse of the concession model for bus lines in the nineties, Colombia restructured its public transport operations throughout the country. In Bogotá, Mayor Enrique Peñalosa was responsible for implementing the new strategy. He took over the idea of an express bus system from the Brazilian city of Curitiba, and set the target of covering around 80 percent of trips within Bogotá with bus services by the year 2032. The BRT's relatively low cost and speedy implementation added to the attractiveness of the system. In order to keep up with population growth, however, the city must expand the BRT network. And in recent years there has been no sign of this happening, for political reasons. The last government put all its financial resources into the planning of a subway network, and the present one is focusing on plans for the construction of a tram system. So the future development of the BRT system remains an open question.



# COPENHAGEN (DK)



POPULATION: 528,208 inhabitants (2010)  
 POPULATION GROWTH: 1.3%  
 AREA: 89 km<sup>2</sup>  
 POPULATION DENSITY: 5,935 inh./km<sup>2</sup>

GDP: €43,640 per capita  
 UNEMPLOYMENT: 5.6%  
 PRIVATE CARS: 180/1,000 inh.  
 MOTORCYCLES: 141/1,000 inh.

FATAL ACCIDENTS: 5 p. a.  
 INJURIES: 225 p. a.  
 DIESEL: €1.49/liter  
 PUBLIC TRANSPORT: €3.23/trip

The Danish capital aspires to be a city with a high quality of life for all



## TRANSPORT MODE SHARE

How inhabitants and visitors to the city get around (number of trips)

- Motorized individual transport 27%
- Public transport 15%
- Cycling 30%
- Walking 25%
- Other 3%

## TRANSPORT INFRASTRUCTURE

Commuter trains .....	170 km
Subway .....	20.50 km
City buses .....	Yes,
no data supplied on length of network	
Bike lanes.....	350 km

Copenhagen is the capital of Denmark and the biggest city in the country with half a million inhabitants. The city center has a high population density of almost 6,000 inhabitants per square kilometer. The greater metropolitan region extends along five main axes of settlement and is home to close to 1.2 million inhabitants.

After a period of recession in the 1990s, the city today benefits from a strong economy and has 350,000 jobs, as well as 63,000 students. Public transport in Copenhagen consists of a commuter train system (the S-Tog), which connects the suburbs and the city along a network of 170 kilometers. In the city itself, local public transport relies for the most part on buses. The subway system is still minute, with just two short sections, and was only commissioned in 2003.

More significant, in terms of daily transport, are bicycles. Over half the people living in Copenhagen use bicycles for all trips they make, even in extreme weather conditions and in winter. Around three quarters of all cyclists use their bicycles all year round. The network of bike paths stretches 350 kilometers, and cyclists cover 1.2 million kilometers on it every day. This makes it understandable that a total of 30 percent of all trips made in the Danish capital are made by bicycle. If we restrict our view to trips made to work or place of study, the share of cycling rises to 36

percent. For distances over five kilometers the share is close to 60 percent.

## Combining solutions for increasing mobility with ambitious environmental targets

Copenhagen is becoming more attractive all the time. Around 1,000 people are moving to the city every month. The ongoing growth in population and the increasing demand for transport present a challenge to the city. In the last decade the number of cycle trips rose by 13 percent and the demand for public transport by 10 percent. Car transport rose as well. Copenhagen aims to satisfy the rising demand for mobility in the most sustainable way possible, and the Danish capital is pursuing ambitious climatic targets. It plans to reduce CO<sub>2</sub> emissions by 20 percent between 2005 to 2015. By 2025 Copenhagen hopes to be entirely CO<sub>2</sub>-neutral.

## Transport planning is thus subject to the following guidelines:

- » Compact urban development with short routes
- » Creating the best possible conditions for environmentally friendly means of transport
- » Optimizing the flow of traffic
- » Influencing the choice of modes of transport by means of incentives
- » Creating space for innovative solutions. //



“ THE GOALS SET IN THE CLIMATE PLAN ARE TAKEN SERIOUSLY IN COPENHAGEN. ”

Brian Hansen, Head of Traffic Planning, City of Copenhagen

## CYCLING STILL TO INCREASE

Many of the most important goals which the city of Copenhagen has set itself for the future of mobility relate to cycling. The city hopes to raise the share of bicycles used for trips to work or place of study from its present 36 percent to 50 percent. In parallel to this, bicycling is to be made safer, with the aim of reducing serious injuries to cyclists by 50 percent. The subjective feeling of safety should be boosted as well. The city hopes to reach a situation where 80 percent of cyclists feel safe on the roads.

And it is not just when traveling to work or university that Copenhagen residents are to be discouraged from using the car: the same applies to their leisure time. With this goal in mind, the city wants to ensure that 90 percent of its citizens can reach a park, a lake or a swimming pool in less than 15 minutes on foot, and so be able to visit such places twice as frequently in the future as they do today.

Another goal is a Copenhagen with clean air and less traffic noise – an urban environment favorable to the health of its inhabitants. Among the concrete measures whereby the city hopes to attain this target are the development of the bicycling infrastructure with a view to making it more attractive, and the improvement of public transport services. Moreover, city planners are discussing and implementing restrictions on the use of private cars.

### Cycling:

Copenhagen aims to introduce a “Plus Network” for cyclists. In addition to improvement of the existing infrastructure of bike routes, this in-

#### ↑ STRENGTHS/POTENTIAL

Consistent policy in favor of cycling. Compact urban structure. Ambitious climate goals.

#### ↓ WEAKNESSES/THREATS

Speedy growth is resulting in a rise in car use. Relatively low use of local public transport.

volves several major projects designed to make bicycling a safe and speedy option. For example:

- » High quality of bike lanes and paths, with on-going maintenance
- » Three lanes in each direction on 80 percent of the bike path network
- » Big construction projects like bridges and tunnels
- » Green waves of traffic lights for cyclists
- » Bicycle “superhighways” and green routes for commuters from the surrounding countryside

#### Public transport:

- » Extension of the subway system with the addition of a circular line by the year 2018
- » Transformation of the city center main street Nørrebrogade into an axis restricted to buses and cyclists.

#### Individual transport:

- » Planned management of parking space, with differentiated charges depending on demand
- » City toll system, which could reduce car transport by 20 percent (not yet approved)

### Speedy, simple and convenient – bicycle transport in Copenhagen

In the past decade bicycle use in Copenhagen increased by 13 percent, so that today the bicycling ratio for distances up to five kilometers comes to 58 percent. When asked why they use the bicycle, 88 percent of inhabitants stated that they find it “speedy, simple and convenient”. The benefits to the environment are similarly clear. And the health benefits resulting to Copenhagen residents have been estimated at a value of 230 million euros per annum. At the same time, CO<sub>2</sub> emissions have been cut by 90,000 tons. The bicycle strategy adopted by the city of Copenhagen up to the year 2025 goes by the name of “Good, Better, Best”. It focuses on the establishment and maintenance of rapid, safe, convenient and direct routes. With a view to reaching its ambitious targets for city life and the Copenhagen environment, the city is investing ten to fifteen million euros a year in infrastructure and additional incentives to persuade even more citizens to use their bikes.

## HOW COPENHAGEN WANTS TO CHANGE

- = transport planning priorities
- = urban development priorities

### Highest priority

- Reduce greenhouse gas emissions from transport
- Reduce travel times
- Improve bicycle friendliness
- Transit oriented development
- Limiting urban sprawl

### High priority

- Improve public transport service quality
- Extend public transport infrastructure
- Reduce congestion
- Improve regional accessibility to the city
- Improve mobility options for all citizens
- Reduce air pollutant emissions from transport
- Improve transport safety
- Improve walkability
- Foster secure and safe places
- Highly attractive public spaces
- Mixed land use in order to reduce transport demand
- Focusing urban development in community centers
- Compact urban growth

### Medium priority

- Improve access to destinations within the city
- Enhance and protect green and open space areas

### Low priority

- Reduce noise emissions from transport
- Improve traffic organization

### Lowest priority

# ISTANBUL (TR)



**POPULATION:** 13.3 million inhabitants  
**POPULATION GROWTH:** 2.0%  
**AREA:** 5,512 km<sup>2</sup>  
**POPULATION DENSITY:** 2,405 inh./km<sup>2</sup>

**GDP:** €9,631 per capita  
**UNEMPLOYMENT:** 14.3%  
**PRIVATE CARS:** 145/1,000 inh.  
**MOTORCYCLE:** 15/1,000 inh.

**FATAL ACCIDENTS:** 223 p. a.  
**INJURIES:** 16,958 p. a.  
**DIESEL:** €1.77/liter  
**PUBLIC TRANSPORT:** €0.81/trip

The city on the Bosphorus wants to create better links between its European and Asian sectors



## TRANSPORT MODE SHARE

How inhabitants and visitors to the city get around (number of trips)

- Motorized individual transport 16%
- Public transport 35%
- Cycling 0%
- Walking 49%
- Other 0%

## TRANSPORT INFRASTRUCTURE

Roads .....	30,291 km
Commuter train .....	72 km
Subway .....	36 km
Light rail transit .....	38.8 km
Funicular .....	1.24 km
Cable car .....	0.72 km
Bus Rapid Transit .....	52 km
City buses .....	12,000 km
Ferries .....	47 lines

**W**ith 13.3 million inhabitants, Istanbul is the cultural and economic center of Turkey. The metropolis extends over 45 kilometers from north to south, and 165 kilometers from east to west. The city occupies a strategically important position for traffic between the Balkans, the Caucasus and the Near East. Every day 1.1 million passengers travel between Europe and Asia through Istanbul.

At 145 cars per 1,000 inhabitants, private car ownership is still relatively low. Today some three million cars are on the roads – though another 700 are being added every day. The rise in the volume of car traffic is leading to road congestion and frequent traffic queues. The public transport system offers two commuter railroads, four subway lines, two modern light rail and two historic tram lines, as well as cable car and funicular services, a bus network and the Metrobüs Bus Rapid Transit system (BRT) which went into operation in 2007. The latter carries around 700,000 passengers every day on a single route with a length of 52 kilometers.

In recent years Istanbul has expanded its local public transport system to a significant degree and opened up new operational routes. It hasn't just been a matter of expansion, either: new facilities like park and ride systems, travel information systems and integrated ticket offers

using smartcards have also been created, with the aim of making public transport a more attractive option. About half of all the trips within the city are still being made on foot; meanwhile 35 percent of inhabitants rely on public transport services. Just 16 percent use a private car.

In recent years, trips made within the city have doubled – rising from eleven million in the year 2004 to 23 million in 2011. By the year 2023 they are expected to double once again.

## Massive infrastructure investments between now and 2023

With a view to the more efficient integration of municipal planning and transport policy, Istanbul has developed a transport master plan. In 2011 this was reviewed for the period up to 2023, when the centenary of the Turkish Republic will be celebrated. By then the city is hoping to have realized most of the projects it has in the pipeline. At the same time, Istanbul means to make massive investments in the infrastructure of its rail and road network. A major emphasis here is on providing better connections between the European and Asian halves of the city. Measures envisaged also include the introduction of pedestrian zones, above all in historic urban districts. //





“ ISTANBUL SHALL BECOME ONE OF THE MOST LIVABLE AND ENVIRONMENTALLY FRIENDLY METROPOLISES. ”

Masuk Mete, Deputy General Director, Istanbul Electricity Tramway and Tunnel Enterprises

## FOCUS ON WHAT PEOPLE WANT

Istanbul is aspiring to become one of the most important economic centers of the world – one that is environmentally friendly, and at the same time offers a high quality of life. The main target of transport planning consists in the establishment of a rail network measuring 640 kilometers in length by the year 2023.

### Combination of different modes of transport makes for more rapid connections

Istanbul’s master plan contains several top level objectives. First and foremost, the city is to be made more accessible. Then, the urban and transport planners aim to develop new urban centers. In this way they are hoping that population and jobs can be more evenly spread out than in the past, which should help counteract the increase in traffic. The improved integration of different means of transport should also make it easier for people to combine trips. At the same time, the city is working towards the creation of a sustainable transport system. The central focus is on the citizens. In concrete terms, that means it is not just a matter of cars getting more rapidly to their destination – what counts is the individual citizen. This will be underpinned by a local public transport system which supports the urban development strategy.

Supposedly “soft” factors are also a high priority for the municipal and transport planning authorities. Road safety, for instance, is to be improved. Furthermore, it is hoped that the emission of greenhouse gases resulting from road traffic can be reduced. Reduction of air pollut-

**↑ STRENGTHS/POTENTIAL**  
Ambitious expansion targets for the transport infrastructure. High proportion of walking.

**↓ WEAKNESSES/THREATS**  
Heterogeneous public transport network where system links are still in need of improvement. Investments in local public transport infrastructure could be thwarted by road upgrading projects.

ants is another plank of the platform. All these measures taken together should bring about further improvements in the quality of life of the Turkish metropolis.

### Concrete projects:

- » Local public transport:
  - » Expansion of the rail network to a length of 640 kilometers by the year 2023. This would bring rail transport up to a 31 percent ratio
  - » Renewal of the bus fleet, with 1700 new buses and a vehicle pool with an average age of 3.5 years in the year 2013
  - » Marmaray rail tunnel under the Bosphorus for commuter trains
- » Car transport:
  - » Eurasia Tunnel: two level road tunnel under the Bosphorus
  - » Third road bridge over the Bosphorus
  - » Intelligent Transportation Systems (ITS)
- » Non-motorized transport:
  - » Increasing the number of pedestrian zones in historic urban districts

## HOW ISTANBUL WANTS TO CHANGE

- = transport planning priorities
- = urban development priorities

### Highest priority

- Improve public transport service quality
- Improve transport organization
- Improve transport safety

### High priority

- Extend public transport infrastructure
- Reduce travel times
- Improve mobility options for all citizens
- Reduce greenhouse gas emissions from transport
- Reduce air pollutant emissions from transport
- Foster secure and safe places
- Highly attractive public spaces
- Enhance and protect green and open areas

### Medium priority

- Improve walkability
- Reduce congestion
- Improve regional accessibility to the city
- Improve access to destinations within the city
- Focusing urban development in community centers
- Transit oriented development
- Limiting urban sprawl
- Compact urban growth

### Low priority

- Reduce noise emissions from transport

### Lowest priority

- Improve bicycle friendliness

### Three major investments aim to improve Istanbul’s transport infrastructure

**The Marmaray tunnel:** This rail tunnel measuring 13.3 kilometers is designed to link the commuter train systems on the Asian and European sides of the city, which until now have been operated separately. The project should be completed in the course of 2013.

**The Eurasia tunnel:** This project envisages the construction of a 14.6 kilometer road connection between the European and Asian parts of Istanbul. The heart of the scheme is a two level tunnel under the Bosphorus measuring 5.4 kilometers, and exclusively designed for the use of private cars.

**The third Bosphorus bridge:** On the northern periphery of the city, further out from the two bridges that already exist, Istanbul plans to build a 1.3 kilometer suspension bridge. The city hopes that this will relieve the existing road network, which must carry around 25,000 heavy goods vehicles.

# JOHANNESBURG (ZA)



POPULATION: 3.8 million inhabitants  
 POPULATION GROWTH: 1.3%  
 AREA: 1,645 km<sup>2</sup>  
 POPULATION DENSITY: 2,325 inh./km<sup>2</sup>

GDP: €4,600 per capita  
 UNEMPLOYMENT: 37%  
 PRIVATE CARS: 410/1,000 inh.  
 MOTORCYCLES: no data supplied

FATAL ACCIDENTS: 376 p. a.  
 INJURIES: 101,372 p. a.  
 DIESEL: €1.08/liter  
 PUBLIC TRANSPORT: €0.37/trip

The South African city aims to reduce the number of its minibuses and develop a modern local public transport network



## TRANSPORT MODE SHARE

How inhabitants and visitors to the city get around (number of trips)

- Motorized individual transport 42%
- Public transport 44%
- Cycling 0%
- Walking 9%
- Other 5%

## TRANSPORT INFRASTRUCTURE

Roads .....	9,247 km
Regional trains (Metrorail) .....	No data
Express trains (Gautrain) .....	80 km
Bus Rapid Transit (BRT) .....	25 km
City buses .....	No data supplied
Minibuses .....	12,869 km

**W**ith 3.8 million inhabitants, Johannesburg is the most heavily populated city in South Africa. At the same time it is the capital of the Gauteng province, which in turn makes up the Metropolitan Region of Johannesburg with a total of eleven million residents.

Johannesburg is responsible for 16 percent of South Africa's gross domestic product. With its growing economy, the city attracts qualified workers and specialists from other parts of the country and from abroad. Johannesburg's official unemployment statistics (37 percent), however, ignore the high ratio of informal labor. Most of the challenges of urban and transport planning the city faces result from the heritage of apartheid, with its compulsory resettlements. In 1949, for the first time, 80,000 people were forced to relocate to the southwestern townships, the area known as Soweto. The minibus taxi business came into being in response to the mobility needs that were created as a result of the resettlements. Even today this is hardly subject to regulation, and the safety standard of the vehicles is poor. The minibus taxis receive no public funding. Because the taxi owners assert territorial claims to profitable routes, confrontations and armed violence are not infrequent.

Johannesburg took advantage of the 2010 Football World Cup being held in South Africa to

develop and extend its public transport system. The city accordingly took out loans for the construction of its Bus Rapid Transit (BRT) system, known as Rea Vaya, and the Gautrain line, a modern shuttle train service. The BRT system went into operation in 2009. A length of 25 kilometers, it has dedicated lanes, and connects Soweto with the city center. The system consists of 143 buses, owned by 300 former owners of minibus taxis, who also work as bus drivers. Other transport facilities are the city-owned Metrobus, and the overland and city buses operated by private service providers.

Today residents of Johannesburg make 44 percent of their trips by local public transport, almost three quarters using minibuses. Another 42 percent of travel is done by private car, which results in frequent traffic congestion.

## All set for integrated local public transport

Johannesburg is endeavoring to coordinate its fragmented public transport system. After the Rea Vaya BRT system was launched, Johannesburg declared that an integrated public transport system was its objective. This, it was hoped, would meet the mobility needs of all citizens, while at the same time providing a foundation for economic growth. The city therefore aims to continue cutting back the numbers of minibuses. //



“OUR VISION FOR AN INTEGRATED PUBLIC TRANSPORT SYSTEM IS ONE THAT IS RESPONSIVE TO THE MOBILITY NEEDS OF ITS CITIZENS AND PROVIDE THE BASIS FOR ECONOMIC GROWTH.”

Walter Mahlatsi, Member of the Transport Committee of the City of Johannesburg

## OVERCOMING THE CONSEQUENCES OF APARTHEID

Johannesburg’s urban and transport planners have enshrined their vision in the “Growth & Development Strategy 2040” (GDS). This is dedicated to the goal of designing the city of the future – a Johannesburg that will be dynamic, economically integrated and multicultural.

With a view to future mobility, Johannesburg is currently working on a new and integrated transport development plan for the coming five years. The city is collating information about the available transport services and existing demand – with citizens actively involved in the process.

The participation of the public in projects like this is regarded as a cornerstone of democratic South Africa. Johannesburg has 130 district committees. Each district appoints a transport representative. Meetings of civic organizations are held on a quarterly basis, with invitations being issued to the different population groups. In this way the municipal government of Johannesburg is trying to give all residents of the city a chance to make their voice heard.

### Integration of different modes of transport and maximum accessibility

The city’s transport development plan focuses on a number of different aspects. To begin with, pedestrians, cyclists and local public transport are to be given priority over other road users. In addition, the city hopes to integrate the various public transport modes. The cost of mobility is also under consideration. Johannesburg would like to avoid burdening the population with un-

#### ↑ STRENGTHS/POTENTIAL

Establishment of the BRT system as an intermediate target for the encouragement of local public transport system use. Strong tradition of civic involvement.

#### ↓ WEAKNESSES/THREATS

Conflicts with the minibus taxi business. Lack of access to mobility services for parts of the population. Low standard of road safety.

due expenses. At the same time, the transport system of the future should guarantee maximum ease of access and reduce travel times in the region. Other objectives are an environmentally friendly public transport vehicle pool, and the reduction of traffic queues.

This policy also gives rise to targets for urban development. Johannesburg aims to protect and extend green and undeveloped areas and enhance the attractiveness of public spaces.

#### Concrete measures:

- » Extension of the Rea Vaya BRT system
- » Introduction of ticket automation
- » Improvement of bus stop facilities
- » Holistic view of the roads for all road users
- » Construction of bicycle infrastructure and promotion of favorable conditions for cyclists.

## HOW JOHANNESBURG WANTS TO CHANGE

- = transport planning priorities
- = urban development priorities

### Highest priority

- Improve public transport service quality
- Extend public transport infrastructure
- Reduce congestion
- Reduce travel times
- Improve regional accessibility to the city
- Improve access to destinations within the city
- Improve mobility options for all citizens
- Improve transport organization
- Foster secure and safe places
- Highly attractive public spaces
- Enhance and protect green and open space areas
- Mixed land use in order to reduce transport demand
- Focusing urban development in community centers
- Transit oriented development
- Compact urban growth

### High priority

- Reduce greenhouse gas emissions from transport
- Reduce air pollutant emissions from transport
- Reduce noise emissions from transport
- Improve walkability
- Improve bicycle friendliness
- Improve transport safety
- Limiting urban sprawl

### Medium priority

### Low priority

### Lowest priority

### Football, taxis and partnerships

The 2010 Football World Cup gave a boost to local public transport in Johannesburg, and was instrumental in acquiring the funding for the Rea Vaya Bus Rapid Transit project. This was backed by a public-private partnership set up in 2009, which encouraged minibus owners to become co-owners of the BRT system. After three years of planning and discussion with nine taxi companies, the BRT operating company PioTrans was founded. Today it includes more than 300 former taxi operators.

The future challenge for the city of Johannesburg involves setting up more companies of this kind, with a view to expanding the Rea Vaya network on a generous scale to include other city districts. Again, this is likely to involve conflicts with the minibus taxi industry, which could likewise be resolved by encouraging the minibus operators to participate in the scheme.



# LONDON (GB)



POPULATION: 8.2 million inhabitants  
 POPULATION GROWTH: 0.3%  
 AREA: 1,570 km<sup>2</sup>  
 POPULATION DENSITY: 5,204 inh./km<sup>2</sup>

GDP: €43,920 per capita  
 UNEMPLOYMENT: 9%  
 PRIVATE CARS: 343/1,000 inh.  
 MOTORCYCLES: 16/1,000 inh.

FATAL ACCIDENTS: 126 p. a.  
 INJURIES: 28,763 p. a.  
 DIESEL: €1.64/liter  
 PUBLIC TRANSPORT: €3.30/trip

The transport infrastructure is designed to support London's economy



## TRANSPORT MODE SHARE

How inhabitants and visitors to the city get around (number of trips)

- Motorized individual transport 35%
- Public transport 42%
- Cycling 2%
- Walking 21%
- Other 0%

## TRANSPORT INFRASTRUCTURE

Commuter trains .....	86 km
Subway .....	402 km
City buses .....	673 lines
Trams .....	28 km

London, the capital of the United Kingdom, has 8.2 million inhabitants. Every year 30 million people visit the city. London is responsible for a fifth of the country's gross domestic product. While in the center most trips are made using local public transport facilities or non-motorized transport, in the outer districts cars are predominant.

The most important pillar of the public transport system is the "Tube", the oldest subway in the world, and with a distance of 402 kilometers also the second longest. Then there is a commuter train system covering 86 kilometers, which is still being developed, and a tram network which covers a distance of 28 kilometers to date. After the Tube, buses play the most important role in London's public transport system. In the 1990s motorized individual transport began to recede, while local public transport grew more important. Since 2001 the share of local public transport in transport overall has risen by almost nine percentage points.

After the number of inhabitants dropped in recent decades, the city is now looking more attractive again, and a twelve percent growth of population is anticipated between now and 2031 – the biggest population increase since the 1930s. Half of this population growth is expected to take place in London's East End, while the number of jobs in the city center will rise. This pres-

ents the city with the challenge of providing mobility between the two areas. Already today local public transport services are under strain, and many roads are congested. These problems will be further accentuated as a result of the growth in population. In 2003, London became one of the first cities in the world to introduce a toll on private cars entering the city center – the Congestion Charge. Motor vehicles traveling on roads labeled with a "C" between 8.00 am and 5.00 pm must pay a charge roughly equivalent to 11.60 euros.

## Integrated plan for transport and municipal development in the coming 20 years

London is working towards the goal of simplifying mobility for its residents and visitors, while continuing to increase the share of non-motorized modes of transport and public transport. Motorized individual transport, on the other hand, is to be discouraged. Following detailed consultation, a "London Plan" has been drawn up, defining the economic and urban planning objectives of Greater London and the Mayor's transport strategy for the coming 20 years.

All these strategies have been developed in parallel to one another and are coordinated. The London Plan thus represents a completely integrated framework for transport, social and municipal development up to the year 2031. //



“ THE KEY ROLE THAT TRANSPORT HAS IN SUPPORTING LONDON’S ECONOMIC GROWTH AND THEREFORE THE UK’S RECOVERY IS BEING BROADLY RECOGNIZED. ”

Richard de Cani, Director Transport Strategy and Planning, Transport for London

## CHALLENGES OF GROWTH

Boris Johnson, Mayor of London, wants to make his city “the best major city in the world”. His strategy for transport development in the British capital plays a crucial role in this regard. The transport infrastructure is to be designed in such a way as to promote the city’s economic development, while keeping pace with population growth. In this way the Mayor hopes to give Londoners extended mobility options, as well as raising the quality of life and road safety standards. The city can expect to benefit from the long-term effects of the Olympic Games held in London in 2012. Last but not least, London aims to reduce the emission of greenhouse gases resulting from traffic.

### First successes of London transport strategy already visible

Under the auspices of its transport strategy, London has expanded its local public transport system in recent years, as well as increasing both capacity and services. The city has also succeeded in making cycling a more attractive proposition. Since 2000, the number of cyclists in the capital has risen by 117 percent.

### Concrete measures:

- » Introduction of cleaner buses. New buses will meet the current EURO emission standards; old vehicles will be retrofitted
- » Hybrid bus scheme – 260 vehicles already in operation, and another 400 hybrid buses are to be acquired by the end of 2013

#### ↑ STRENGTHS/POTENTIAL

High quality of local public transport services, with correspondingly high demand. Integrated transport and municipal development strategy. Ambitious climate goals and innovative measures.

#### ↓ WEAKNESSES/THREATS

Extremely low ratio of cyclists in the past. Antiquated subway infrastructure, and chronic overcrowding.

- » Low emission zones: heavy goods vehicles with exceptionally high toxic emissions are no longer allowed to enter these areas
- » Extension of the car toll: London’s transport planners are considering extending the Congestion Charge to the entire city
- » Supporting electromobility: by 2015 there should be 25,000 electrical vehicles on the road in London – and public charging stations will be provided
- » Cycling revolution: London aims to make cycling easier and more attractive – for example, with a network of rapid bike lanes, a bicycle loan system and secure bicycle parking spaces
- » Efficiency: to allow the transport system to be used as efficiently as possible, the different modes of transport will be more effectively linked together. This could involve an integrated fare system, among other solutions

## HOW LONDON WANTS TO CHANGE

- = transport planning priorities
- = urban development priorities

### Highest priority

- Improve walkability
- Improve bicycle friendliness
- Improve public transport service quality
- Extend public transport infrastructure
- Improve access to destinations within the city
- Improve mobility options for all citizens
- Reduce greenhouse gas emissions from transport
- Reduce air pollutant emissions from transport
- Improve transport safety
- Enhance and protect green and open space areas
- Mixed land use in order to reduce transport demand
- Transit oriented development

### High priority

- Reduce congestion
- Reduce travel times
- Improve regional accessibility to the city
- Reduce noise emissions from transport
- Improve transport organization
- Foster secure and safe places
- Highly attractive public spaces
- Limiting urban sprawl
- Compact urban growth

### Medium priority

- Focusing urban development in community centers

### Low priority

### City-wide toll could help London reach climate targets

London is aiming at the ambitious goal of reducing its CO<sub>2</sub> emissions by 60 percent by the year 2025 in comparison with 1990. London’s Climate Action Plan specifies various measures to this end, including more efficient vehicles and the use of low-CO<sub>2</sub> biofuels. Current estimates, however, do not project these measures on their own to be sufficient to reach the 2025 emission targets. Further improvements in vehicle efficiency will not be enough to reduce emissions to the desired extent.

Forecasts today indicate that the use of electrical vehicles could cut emissions by eight percent. But for this it would be necessary to have more than 50 percent electrical vehicles on the roads, for the city to reach the ambitious targets it has set for itself. A city-wide toll, backed up by incentives to purchase low-CO<sub>2</sub> vehicles, could be the solution.



# LOS ANGELES (USA)



POPULATION: 3.8 million inhabitants (2010)	GDP: €43,915 per capita	FATAL ACCIDENTS: 166 p. a.
POPULATION GROWTH: 1.2%	UNEMPLOYMENT: 9.1%	INJURIES: no data supplied
AREA: 1,217 km <sup>2</sup>	PRIVATE CARS: 589/1,000 inh.	DIESEL: €1.18/liter
POPULATION DENSITY: 3,116 inh./km <sup>2</sup>	MOTORCYCLES: no data supplied	PUBLIC TRANSPORT: €3.11/trip

Urban sprawl and dependence on cars to be replaced by development focusing on local public transport



## TRANSPORT MODE SHARE

How inhabitants and visitors to the city get around (number of trips)

- Motorized individual transport 78%
- Public transport 11%
- Cycling 1%
- Walking 3%
- Other 7%

## TRANSPORT INFRASTRUCTURE

City of Los Angeles:

Roads ..... 10,500 km

Los Angeles County:

Freeways ..... 850 km

High occupancy vehicle lanes ..... 750 km

Commuter trains ..... 830 km

Subway and light rail transit ..... 140 km

Bus Rapid Transit ..... 65 km

City buses ..... 2,306 km

Bike lanes ..... 218 km

**W**ith almost four million inhabitants, the city of Los Angeles forms part of Los Angeles County. Together with other townships it makes up the Greater Los Angeles Area, which extends over four surrounding counties and in which close to 18 million people live.

This greater metropolitan region is the second biggest economic powerhouse in the entire country. The population density for the entire area is relatively low – just 200 inhabitants per square kilometer. But in some urban and suburban districts – in the heart of Los Angeles for example – population density is much higher, with up to 3,000 per square kilometer. In the early decades of the twentieth century the more densely populated areas of the region were linked up with rail connections. With the rise of the car and the construction of a highway system in the 1950s, the open spaces between the larger towns increasingly came to be taken up with less densely inhabited settlements. Since those times the car has been the main mode of transport in Los Angeles. Around 70 percent of commuters drive their own car; eight percent participate in vehicle sharing schemes, and only eleven percent use local public transport.

The Los Angeles local public transport system is closely linked with the surrounding municipalities, and for the most part is the responsibility of

the Los Angeles County Metropolitan Transportation Authority (LA Metro). LA Metro operates two subway lines, four light rail lines, two Bus Rapid Transit lines and traditional city buses. It also runs the commuter trains of the Metrolink system in partnership with adjacent counties. In Los Angeles itself, the Los Angeles Department of Transportation (LADOT) operates further city bus services.

## Los Angeles aims to reduce dependence on the car and cut traffic congestion

As an important economic center, Los Angeles holds attractions for companies and people both from the USA and from abroad. In spite of a slight decline in population in recent decades, Greater Los Angeles Area is expected to continue to grow. In the coming five years the number of inhabitants will rise by nearly three million, and a million new jobs should be created.

The consequence will be a 30 percent higher demand for transport, the doubling of freight transport and more traffic queues, which could force speed on the freeways down to 30 kilometers per hour.

Local public transport has the image of being the poor man's mode of transport, which militates against the higher use of it. More than 60 percent of the users are immigrants, and almost 80 percent are on low incomes. //





“ WE ARE CONSTRUCTING A SUSTAINABLE TRANSPORT SYSTEM FOR THE CITY OF LOS ANGELES.

Cris B. Liban, Head of the Department of the Environment, Los Angeles County Metropolitan Transportation Authority

” THE CITY OF LOS ANGELES IS LEADING AN UNPRECEDENTED INVESTMENT FOR PUBLIC TRANSPORTATION NOT ONLY IN LOS ANGELES BUT IN THE UNITED STATES.

Jaime de la Vega, Head of the Department of Transport Planning, City of Los Angeles



## MOVING AWAY FROM THE CAR

The city of Los Angeles is trying to reduce the dependence of the population on the car and so cut the use of cars altogether. Its objective is to reduce greenhouse gas emissions by 35 percent in comparison with 1990 levels by the year 2030.

As the biggest public transport enterprise in Los Angeles, LA Metro is contributing to this target by not only operating a sustainable transport system, but also following the guiding ideal of sustainability in developing it – for example, by relying on renewable sources of energy in the creation of a new transport infrastructure.

### More compact settlements in the neighborhood of railroad stations

In past years settlements in the vicinity of several LA Metro stations have become much more heavily populated. Local public transport has thus directly contributed to the creation of more compact settlement structures, which reduce the inhabitants’ dependence on cars. As a result the use of local public transport in Los Angeles has risen markedly. LA Metro supported this shift with a scheme to encourage the development of land owned by companies.

### Local public transport infrastructure:

- » Expansion of the subway and light rail system, with an additional 120 kilometers
- » Investments in new vehicles
- » Expansion of the Bus Rapid Transit network to a total of 380 kilometers

#### ↑ STRENGTHS/POTENTIAL

Ambitious expansion program for local public transport. Active transport and urban development policies.

#### ↓ WEAKNESSES/THREATS

High dependency on cars in many areas of the region. Low population density beyond the urban centers.

### Commuter oriented schemes:

- » Car-sharing schemes addressed to companies and their staff
- » Creation of more high occupancy vehicle lanes on freeways.

### Cycling:

- » A master plan for cycling envisages the creation of around 1,300 kilometers of new bike lanes within the city
- » Bike lanes should above all be created along local public transport routes
- » Additional incentives will encourage commuters to resort to bike-and-ride systems

### Clean fuels and vehicles:

- » Hybrid buses with gas and electric engines
- » Park-and-ride systems with charging stations to encourage the use of electric vehicles
- » Additional charging stations for electric vehicles in the city region

## HOW LOS ANGELES WANTS TO CHANGE

- = transport planning priorities
- = urban development priorities

### Highest priority

- Improve walkability
- Improve bicycle friendliness
- Improve public transport service quality
- Extend public transport infrastructure
- Improve regional accessibility to the city
- Improve mobility options for all citizens
- Improve transport safety
- Mixed land use in order to reduce transport demand
- Transit oriented development
- Compact urban growth

### High priority

- Reduce congestion
- Reduce travel times
- Improve access to destinations within the city
- Reduce greenhouse gas emissions from transport
- Reduce air pollutant emissions from transport
- Improve transport organization
- Foster secure and safe places
- Highly attractive public spaces
- Limiting urban sprawl

### Medium priority

- Reduce noise emissions from transport

### Low priority

### Lowest priority

- Enhance and protect green and open space areas

### How local politics influence the national transport strategy

During his term of office from 2005 to 2013, Mayor Antonio R. Villaraigosa made unparalleled investments in the development of public transport, financed by a turnover tax of half a cent known as “Measure R”. This was approved by voters in the 2008 elections, and in the coming 30 years should bring in a total of almost 40 billion dollars for local public transport.

In 2010 Villaraigosa addressed himself to the federal government with his “30/10 Initiative”. With the plan of realizing projects in ten years rather than in thirty, he hoped to receive credit from the government. When the government proved skeptical to begin with, Villaraigosa teamed up with another 200 mayors of American cities. The 30/10 Initiative thus gave rise to the “America Fast Forward” program, which was approved by Congress and President Obama in 2012.

# LYON (F)



POPULATION: 1.3 million inhabitants  
 POPULATION GROWTH: 0.5%  
 AREA: 516 km<sup>2</sup>  
 POPULATION DENSITY: 2,460 inh./km<sup>2</sup>

GDP: €46,484 per capita  
 UNEMPLOYMENT: 8.7%  
 PRIVATE CARS: 494/1,000 inh.  
 MOTORCYCLES: no data supplied

FATAL ACCIDENTS: 36 p. a.  
 INJURIES: 1,884 p. a.  
 DIESEL: €1.20/liter  
 PUBLIC TRANSPORT: €1.60/trip

Real-time information about bus, rail, cars and bicycles should reduce CO<sub>2</sub> emissions from traffic



## TRANSPORT MODE SHARE

How inhabitants and visitors to the city get around (number of trips)

- Motorized individual transport 47%
- Public transport 15%
- Cycling 4%
- Walking 33%
- Other 1%

## TRANSPORT INFRASTRUCTURE

Roads .....	2,850 km
Bike lanes .....	447 km
Buses overall .....	1,250 km
Trolleybuses .....	61.3 km
Regional trains .....	No data supplied
Subway .....	30.4 km
Tram .....	48.3 km
Tram-train .....	23 km
Cog railroad .....	1.2 km

**G**rand Lyon – Greater Lyon – is the name of the urban region centering on Lyon, made up of the city and its surrounding municipalities. The region has 1.3 million inhabitants. Grand Lyon is at the same time an administrative unit. It is on this level that plans are approved, including plans for transport and urban development. Grand Lyon’s transport policy is aimed at encouraging a shift, in Lyon and the entire region, away from private cars, and towards the numerous other modes of transport available to the citizens.

The main burden of public transport is taken on by the subway network, consisting of four lines. This is backed up by the tram, which has experienced a powerful revival in Lyon in the last decade – as has been the case in other French cities. The Rhône Express deserves mention here – a so-called tram-train line going to the airport, which transfers from the rail track onto the urban tram network. In addition to city buses, there are also “lignes majeures”, or main lines, which operate with great frequency, and often travel in a dedicated bus lane. Finally, there are trolleybuses, with a total of nine lines.

Local public transport is supported by several park-and-ride centers in outlying city districts. In spite of massive investments in the transport infrastructure, the share of private cars in city transport overall has only fallen by four percent

in the last ten years. Half of all trips in the city continue to be made by car; local public transport only comes to a share of 15 percent.

## Lack of funding exacerbates transport infrastructure shortages

Grand Lyon’s transport strategy has reached a stalemate. It is becoming increasingly difficult to raise finance for improvement of the infrastructure. At the same time, there is an urgent need for action, in view of rising traffic congestion. More than half the trips made by car are for distances of less than three kilometers. The ambitious bike sharing system “Vélo’v”, introduced by Lyon in 2005, was designed to offer an alternative for these short distances. At present it has a good 50,000 registered users, while cycling has a share of around four percent in terms of the entire transport volume.

The new strategy of Grand Lyon is aimed at changing the behavior patterns of road users, which for the most part are based on habit and unconscious decisions. The plan is to use Intelligent Transport Systems (ITS), in order to relay a maximum of information on transport to road users by way of their smartphones or other digital equipment. The present challenge facing Lyon is how to process the data on all modes of transport in order to present them conveniently. //



“ THE TIME OF MASSIVE INVESTMENTS IS OVER, THE FOCUS IS NOW ON OPTIMIZING THE WHOLE TRANSPORT SYSTEM, USING ITS. ”

Jean Coldefy, Road Transport and Local Public Transport Program Coordinator, Grand Lyon

## INTERLINKING ALL MODES OF TRANSPORT

In essential terms, Lyon’s transport policy goes back to the Master Plan for Urban Mobility of 1997. This was principally dedicated to the objective of reducing the inequality between the different modes of transport. Lyon hoped this approach would help create better conditions for a sustainable city with a high quality of life.

### Ensuring accessibility and reclaiming public space in the city

Today’s transport development policy, which rests on the Urban Mobility Master Plan, can be broken down into three priority objectives. First of all, the transport planners of the Grand Lyon region are concerned that both passenger transport and freight should flow in such a way that all road users can count on reaching their destination without a hitch. At the same time, the planners would like to minimize the negative ecological and socioeconomic effects of traffic as far as possible. And finally they are also pursuing the target of reclaiming public space by encouraging increasing numbers of citizens to opt for environmentally friendly modes of transport. It is hoped that this will result in a more attractive city all-round.

For decades, Grand Lyon has made massive investments in the development of its transport infrastructure. Now, in a situation marked by a lack of funding, the city and the region are increasingly focusing on projects to improve the transport system itself. Targets set by the municipal authorities include checking urban sprawl, reducing congestion and creating more favorable conditions for pedestrians and cyclists.

#### ↑ STRENGTHS/POTENTIAL

Transport system with a lot of variety. High availability of traffic information. Technological innovation.

#### ↓ WEAKNESSES/THREATS

High ratio of private cars in transport overall. Currently no transport development plan. Lack of restrictions on use of the car.

### Real time traffic information, expansion of the subway and a major bicycle network

The transport planners of the Grand Lyon metropolitan region have a whole raft of projects on their future agenda, designed to achieve their goal of a city with a high quality of life and an efficient transport system:

- » The city has plans for an integrated real time information and navigation system, with data being accessible online for users of PCs and mobile devices like smartphones
- » A traffic forecasting model for traffic control centers is to be developed, with the aim of reducing congestion
- » The subway’s Line B is to be extended
- » Other subway lines will be automated
- » By 2014 the bike path network should be extended to 520 kilometers; by 2020 it is planned to reach 920 kilometers

## HOW LYON WANTS TO CHANGE

- = transport planning priorities
- = urban development priorities

### Highest priority

- Reduce congestion
- Improve regional accessibility to the city
- Improve access to destinations within the city
- Improve mobility options for all citizens
- Limiting urban sprawl
- Compact urban growth

### High priority

- Improve walkability
- Improve bicycle friendliness
- Improved public transport service quality
- Reduce greenhouse gas emissions from transport
- Reduce air pollutant emissions from transport
- Foster secure and safe places
- Highly attractive public spaces
- Enhance and protect green and open space areas
- Mixed land use in order to reduce transport demand
- Focusing urban development in community centers

### Medium priority

- Extend public transport infrastructure
- Reduce travel times
- Improve transport safety

### Low priority

- Reduce noise emissions from transport

### Lowest priority

- Transit oriented development

### Optimod’Lyon – using information to highlight alternatives

The city hopes to optimize its transport system with the help of its “Optimod’Lyon” scheme, designed to heighten the efficiency of transport use in future. The key idea of the project is to collate all the available information about traffic and present it as a basis for mobility decisions. At present traffic information exists separately – on the local public transport system, as part of the bicycle-sharing scheme and at road traffic control centers. It is hoped that by combining information from all three sources, multimodal transport can be made to look more attractive. The real time information will be relayed to road users on their PCs at home, to their smartphones and tablets, and will also be flashed up on roadside display boards. Planners are expecting Optimod to yield a good cost-benefit ratio. While the outlay will be just a fraction of the money already invested in infrastructure, the effects on traffic conditions should be significantly beneficial – and environmentally friendly.



# MELBOURNE (AUS)



POPULATION: 4.1 million inhabitants  
 POPULATION GROWTH: 1.2%  
 AREA: 7,694 km<sup>2</sup>  
 POPULATION DENSITY: 530 inh./km<sup>2</sup>

GDP: €33,574 per capita  
 UNEMPLOYMENT: 5.4%  
 PRIVATE CARS: 589/1,000 inh.  
 MOTORCYCLES: no data supplied

FATAL ACCIDENTS: 34 p.a.  
 INJURIES: 4,820 p.a.  
 DIESEL: €1.18/liter  
 PUBLIC TRANSPORT: €3.11/trip

A global city with a high quality of life, facing the challenge of making transport more sustainable



## TRANSPORT MODE SHARE

How inhabitants and visitors to the city get around (number of trips)

- Motorized individual transport 75%
- Public transport 9%
- Cycling 2%
- Walking 13%
- Other 1%

## TRANSPORT INFRASTRUCTURE

Commuter trains .....	830 km
Tram .....	250 km
Bus Rapid Transit .....	7 lines
City buses .....	6254 km

**M**elbourne is the second biggest metropolitan region in Australia. According to various studies, including the “Global Liveability Report”, the city is one of the top ten in the world in terms of quality of life. The capital of the state of Victoria, the city of Melbourne itself has close to 100,000 inhabitants; the Greater Melbourne metropolitan region, on the other hand, extends over a radius of 30 kilometers and has a total population of four million.

The inner city has a very high population density. Residents make up to 70 percent of their trips on foot or by bicycle. Further out, the population density is much lower. In these districts, the inhabitants are more dependent on use of private cars. The share of individual transport in urban transport overall is around 47 percent. The city center draws 400,000 commuters every day, with 21 percent of jobs in Victoria being located in Melbourne – 40 percent of these in the inner city alone.

Melbourne has the biggest tram network in the world, concentrated on the heart of the metropolitan region. For trips extending beyond the periphery, a well-developed commuter train system is available. In the city center these trains also go underground.

The number of jobs in Melbourne has risen over the last two decades by 150,000; over the

same period the volume of transport grew by 25 percent. By 2030, further growth of 100,000 jobs is anticipated. The number of daily commuters is also on the increase – from 780,000 in 2011, it is expected to reach 1.2 million by 2030.

## Transport infrastructure will soon be pushing its limits

Trend projections have shown, on this basis, that up to 60 percent more space will be needed for the transport infrastructure. Studies of future mortgage and fuel price developments forecast steep increases, by which people living in the periphery of the metropolitan region will be particularly hard hit. Since 2003, there has been no rise in the volume of private car transport. This is due to frequent traffic queues, which have prompted many residents to use public transport. Cars are losing their appeal, especially with the younger generation. At the same time, cycling is becoming increasingly popular.

The authorities in Melbourne have a comprehensive planning and information system, which they are using for the development of holistic mobility strategies. The objective is to enable all city residents, both in the inner city and the outlying areas, to benefit from the same high standards of mobility and life quality. //



“ IF WE DON'T DELIVER PEOPLE TO GOOD PLACES, TRANSPORT IN A WAY IS A LOSS OF OPPORTUNITY. ”

Robert Moore, Urban Design and Docklands Manager, City of Melbourne

## CITY RENEWAL VIA PUBLIC TRANSPORT

Melbourne aspires to be an economically significant global city, while at the same time offering sustainability together with a high quality of life. With this aim in view, its planners have developed a strategy which marries transport planning and land use. The objective is to make public transport in Melbourne universally accessible. Inner city roads, in particular, are to be improved. At the same time Melbourne is to become a city of cyclists, where “high-mobility streets” will be opened up for pedestrians and public transport.

These changes should have effects on the transport mode share. By the year 2030 Melbourne aims to see a significant increase in the percentage of trips being made by local public transport, by bicycle or on foot. Over the same period it is hoped that the share of motorized individual transport can be reduced by a third.

### Integrated approach to urban development and transport planning

In response to the city’s future growth, urban and transport planners are largely counting on the development of urban renewal districts in the region. One of the main projects in the pipeline is the renewal of Melbourne’s inner city. Old industrial premises, above all, will be renovated, and highly concentrated neighborhoods with mixed use will be developed in parallel. The creation of new residential districts will be coordinated with local public transport, and focused on the transport corridors leading away from the densely populated city center.

Melbourne’s transport strategy is holistic and incorporates all modes of transport. The em-

#### ↑ STRENGTHS/POTENTIAL

Comprehensive planning and information system. Clear concept for the integrated planning of transport and land use.

#### ↓ WEAKNESSES/THREATS

Low population density in the outlying regions of the metropolis. In spite of the strong economic position the city enjoys, financial resources for major transport projects are limited.

phasis is on the creation of favorable conditions for pedestrians and improving access to public transport services. The aforementioned high-mobility streets will be developed as a top priority. These will be served frequently by trams, give priority to buses and provide easy access to stations. As a result, it is hoped that local public transport will become a more attractive option.

#### Concrete projects:

- » Increased frequency of commuter train services, from the current level of 135 trains per day to 256 by the year 2030
- » Elimination of bottlenecks and extension of the tram network
- » Improved quality of bus stop facilities
- » Expansion of bicycle network and bicycle sharing system

### HOW MELBOURNE WANTS TO CHANGE

- = transport planning priorities
- = urban development priorities

#### Highest priority

- Reduce congestion
- Improve mobility options for all citizens
- Improve transport organization
- Transit oriented development
- Compact urban growth

#### High priority

- Improve walkability
- Improve bicycle friendliness
- Improve public transport service quality
- Extend public transport infrastructure
- Reduce travel times
- Improve regional accessibility to the city
- Improve access to destinations within the city
- Reduce greenhouse gas emissions from transport
- Improve transport safety
- Foster secure and safe places
- Highly attractive public spaces
- Enhance and protect green and open space areas
- Mixed land use in order to reduce transport demand
- Focusing urban development in community centers
- Limiting urban sprawl

#### Medium priority

- Reduce air pollutant emissions from transport

#### Low priority

- Reduce noise emissions from transport

#### Lowest priority

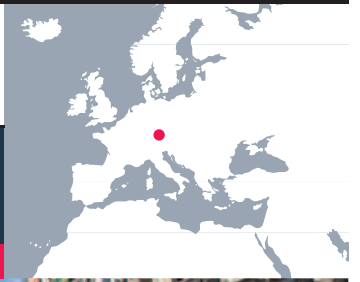
### Heavily used streets as temporary pedestrian zones

The Australian metropolis of Melbourne has been successful in transforming streets in the city center – like Little Collins Street, for example – into temporary pedestrian zones. This means that at certain times of day, when a great many pedestrians are out and about, cars are not allowed to enter. Outside these restricted hours the road remains open to both pedestrians and vehicles.

The number of streets being closed to vehicular traffic for temporary periods continues to increase in Australia’s big city. And the restricted periods are steadily being extended. Temporary pedestrian zones are gradually spreading out over the entire inner city. The demand for this temporary traffic-calming is on the increase, as the zones free of traffic are frequently used as a venue for events which attract both residents and visitors.



# MUNICH (D)



POPULATION: 1.4 million inhabitants  
 POPULATION GROWTH: 0.6%  
 AREA: 310.71 km<sup>2</sup>  
 POPULATION DENSITY: 4,449 inh./km<sup>2</sup>

GDP: €53,166 per capita  
 UNEMPLOYMENT: 5.3%  
 PRIVATE CARS: 432/1,000 inh.  
 MOTORCYCLES: 38/1,000 inh.

FATAL ACCIDENTS: 14 p.a.  
 INJURIES: 5,613 p.a.  
 DIESEL: €1.23/liter  
 PUBLIC TRANSPORT: €2.40/trip

**Mobility and life quality based on attractive alternatives to the car**



## TRANSPORT MODE SHARE

How inhabitants and visitors to the city get around (number of trips)

- Motorized individual transport 37%
- Public transport 21%
- Cycling 14%
- Walking 28%
- Other 0%

## TRANSPORT INFRASTRUCTURE

Commuter trains .....	442 km
Tram .....	75 km
Subway .....	95 km
City buses .....	456 km

The capital of Bavaria has 1.4 million inhabitants, making it the third biggest and at the same time the most densely populated city in Germany. Together with the closely linked surrounding region, Munich has a total population of 2.8 million. In contrast with many other parts of Germany, the metropolitan region expects quite powerful growth to continue in future. The reasons are clear: the city is economically attractive, offers almost a million jobs and has a higher purchasing power than any other city in Germany.

Ownership of private cars in the city of Munich is lower than in comparable German regions, but in the surrounding countryside it is higher. A network of freeways in a star formation connects the region with the city. The inner city has suffered little from the road upgrades that became standard in the era of mass motorization. The urban public transport network, on the other hand, is extremely well developed. The subway network covers all main axes, the tram system absorbs a moderate volume of traffic and area-wide bus services ensure access to all parts of the city. Then there is the commuter train system, which connects the region with the city center without any need to change trains. Much of the inner city is a pedestrian zone closed to cars. On a national scale, frequency of car use throughout the region is relatively low. At the same time, the share of bicycles

is higher: almost every other person uses a bicycle to get to work every day, or at least once a week. Local public transport is used for 21 percent of all trips – and when it is a matter of job-related travel, the figure is in excess of 40 percent.

## Maintaining local public transport while mitigating the impact of private vehicles

According to current forecasts, both the population and the number of jobs available in Munich will continue to grow. While personal car use remains comparatively low, the volume of transport in absolute terms will increase. A shift in the direction of public transport is seen as the favored solution; at the same time, public transport services are finding themselves increasingly utilized to their limit. The subway, with a network that began to be extended in the 1960s, is already overloaded at peak hours. The commuter train system faces a similar situation. Having started as one of the first systems of its kind in Germany, it has not been adapted more recently to meet rising demand. The central sector of the network is already operating at full capacity, and has long been looking for a solution.

Urban and transport planners are pinning great hopes on cycling. But it must be admitted that the city's own claim to be a "cycling capital" can hardly be met on the basis of its current bike path network. //





“ FOR SUCCESSFUL TRANSPORT PLANNING, YOU NEED THE INVOLVEMENT OF BOTH EXPERTS AND THE GENERAL PUBLIC RIGHT FROM THE START. ”

Georg-Friedrich Koppen, Head of the Department of Mobility, Federal State Capital of Munich

## FOCUS ON CIVIC PARTICIPATION

Transport planning in Munich is an integral part of the city’s plans for urban development. The city has itself formulated the guideline of “Maintaining and improving mobility for all – managing transport in the city’s best interest”.

### The three strategies of Munich’s transport development plan

The planners have decided to reduce the volume of transport generally by means of compact residential development dedicated to mixed use. At the same time, they want to promote the shift in the direction of environmentally friendly modes of transport. Citizens are to be encouraged to walk, bicycle, or take the bus or train. Finally, where it is impossible to do away with or replace car transport, it must be made more acceptable.

The transport development plan owed much to civic involvement. An intermediate evaluation shows that some successes have already been achieved. The transport balance has already shifted significantly away from the private car to cycling and the use of public transport. The number of private vehicles entering the historic city center has been cut by 40 percent in the last ten years.

### Acceptable road traffic, expanded public transport services

The flagship project of the transport development plan involves a twofold strategy, combining the upgrading of road and rail infrastructure with the development of the inner city into a barrier-free public area attractive to residents and visitors alike.

#### ↑ STRENGTHS/POTENTIAL

High quality of local public transport services. Management of parking facilities. Strong tradition of involvement of experts and general public.

#### ↓ WEAKNESSES/THREATS

Capacity limits of local public transport. Problems of infrastructure finance. Gaps in the bike lane network.

#### Car traffic:

- » Tunnels and noise mitigation measures for heavily used sections of the main road network
- » Environmental zone: only vehicles that meet latest emission standards are allowed to enter
- » Differentiated management of parking facilities

#### Local public transport:

- » Construction of a second main commuter train line
- » Upgrading infrastructure with a view to increasing frequency of scheduled rail services
- » Expansion of tram network with the construction of new lines
- » Speeding up of bus lines

#### Cycling and walking:

- » Continued publicity for the image of Munich as a “cycling capital”
- » Creation of “bike and ride” centers where bicycles can be left
- » Bicycle-friendly redesign of road intersections
- » Redesign of squares to make them a more pleasant space to spend time

## HOW MUNICH WANTS TO CHANGE

- = transport planning priorities
- = urban development priorities

### Highest priority

- Improve walkability
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- Extend public transport infrastructure
- Improve access to destinations within the city
- Improve mobility options for all citizens
- Reduce greenhouse gas emissions from transport
- Reduce air pollutant emissions from transport
- Reduce noise emissions from transport
- Improve transport organization
- Improve transport safety
- Foster secure and safe places
- Highly attractive public spaces
- Enhance and protect green and open space areas
- Mixed land use in order to reduce transport demand
- Focusing urban development in community centers
- Transit oriented development
- Limiting urban sprawl
- Compact urban growth

### High priority

- Reduce travel times
- Improve regional accessibility to the city

### Medium priority

- Reduce congestion

### Low priority

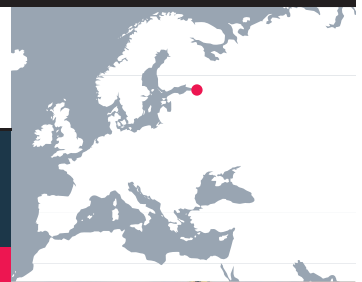
### Lowest priority

### Managing traffic with licensed parking areas

Munich sees the management of parking space as one of the most important keys for influencing the volume of traffic, especially in central areas of the city. Parking spaces should increasingly be made available to residents of Munich rather than being taken up by commuters. Commuters will be expected to switch to other modes of transport like the local public transport networks. An essential component in the city’s strategy is the establishment of licensed parking areas, where parking is generally subject to controls. A distinction is made between three license types:

- » Residents’ parking: parking spaces exclusively reserved for residents with the appropriate permit
- » Mixed parking: parking for residents, together with parking chargeable by the hour
- » Short term parking: chargeable parking for all, limited to a maximum of two hours.

# ST. PETERSBURG (RUS)



POPULATION: 4.9 million inhabitants  
 POPULATION GROWTH: 0.6%  
 AREA: 1,439 km<sup>2</sup>  
 POPULATION DENSITY: 2,826 inh./km<sup>2</sup>

GDP: €8,600 per capita  
 UNEMPLOYMENT: 1.9%  
 PRIVATE CARS: 310/1,000 inh.  
 MOTORCYCLES: no data supplied

FATAL ACCIDENTS: 469 p.a.  
 INJURIES: 8,764 p.a.  
 DIESEL: €0.70/liter  
 PUBLIC TRANSPORT: €0.60/trip

**A city seeking to reconcile different mobility needs**



## TRANSPORT MODE SHARE

How inhabitants and visitors to the city get around (number of trips)

- Motorized individual transport 30%
- Public transport 70%
- Cycling – no data supplied
- Walking – no data supplied
- Other – no data supplied

## TRANSPORT INFRASTRUCTURE

Roads .....	3,600 km
Subway .....	113 km
Tram .....	228 km
Commuter trains .....	100 km
Regional trains .....	423 km
Trolleybuses .....	497 km
City buses .....	10,800 km
Regional buses .....	1,493 km
Minibuses (Marshrutkas) .....	No data

**W**ith a population approaching five million, the metropolis of St. Petersburg is the second biggest economic center and transport hub in Russia. Almost 20 percent of the entire foreign trade and transport of the Russian economy passes through the city on the Neva River. The city has an area of 1,439 square kilometers. Its average population density comes to 2,826 inhabitants per square kilometer. From the 1960s through to the 1980s, urban planners allowed huge dormitory suburbs to come into being on the periphery. Today these are still crucial to the complex commuter activities and mobility requirements of the city.

Since the introduction of the tram in the 1920s, public transport has been dominant in St. Petersburg. Buses and trolleybuses came later; the subway was constructed in the 1950s. Today the local public transport network consists of five subway lines which form the backbone of the entire system, backed up by a tram network with a total length of 228 kilometers. Bus transport meanwhile boasts 274 public city bus lines, as well as the privately operated minibus taxis known as marshrutkas. These play an important part in connection with suburban transport and as a transfer facility for public rail connections. Under the Communist regime, the global boom of the automotive industry had little effect on St.

Petersburg. But since the Soviet Union came to an end in 1990, private car ownership has been steadily increasing. Today St. Petersburg has 310 cars for every 1,000 inhabitants.

As a result, congestion and air pollution are among the problems besetting the city center. Local public transport, however, still continues to predominate, with a 70 percent share of motorized transport overall. More than 3.5 million people take a bus or train every day.

## Economic growth built more roads, but saw a decline in public transport infrastructure

In the 1990s the government privatized many formerly state owned enterprises, and liberalized the market in land and real estate. As a result, urban planning came to focus more on the interests of private investors. The local public transport infrastructure was likewise increasingly obliged to give way to building of roads. Whereas St. Petersburg still had the biggest tram system in the world at the turn of the millennium, in the years between 2000 and 2012, a hundred kilometers of tramlines were decommissioned.

For transport planners today, the top priority is the integration of economic, municipal and transport development. In 2011, St. Petersburg became the first Russian city to have a long-term transport strategy. //



“ WE MUST FIND A BALANCE BETWEEN THE COMPETING INTERESTS OF DIFFERENT TRANSPORT USERS. ”

Alexei Lvov, Deputy Chairman of the Committee for Transport Strategy

## A MORE EFFICIENT SYSTEM

St. Petersburg’s transport strategy is aimed at a balanced transport system – one that will offer its citizens a high quality of public urban space, as well as an improved quality of life. With this end in view, St. Petersburg wants to operate its transport system with maximum efficiency and to minimize the negative impact of traffic on the city and its inhabitants. Planners are chiefly concerned with taking into account the different needs of transport users, as well as finding a harmonious balance between the needs of the present and the requirements of future generations.

### Significantly increased public transport facilities by 2025

A first point of departure is integrated planning. The concentration of the road network is due to increase, from 3.8 kilometers per square kilometer in 2011 to 5.1 by the year 2025. At the same time, compact areas dedicated to mixed use are to be developed. Public transport’s share in transport overall is planned to rise to 75 percent by 2025, as a result of measures making the city more easily accessible to non-motorized transport. Public transport meanwhile will be modernized and its capacity increased.

Additional upgraded transport routes should make the system more efficient, while traffic management will serve to optimize the flow. By 2025 the city hopes to reduce accident frequency to 2.6 per 1,000 vehicles. With a view to relieving congestion in the city center, the municipal authorities also plan to divert through traffic, introduce systematic management of parking facilities and set up bus lanes.

#### ↑ STRENGTHS/POTENTIAL

Very high share of public transport. Still comparatively low motorization today. Integrated transport strategy.

#### ↓ WEAKNESSES/THREATS

Massive road building plans. Lack of measures for the restriction of car use. Unambitious cycling policy.

#### Private cars:

- » Construction of freeways, with increased road capacity throughout the city (“Western Rapid Diameter” pilot project)
- » Improved traffic flow, with the aim of 15 percent fewer holdups, 8 to 15 percent higher average speed

#### Local public transport:

- » Expansion of public transport system in peripheral areas of St. Petersburg
- » Adding new stations to subway network
- » Construction of a new subway line going from northeast to southwest
- » 4,500 kilometers of additional bus routes by 2015
- » Six separate bus lanes on certain urban corridors
- » Introduction of water taxis

#### Non-motorized transport:

- » Bike-and-ride stations
- » Bike lanes along three inner city main roads

### Establishment of a transport model for St. Petersburg

St. Petersburg has ambitious development plans, both for its road networks and for local public transport. But it is still lacking in instruments for arriving at a reliable estimate of the effects of these measures, and thus establishing a justification for future development projects.

This is why the municipal authorities of the Russian metropolis are currently working on a transport model. So far fundamental data has been collected, and a traffic census project has been launched. A special tool for commercial traffic is being developed, with 580 observation points having been set up in different parts of the city. Experts have developed a method to estimate the social and economic implications of possible transport development measures of the future. The city is also researching the transport habits of the population with the help of surveys.

## HOW ST. PETERSBURG WANTS TO CHANGE

- = transport planning priorities
- = urban development priorities

### Highest priority

- Improve bicycle friendliness
- Extend public transport infrastructure
- Reduce congestion
- Improve regional accessibility to the city
- Improve access to destinations within the city
- Improve mobility options for all citizens
- Improve transport organization
- Focusing urban development in community centers

### High priority

- Reduce travel times
- Improve transport safety
- Foster secure and safe places
- Highly attractive public spaces
- Enhance and protect green and open space areas
- Mixed land use in order to reduce transport demand
- Transit oriented development

### Medium priority

- Reduce noise emissions from transport
- Improve walkability

### Low priority

- Reduce greenhouse gas emissions from transport
- Reduce air pollutant emissions from transport
- Improve public transport service quality
- Limiting urban sprawl

### Lowest priority

- Compact urban growth



# SÃO PAULO (BR)



POPULATION: 11.2 million inhabitants  
 POPULATION GROWTH: 3.7%  
 AREA: 1,523 km<sup>2</sup>  
 POPULATION DENSITY: 7,383 inh./km<sup>2</sup>

GDP: €13,565 per capita  
 UNEMPLOYMENT: 10%  
 PRIVATE CARS: 445/1,000 inh.  
 MOTORCYCLES: 7/1,000 inh.

FATAL ACCIDENTS: 1,365 p.a.  
 INJURIES: 32,134 p.a.  
 DIESEL: €0.69/liter  
 PUBLIC TRANSPORT: €1.15/trip

The Brazilian city aims to improve public transport with a view to reducing congestion



## TRANSPORT MODE SHARE

How inhabitants and visitors to the city get around (number of trips)

- Motorized individual transport 29%
- Public transport 39%
- Cycling 1%
- Walking 29%
- Other 2%

## TRANSPORT INFRASTRUCTURE

Roads .....	17,000 km
Subway .....	81 km
Commuter train .....	261 km
Bus Rapid Transit .....	133 km
Trolleybuses .....	160 km
City buses .....	4,500 km

São Paulo is not just the biggest city in Brazil – it is the biggest in the entire South American continent. The city itself comprises eleven million inhabitants on an area of 1,523 kilometers. The São Paulo Metropolitan Region (SPMR) extends over 8,000 square kilometers and has around 20 million inhabitants. This makes SPMR one of the ten biggest metropolitan regions in the world. With the second highest gross domestic product in Brazil and one of the five highest in Latin America, the city is an economic powerhouse as well as being the biggest industrial center in the country.

Between 1940 and 1980 the population practically doubled, from 4.7 to 8.5 million. As a result of this rapid growth the transport infrastructure was cobbled together on an ad hoc basis, and urban development was characterized by indiscriminate urban sprawl. Today the road network amounts to a total length of 17,000 kilometers. 29 percent of all trips are made by private car, 39 percent by means of local public transport. Just seven years ago it was the other way around. Massive investments in the public transport infrastructure have led to this shift of emphasis.

Today the city's public transport system consists of a subway network measuring 81 kilometers in length, a commuter train system covering 261 kilometers and an extended bus network with around 30,000 vehicles and routes

extending over 4,500 kilometers. Then there is a steadily growing Bus Rapid Transit (BRT) service with dedicated bus lanes and a current length of 133 kilometers. The entire public transport system carries more than 16 million people every day.

## Upgrading public transport facilities with environmentally friendly vehicles

Today more than seven million private cars are registered in São Paulo, and another 800 to 1,000 are added every day. Many roads are known to be chronically overloaded, and the city is notorious for its traffic queues. In view of its high energy consumption, the transport sector is moreover one of the main sources of greenhouse gas emissions. Of air pollutants, as much as 90 percent is attributed to traffic. The Secretariat for Municipal Transport (SMT) takes both these issues very seriously.

Transport planners are hoping that a Vehicular Pollution Control Plan may yield improvements. Among other measures, this envisages a scheme for the inspection and servicing of all vehicles currently in use, backed up by a Climate Protection Act. There are associated plans to reduce the number of buses operating on fossil fuels in public transport by at least ten percent every year. //



“ THE TRANSPORTATION SECTOR IS ONE OF THE MAIN SOURCES OF AIR POLLUTION AND THE MUNICIPAL SECRETARIAT OF TRANSPORTATION (SMT) IS PLAYING A SIGNIFICANT ROLE TO CHANGE THE SITUATION. ”

Marcio Schettino, Technical Advisor, Municipal Secretariat of Transport, São Paulo

## RIGHT OF WAY FOR ALTERNATIVES

São Paulo’s municipal authorities are hoping that their Vehicular Pollution Control Plan will reduce congestion and offer the city sustainable improvements for the future. The objective is to raise the share of public transport in motorized transport overall to 70 percent by the year 2020. The Vehicular Pollution Control Plan should make transport more efficient, speed up the flow of traffic and at the same time cut air pollution and greenhouse gas emissions.

With this aim in view, the plan is divided into five pillars: the expansion and upgrading of infrastructure, traffic restrictions, promotion of public transport, new forms of technology, and vehicle inspections.

### Efficient transport, renewable energy, more bus and rail transport

The plan is pursuing several strategic approaches at once. First of all the energy efficiency of the vehicle pool is to be raised, as a result of road users increasingly going over to new vehicle technology or renewable fuels and energy sources. At the same time the transport planners are endeavoring to shift mobility from the private car towards the use of public transport. They aspire to achieve these goals by expanding and upgrading public transport services, making buses and trains more attractive all-round. They hope travel times can be reduced across the board, while improving regional accessibility. They also want to reduce traffic noise and raise road safety standards. Going on foot or by bicycle should again become a viable alternative to driving a car.

#### ↑ STRENGTHS/POTENTIAL

High share of local public transport. Technological progress in renewing the vehicle fleet.

#### ↓ WEAKNESSES/THREATS

Overloaded urban road network. Lack of measures for restricting car use.

### Concrete projects:

- » Rodoanel: construction of a 122 kilometer two-lane circular highway, with the aim of reducing truck and coach traffic through the city center
- » Establishment of a 100 square kilometer truck traffic control zone in the inner city
- » Construction of 300 kilometers of bus lanes
- » Extension of the subway network by 284 kilometers by the year 2020
- » Replacement of all diesel buses with buses operating on renewable energy by the year 2018
- » Support for more efficient vehicle technology, including the use of hybrid and electric vehicles as taxis
- » Construction of 168 kilometers of bike paths and introduction of a bike hire scheme
- » Road safety program with a focus on pedestrian safety.

## HOW SÃO PAULO WANTS TO CHANGE

- = transport planning priorities
- = urban development priorities

### Highest priority

- Improve walkability
- Improve public transport service quality
- Extend public transport infrastructure
- Reduce travel times
- Reduce greenhouse gas emissions from transport

### High priority

- Improve bicycle friendliness
- Reduce congestion
- Improve regional accessibility to the city
- Improve mobility options for all citizens
- Reduce air pollutant emissions from transport
- Improve transport organization
- Foster secure and safe places
- Highly attractive public spaces
- Enhance and protect green and open space areas
- Mixed land use in order to reduce transport demand
- Focusing urban development in community centers

### Medium priority

- Improve access to destinations within the city
- Reduce noise emissions from transport
- Improve transport safety
- Transit oriented development

### Low priority

- Limiting urban sprawl
- Compact urban growth

### Lowest priority

### Lower CO<sub>2</sub> emissions as a result of modernizing the bus fleet

It is hoped that the Vehicular Pollution Control Plan will improve air quality, cut greenhouse gas emissions, reduce traffic noise – and introduce appropriate control methods to do so. The bus fleet currently consists of 15,063 buses with an average age of 4.3 years. Diesel consumption comes to 390 million liters a year. The Secretariat for Municipal Transport is hoping to replace the present fleet with buses using various forms of alternative technology. Up until 2011 more than 1,300 buses had been phased out in favor of vehicles running on biodiesel (1,200), ethanol (60) and sugar cane diesel (160). In 2012 this figure rose to 2,500. In addition, new technologies like hybrid drives and the combination of fuels were subjected to testing. The reduction in CO<sub>2</sub> emissions for 2012 was estimated at 10,735 tons per month. Whether this target was actually achieved had not yet been confirmed at the time this study went to press.

# SHANGHAI (CN)



POPULATION: 23 million inhabitants	GDP: €9,364 per capita	FATAL ACCIDENTS: 905 p.a.
POPULATION GROWTH: 0.8%	UNEMPLOYMENT: 4.2%	INJURIES: 1,687 p.a.
AREA: 6,340 km <sup>2</sup>	PRIVATE CARS: 54/1,000 inh.	DIESEL: €0.90/liter
POPULATION DENSITY: 3,632 inh./km <sup>2</sup>	MOTORCYCLES: 45/1,000 inh.	PUBLIC TRANSPORT: €0.25/trip

**The Chinese metropolis needs a transport strategy in keeping with its enormous growth**



## TRANSPORT MODE SHARE

How inhabitants and visitors to the city get around (number of trips)

- Motorized individual transport 20%
- Public transport 25%
- Cycling 29%
- Walking 26%
- Other 0%

## TRANSPORT INFRASTRUCTURE

Roads .....	16,687 km
Subway .....	420 km
Magnetic levitation rail .....	30.5 km
Tram .....	10 km
City buses .....	1,165 lines
Ferries .....	42 ships

**W**ith a population of 23 million inhabitants, Shanghai is China's biggest metropolis. Around four million people live on an area of 100 square kilometers. Another twelve million live in the neighboring metropolitan area, which measures some 660 square kilometers; the rest of the inhabitants are distributed over another 5,000 square kilometers, however, with a much lower population density. Between 2000 and 2010 the city's population rose by more than 40 percent. Additionally, powerful economic growth has been accompanied by increasing motorization and massive investments in road infrastructure.

Although Shanghai has also invested in its public transport system, it has spent two to three times as much on its road infrastructure over the last ten years. The city can nonetheless boast of having the longest subway network in the world. It is also the world's fastest growing subway: the first line was opened in 1995, and already by 2012 the network had a length of 420 kilometers and a full 273 stations. The subway carries more than six million passengers every day. The subway network is backed up by buses, trolleybuses and taxis.

For a long time the bicycle played an important part in people's mobility in Shanghai. There are still cycle paths in Shanghai today,

but bicycles and motorbikes have been banned from most major roads.

## Economic growth in harmony with ecology and social justice?

The demand for transport in Shanghai has grown rapidly in recent decades. The public transport system is becoming increasingly overloaded, and the streets are crowded. Poor air quality in the city affects people's health. After some 20 years of economic growth, the balance of transport has shifted dramatically. In 1995, non-motorized transport added up to around 73 percent, while public transport was used for just 20 percent, and cars for the remaining seven percent of all trips. By 2009 the ratio of pedestrians and cyclists had fallen to 55 percent, with half of today's cyclists using electric bikes. Trips made by private car, in turn, have risen to 20 percent. In spite of major investments in the subway lines, the share of public transport has increased only by a meager five percent.

While the government in Shanghai endeavors to limit the number of private cars with the help of vehicle registration auctions and managed parking schemes, the main focus of infrastructure investment continues to be on the road network. //





“ MY VISION FOR SHANGHAI IS THAT IT BECOMES A GREEN URBAN TRANSPORT CAPITAL. ”

Prof. Pan Haixiao, Department of Urban Planning, Tongji University

## TRANSPORT A POLITICAL ISSUE

In 2002, after five years of discussion and negotiation between various ministries and interest groups, the government of Shanghai finally issued a preliminary draft bill for urban transport in China. This was the first time in the history of China that urban transport strategy had featured at all as an important political issue on the agenda of a municipal council.

### Systematic checks on private motor vehicles, priority given to public transport

Shanghai's urban transport strategy essentially focuses on four main issues. First of all, city leaders resolved to impose much firmer controls in future on the ownership and use of motorized vehicles. Vehicle licenses are only issued within strict limits, and heavy charges are imposed for parking. Secondly, the planners aim to press on with the expansion and upgrading of the road and rail infrastructure. As a third point, transport and land use will be more closely coordinated and harmonized. And lastly, a multimodal urban transport system is being planned, which once introduced, will give priority to public transport. The emission of air pollutants is to be cut back drastically. With a view to attaining this goal, the municipal administration is also hoping to make Shanghai a more pleasant place for pedestrians and cyclists once again. Another important priority is road safety – the planners hope to raise standards with the help of more efficient traffic organization.

#### ↑ STRENGTHS/POTENTIAL

Massive investment in local public transport. Long-term strategic planning and rapid implementation of infrastructure projects. Ambitious control of the demand for transport.

#### ↓ WEAKNESSES/THREATS

Extreme strains on transport and the environment. Unfavorable conditions for cyclists and pedestrians. Inconsistent application in practice of the ambitious policy of controlling transport demand.

### Concrete measures of Shanghai's urban transport strategy:

- » Vehicle registration auctions and management of parking spaces, with a view to restricting the ownership and use of motorized vehicles and preventing congestion
- » Construction of transport infrastructure in the form of urban freeways, expressways and bridges
- » Stricter control of urban development and the urban transport system
- » Expansion and upgrading of the subway, with a view to encouraging people to use public transport. The improvements are to be financed by the local government's income from leasing and vehicle registration auctions
- » Parking management strategy, with differentiated charges. Higher prices will be charged in the city center than in outlying districts and suburbs
- » The obligation to construct bike paths has been firmly enshrined in the planning and building laws of the city.

## HOW SHANGHAI WANTS TO CHANGE

- = transport planning priorities
- = urban development priorities

### Highest priority

- Improve walkability
- Improve bicycle friendliness
- Improve public transport service quality
- Extend public transport infrastructure
- Improve regional accessibility to the city
- Improve mobility options for all citizens
- Reduce air pollutant emissions from transport
- Reduce greenhouse gas emissions from transport
- Improve transport organization
- Improve transport safety
- Highly attractive public spaces
- Enhance and protect green and open space areas
- Limiting urban sprawl
- Compact urban growth

### High priority

- Reduce travel times
- Improve access to destinations within the city
- Foster secure and safe places
- Mixed land use in order to reduce transport demand
- Transit oriented development

### Medium priority

- Focusing urban development in community centers

### Low priority

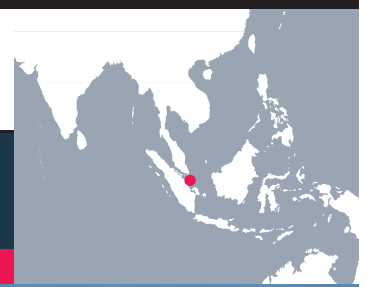
- Reduced noise emissions from transport

### Lowest priority

### Car licenses only obtainable at auction

Restriction of the ownership and use of private cars is one of the most important elements in Shanghai's policy of traffic control. Directives for vehicle registration auctions have played an important part in this since 1994. With continuing economic growth, however, people's purchasing power has increased – so more are in a position to pay the high fees that are required. The demand for private cars thus continues unabated. At the present time, around 8,000 motor vehicle licenses are sold at auction every month. Since 2010 prices have risen drastically – they have been known to go as high as 7,500 euros. The government is now again issuing more licenses, with the aim of keeping prices at a more appropriate level. This, however, is not really in the spirit of the directive. At present the number of licenses sold at auction is twice as high as originally envisaged.

# SINGAPORE (SGP)



POPULATION: 5.1 million inhabitants  
 POPULATION GROWTH: 0.9%  
 AREA: 712 km<sup>2</sup>  
 POPULATION DENSITY: 7,126 inh./km<sup>2</sup>

GDP: €39,156 per capita  
 UNEMPLOYMENT: 2.2%  
 PRIVATE CARS: 100/1,000 inh.  
 MOTORCYCLES: no data supplied

FATAL ACCIDENTS: 139 p.a.  
 INJURIES: 11,065 p.a.  
 DIESEL: €0.78/liter  
 PUBLIC TRANSPORT: €0.64/trip

The city is working to develop a transport system suitable for a growing metropolis with a limited area



## TRANSPORT MODE SHARE

How inhabitants and visitors to the city get around (number of trips)

- Motorized individual transport 29%
- Public transport 44%
- Cycling 1%
- Walking 22%
- Other 4%

## TRANSPORT INFRASTRUCTURE

Roads .....	3,400 km
Freeways .....	161 km
Subway .....	149 km
Automated elevated rail .....	29 km
City buses .....	342 lines

Singapore is an island city state with an area of 712 square kilometers and a little over five million inhabitants. In comparison with other cities, it has a high population density. The island extends over 43 kilometers from east to west and 23 kilometers in a north to south direction. It consists of heavily populated residential quarters and business districts which are linked up with an extensive network of road and rail connections.

The Land Transport Authority (LTA) is responsible for planning and constructing the infrastructure required for all forms of land transport – that is to say, not only the road network but also the local public transport systems. Public transport is operated by two private companies, without government support; the state is however responsible for the expense of maintaining the infrastructure. The Mass Rapid Transit (MRT) subway system forms the backbone of public transport. It is backed up by a network of bus lines and several automated elevated railroads, which principally serve the highly concentrated residential districts built with public funding. It is in these residential districts that almost 80 percent of the Singapore city state's residents live. Taxis, too, have an important part to play. In Singapore, taxi fares are modest – useful for the locals, as few Singaporeans have a motor vehicle to call their own.

Altogether the inhabitants conduct 44 percent of all trips by public transport; motorized individual transport comes to just 29 percent. Bicycling is not a very popular mode of transport, though the share of cyclists in transport overall has risen recently. Car ownership and use are strictly limited – in view of road tolls, and car licensing charges that are often higher than the value of the vehicle itself.

## Growing demand for transport and too little space to expand

On average, more than eleven million trips are made every day by motorized vehicle. By 2020 a 30 percent increase in the demand for public and private motorized transport is expected, reaching a level of 14.3 million trips per day. The subway system is already pushing the limits of capacity. An extensive upgrading of the subway system is being sought as a remedy to the future – and current – challenges this poses.

In view of Singapore's limited area, only public transport will be able to meet future transport demands. Today's urban mobility challenges include not only the drastic increase in the population and the demand for transport, but also demographic changes in society and people's rising expectations – this in view of the fact that an increasing proportion of the population are now well off. //



“OUR GOAL IS A PEOPLE CENTERED LAND TRANSPORT SYSTEM.”

Choi Chik Cheong, Head of the Knowledge Management Division of the LTA Academy

## BARRIER-FREE ACCESS FOR ALL

The vision of the Land Transport Authority for Singapore’s future is a transport system focused on the needs of the population, which will be efficient without being unduly costly. Here, the city takes into account the rising expectations of the general public. Transport is seen as an aspect that has a certain amount of influence over the quality of life. Meanwhile, Singapore also wants to ensure that mobility is not beyond the means of any of its citizens.

### A transport system to meet a wide range of requirements

In 2008 the LTA unfolded its “Land Transport Master Plan”. This specifies a number of measures and key strategies for transport development. For a start, the planners want to make local public transport the first choice among the available transport options. To this end, they aim to increase capacity, link the different modes of transport more effectively and raise standards of safety and comfort.

Secondly, the transport planners want to restrict the use of private cars further still – envisaging a situation where control measures balance out vehicle ownership in such a way that the best possible road traffic conditions can be achieved. Above all, Singapore’s urban planners aspire to meet the many different needs of the residents – aiming for barrier free access to all modes of transport, along with public transport fares affordable for all and improved networking of the different modalities. Altogether they are pursuing the vision of an ecologically sustainable city with a high quality of life.

#### ↑ STRENGTHS/POTENTIAL

High quality and popularity of local public transport services. Active control of demand in connection with private car transport.

#### ↓ WEAKNESSES/THREATS

Limited residential area, along with increasing population and rising demand for transport. Local public transport services to some extent already overloaded.

#### Private cars:

- » In spite of the shortage of land for development, the road network is to be extended
- » Load dependent city tolls and the management of parking facilities will impose tighter controls on motorized individual mobility
- » Car ownership will be even more severely controlled in future with the help of restrictive licensing policies

#### Local public transport:

- » 33 billion euros have been tagged for investment, with a view to doubling the length of the subway network in the next decade
- » In addition, Singapore plans to spend 660 million euros on 800 new buses, so as to increase the capacity of the bus network in the next five years
- » A program is in place for the improvement of the existing infrastructure

## HOW SINGAPORE WANTS TO CHANGE

- = transport planning priorities
- = urban development priorities

### Highest priority

- Improve public transport service quality
- Extend public transport infrastructure
- Reduce congestion
- Reduce travel times
- Improve mobility options for all citizens
- Reduce air pollutant emissions from transport
- Reduce greenhouse gas emissions from transport
- Foster secure and safe places
- Transit oriented development
- Compact urban growth

### High priority

- Improve transport organization
- Improve regional accessibility to the city
- Improve access to destinations within the city
- Reduce noise emissions from transport
- Improve transport safety
- Highly attractive public spaces
- Mixed land use in order to reduce transport demand
- Focusing urban development in community centers

### Medium priority

- Improve walkability
- Improve bicycle friendliness
- Enhance and protect green and open space areas

### Low priority

### Lowest priority

- Limiting urban sprawl

### LTA – top level authority combines all modes of transport

In 1995, Singapore’s vehicle licensing authority, the road building authority, the local transport company and the transport arm of the responsible ministry were amalgamated to form the Land Transport Authority (LTA). Today the LTA plans and designs the entire land transport system, including the bus, rail and road infrastructure. This makes it possible for a completely integrated network to be developed – both in terms of improved accessibility and connections, and on the basis of operational organization and a consistent fare scheme. The LTA is also endeavoring to improve conditions for commuters with the help of an information system called PLANET, which links all modes of transport. This makes it possible for transport users to access real time travel information, as well as geographical information systems and maps. The system also includes a payment facility – users can pay for journeys and discharge parking fees by smartcard.



# RESULTS OF THE STUDY – AN OVERVIEW

Having illustrated the specific character of the cities under investigation in the city dossiers included here, we would now like to give an overall account, with a view to demonstrating the range and emphasis of the different aspects in the cities concerned. In looking for a “generic code” of urban mobility, as well as trying to establish the structural elements and effective relationships relevant to such a code, the

authors of the study selected as wide a range of cities as possible. We wished in this study to avoid the risk of buttressing a hypothesis of shared effective mechanisms just on the basis of similarities between certain cities. The fifteen cities we investigated show wide divergences in terms of their fundamental structure.

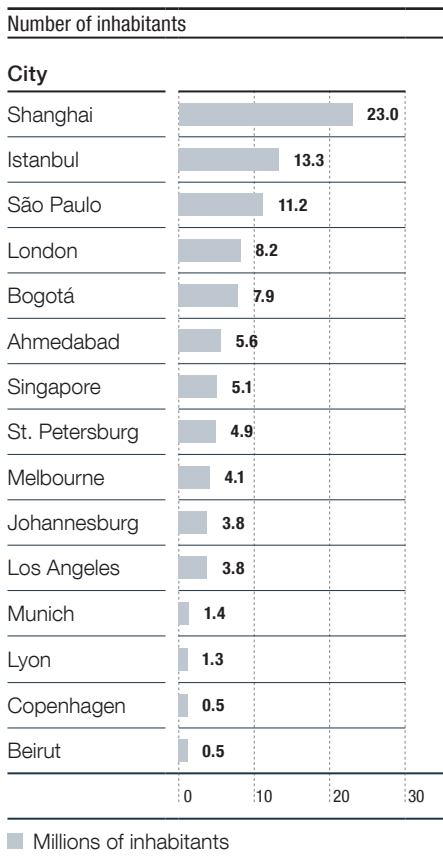
It should be noted that the data used for this study were always based on a fixed and

defined investigative unit. This is explained in the various city dossiers. In the case of Los Angeles, for example, it consists of the city in a narrower sense – not the much more extensive metropolitan region.

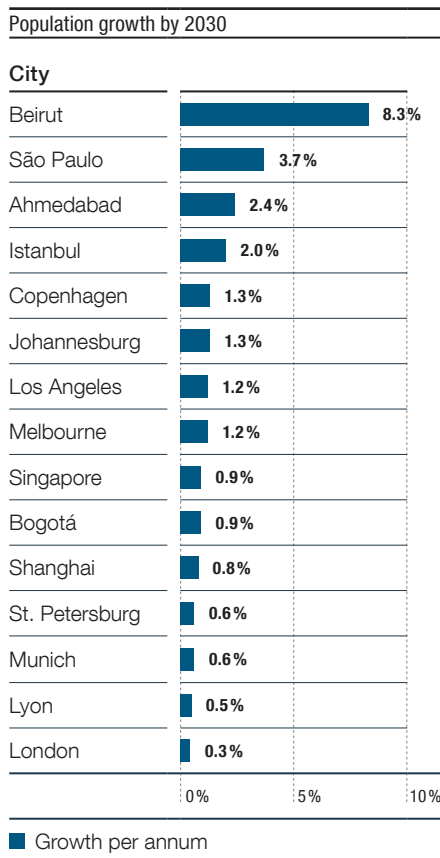
### Population growth results in increase of traffic

In terms of the number of inhabitants, the cities studied range from megacities with a

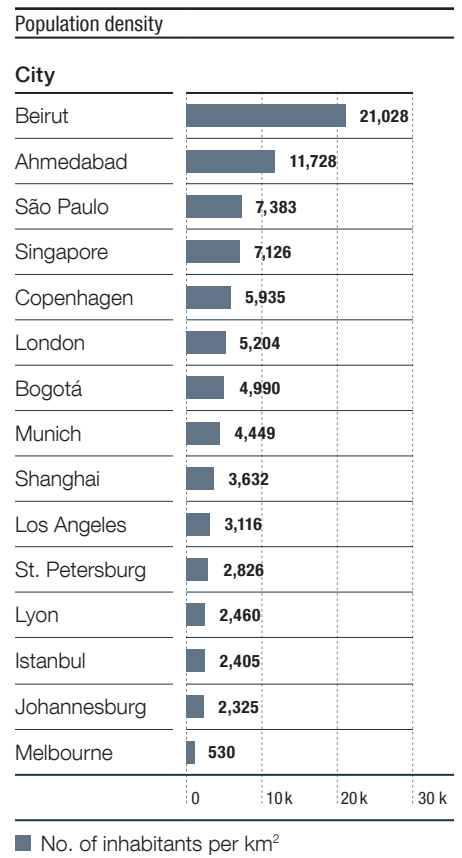
**Figure 1: Population**



**Figure 2: Population growth**



**Figure 3: Population density**



population of more than ten million, like Shanghai, Istanbul and São Paulo, to comparatively small cities like Copenhagen and Beirut, with a population of around half a million (Figure 1). Though Beirut is the smallest city considered in this study, it has far and away the highest population density: here we find 21,000 people to the square kilometer, five times as many as in the most heavily populated German city, Munich (Figure 3). In addition, the Lebanese capital is currently growing much more rapidly than any other – more than twice as fast as the next contender, São Paulo (Figure 2).

**Population growth is a crucially important factor for all cities**

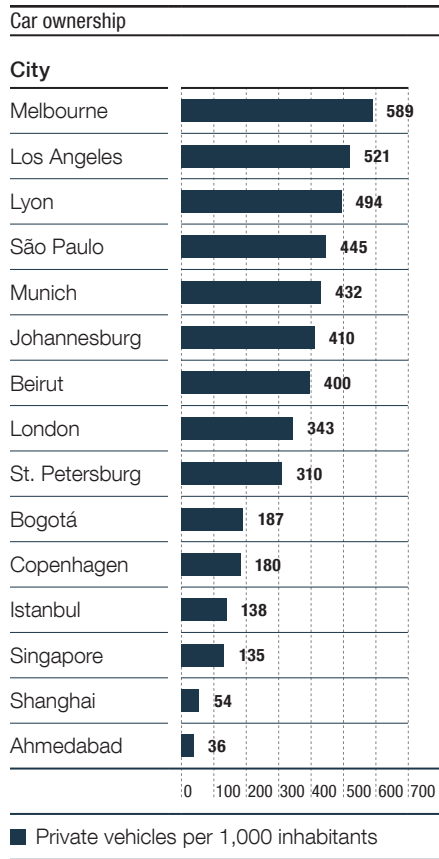
The overview also shows that rapid growth is not restricted to developing and emerging countries. The Danish capital Copenhagen, for example, comes fifth in the list of cities with the highest forecast annual growth rate up until 2030 – significantly ahead of China’s biggest metropolis, Shanghai. For the cities investigated, the growth of their population is a factor of outstanding importance, and is seen as one of the crucial influencing variables for transport planning (Figure 7).

**Quality of transport service affects mobility patterns**

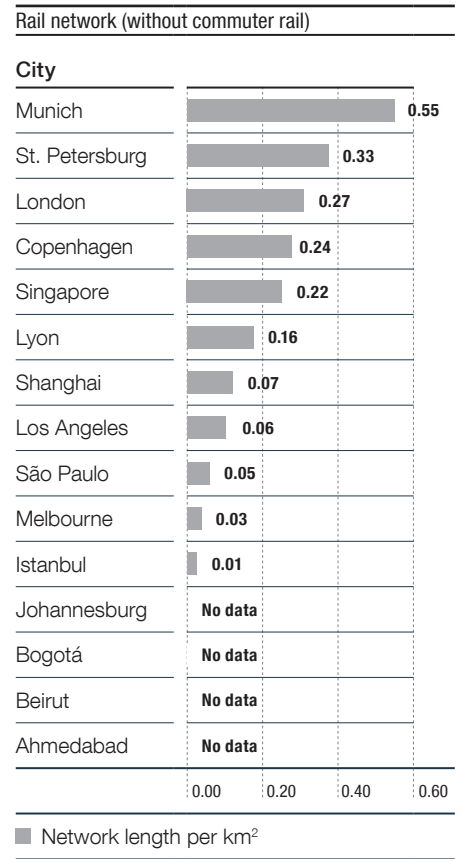
It is obvious from the overview of the cities studied that there exist close mutual relationships between the urban structure of a city and the mobility of its inhabitants. Thus four of the six cities with the lowest population density (Figure 3) are at the same time among the six cities with the highest motorization share (Figure 4) and the highest share of private cars in transport as a whole (Figure 6). The more spread out a city is, the more its residents are inclined to use a private car in order to get from A to B.

The reverse is also true: local public transport services tend to be particularly well developed when the population density is high. We can also recognize a connection between an extended urban rail network (Figure 5) and high reliance on public transport. Most transport experts of the cities that we investigated see the quality of local public transport services as an important influencing variable in relation

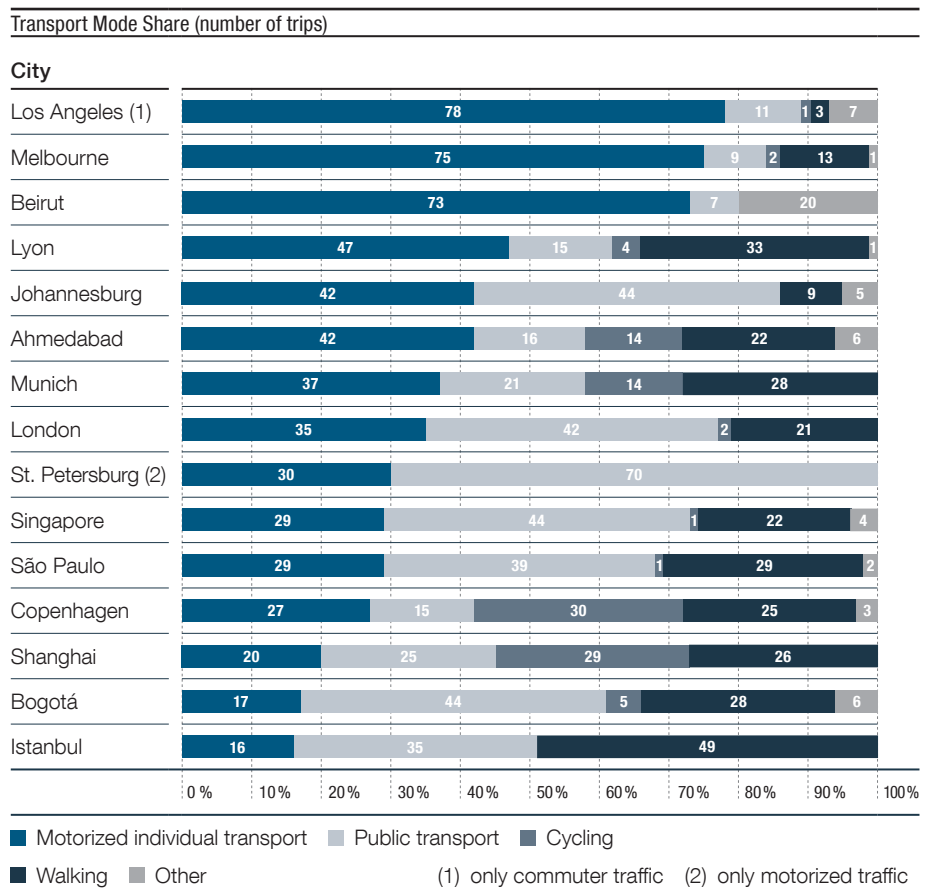
**Figure 4: Car ownership**



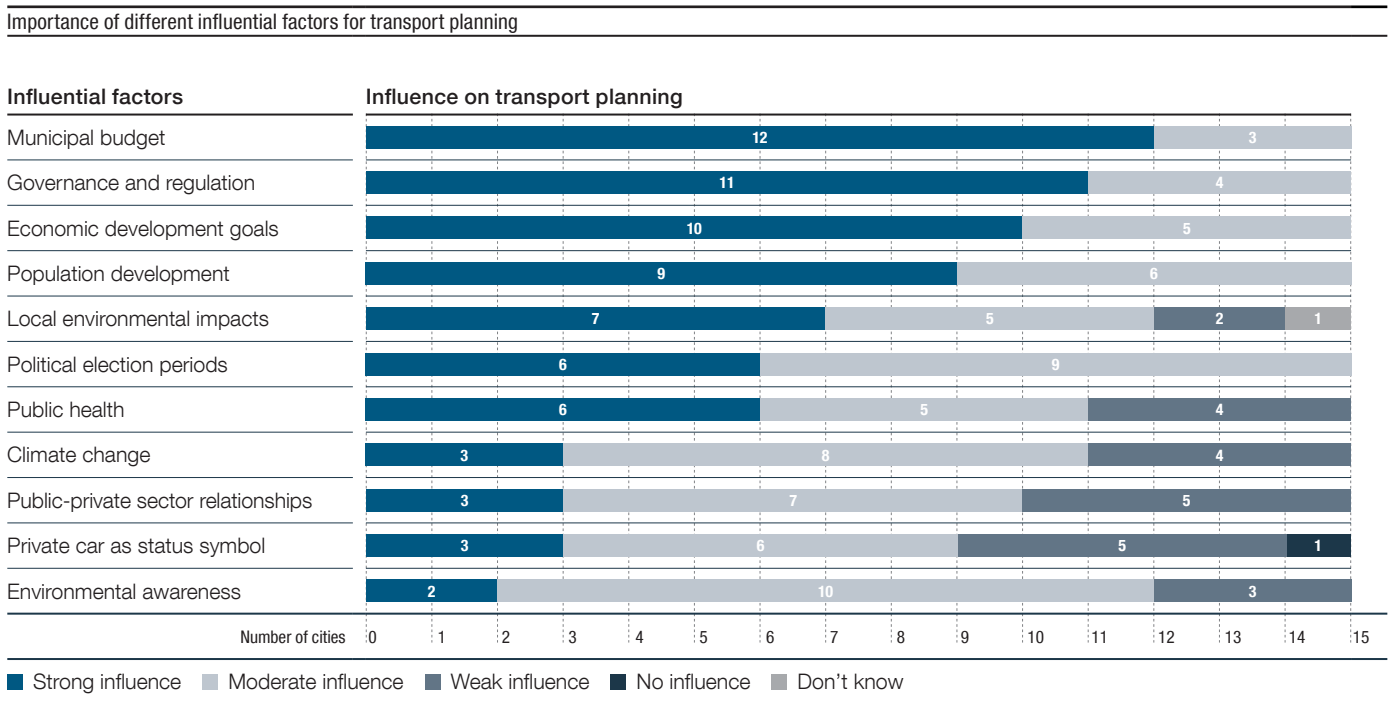
**Figure 5: Urban rail network**



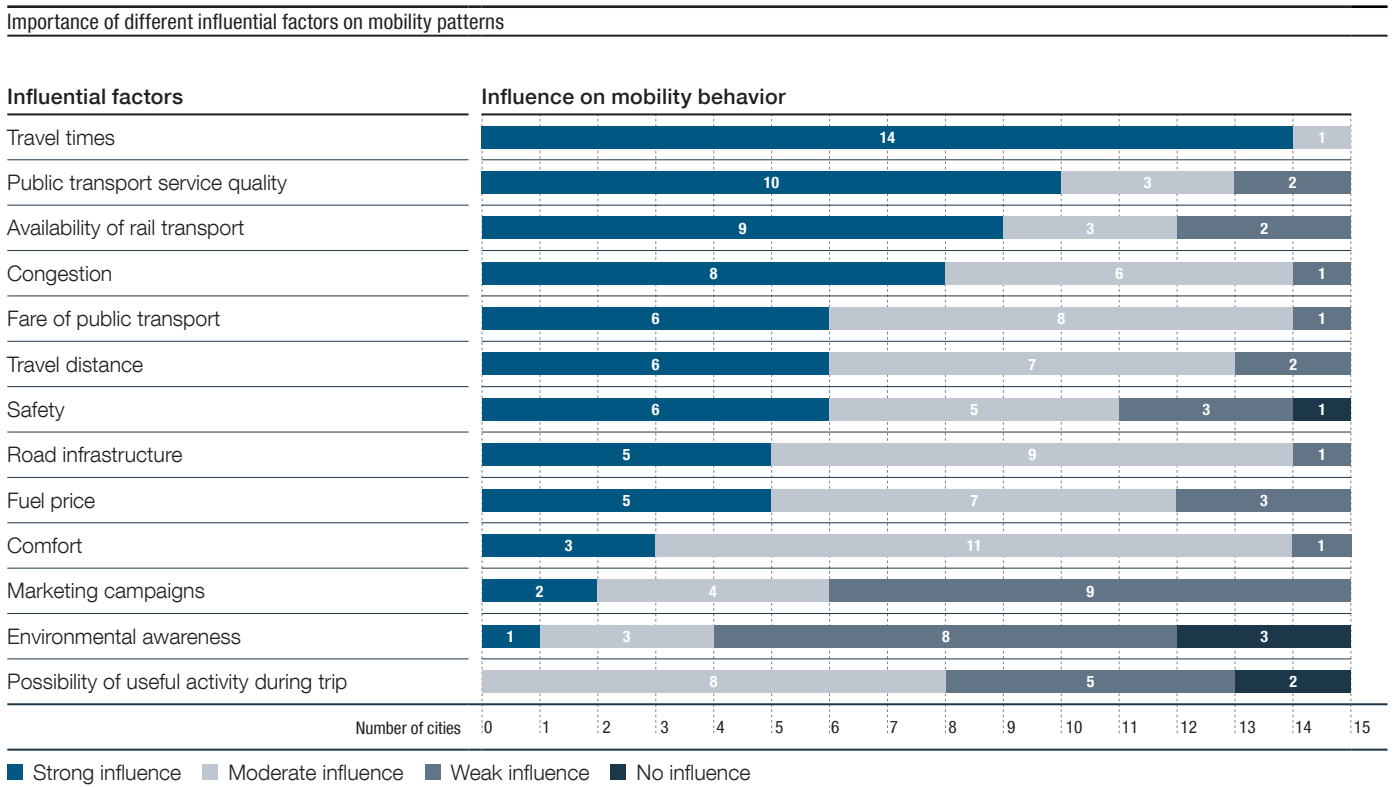
**Figure 6: Modal split**



**Figure 7: Factors influencing transport planning**



**Figure 8: Factors influencing mobility behavior patterns**





to the individual mobility habits of residents. Equally important is the presence of a rail-based system, and the closely associated factor of reduced traveling time (Figure 8).

**Many cities want to expand and improve local public transport**

Against this background it is hardly surprising that the improvement of local public transport services, and investments in local public transport infrastructure, rank higher as a priority than all other transport planning objectives. This is the case right across the board. As practically all the cities under investigation already have conventional bus systems, the focus of planning tends to be on rail-based projects like the subway, commuter trains or tram (Figure 12).

At the same time, in view of the fact that the funding available from the municipal budget for transport projects is seen as the most important influencing variable for a city's transport planning, the challenge with which many cities are confronted is clear. In spite of limited financial

means, they desire to make local public transport services an attractive option (Figure 7 and Figure 8). This is why more and more cities are pinning their faith on Bus Rapid Transit (BRT) projects (Figure 12), which promise a significant improvement in the quality of public transport on a cost-effective basis, and with a relatively short window of implementation. Eight of the cities under consideration have already introduced this kind of system with success; two others have definite plans for it, and another four are thinking about implementing a BRT system.

**Local industry needs more than just easy access by car**

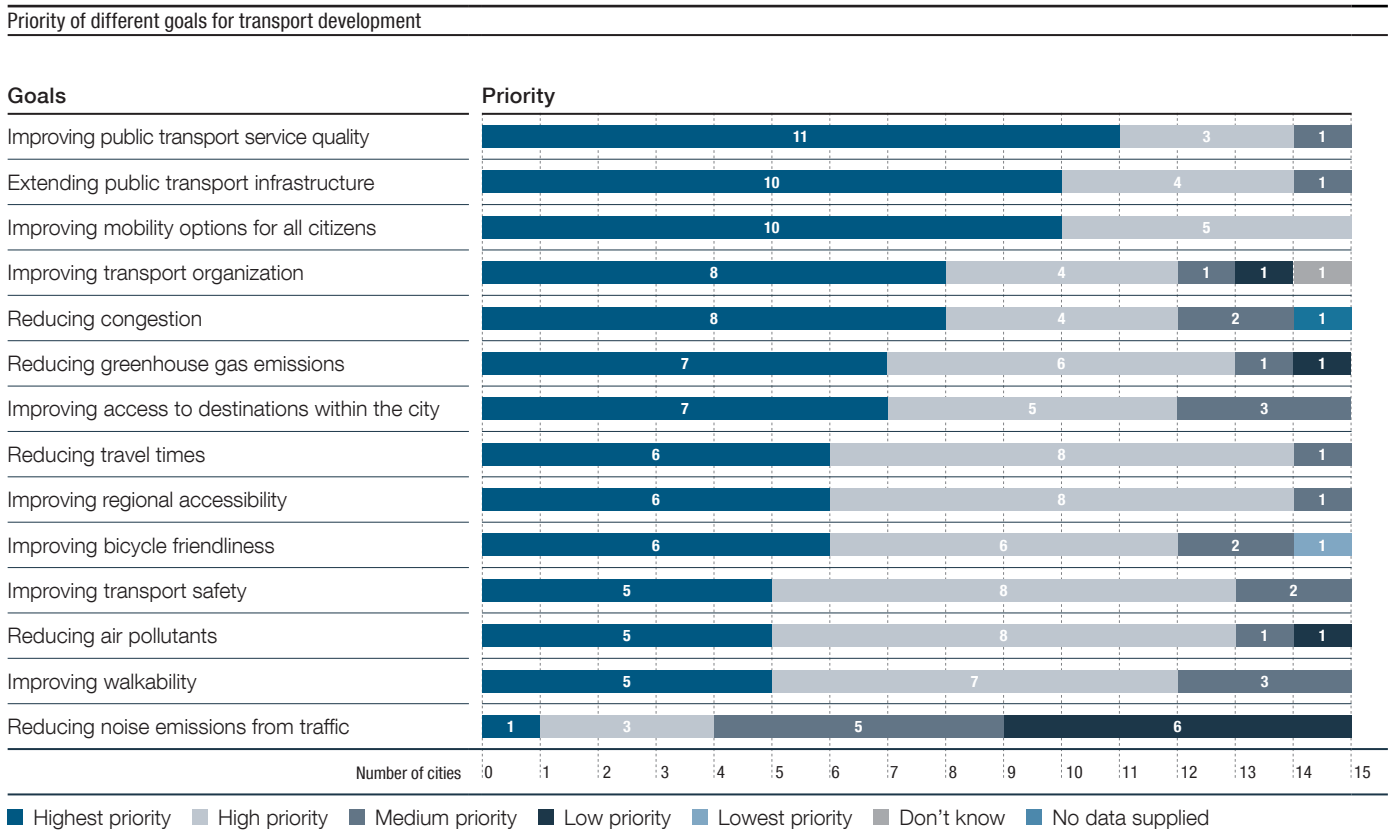
Another interesting conclusion can be drawn from the study when we correlate the powerful influence of local industrial development on transport planning (Figure 7) with the high priority of local public transport as a transport and urban planning objective (Figure 7, Figure 9, Figure 10). If we additionally contemplate measures in the concrete planning phase, the improve-

ment of public transport services and expansion of their capacity are more important for the economic wellbeing of a city than improving the quality of transport in relation to use of the private car (Figure 11). This is presuming, of course, that most cities have already made massive investments in the past in the development of their road infrastructure. Though traffic congestion is seen today as a significant influencing factor for the mobility behavior patterns of the population, only few cities are planning further upgrades of the road system.

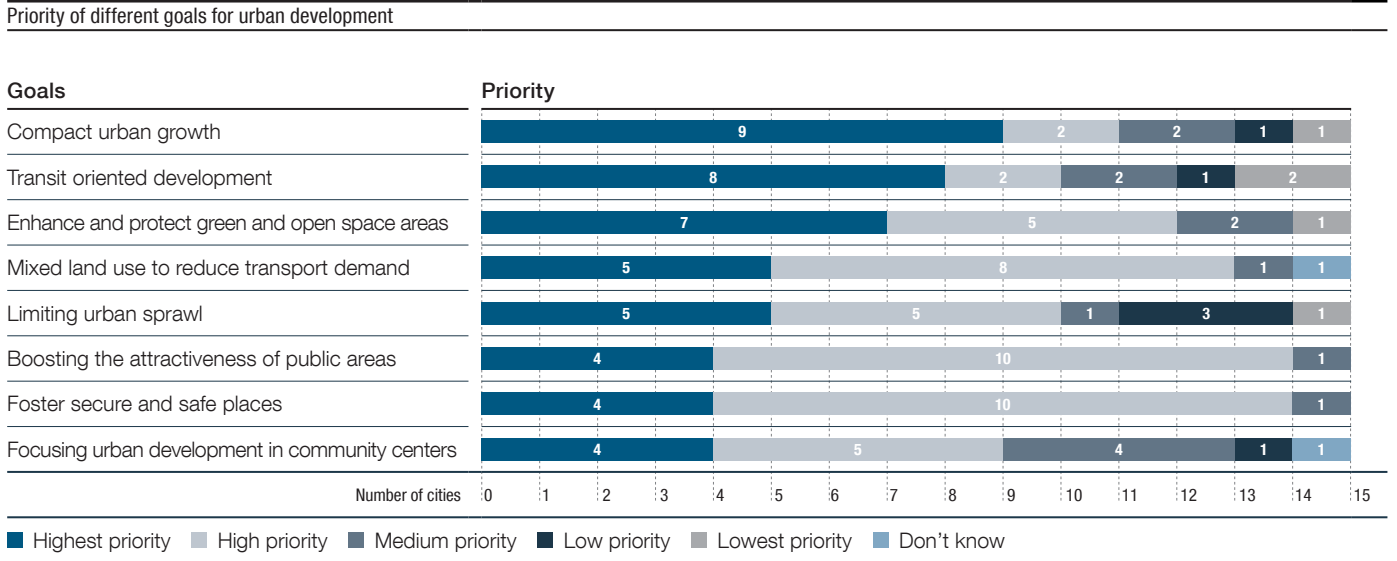
**Cities want to create more space for pedestrians and cyclists**

It is not only local public transport that occupies a prominent place in the transport development of the future. The encouragement of local mobility, on foot or by bicycle, is also a high priority on the transport policy agenda of the cities studied. Transport planners are hoping to reach this goal by developing pedestrian and bicycling infrastructures. Cities are also opting for an

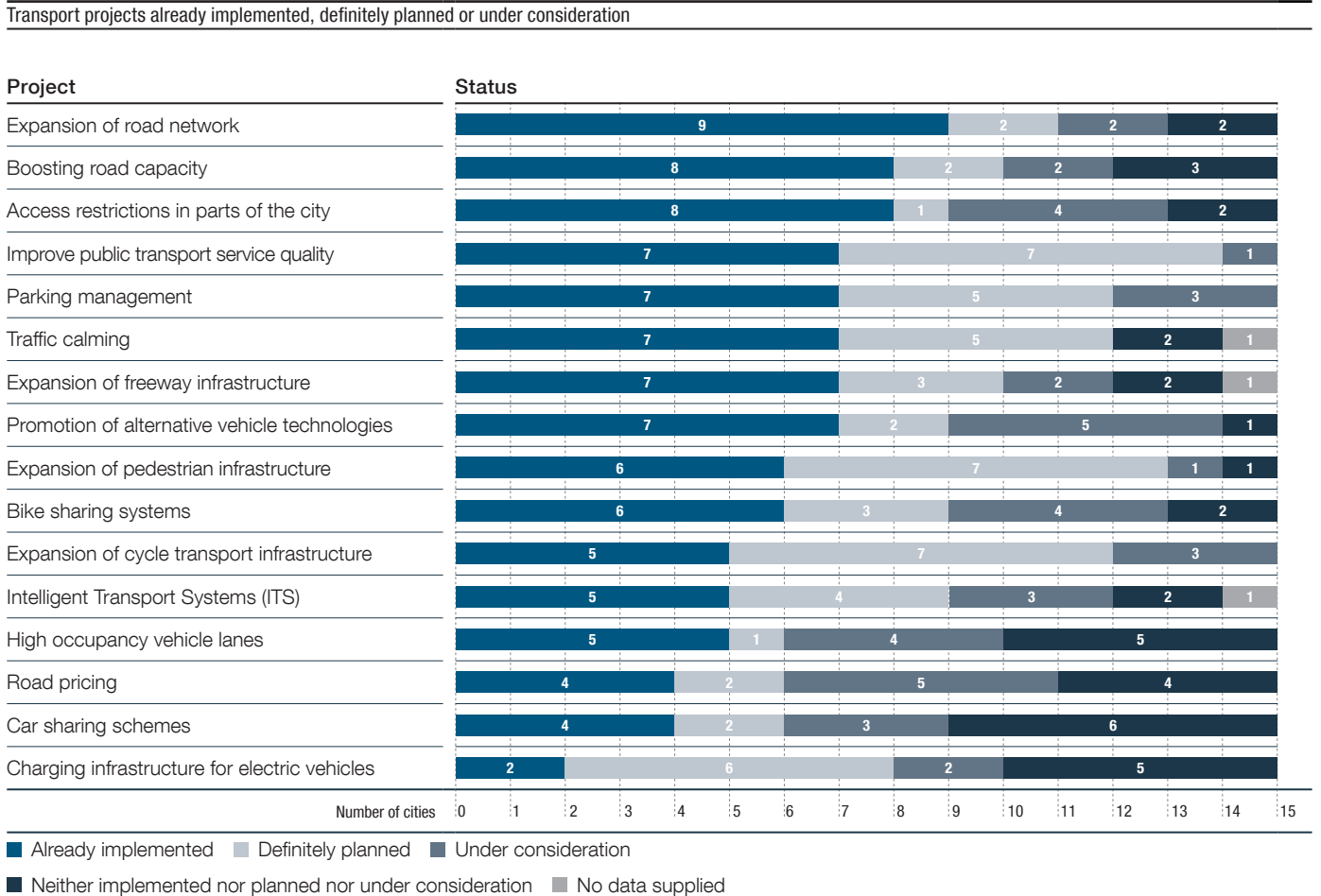
**Figure 9: Priorities of transport development**



**Figure 10: Priorities of urban development**



**Figure 11: Past and future transport projects**



urban development policy that is aimed at the creation of compact urban structures for mixed use, along with green and unoccupied areas (Figure 10, Figure 11).

At the same time, the cities investigated would like to reduce motorized traffic and limit its negative effects as compared with the past. Eight of the fifteen cities have already banned cars and trucks from certain urban areas, with a view to lowering the volume of traffic and reducing emissions. Managed parking spaces and traffic calming have already been introduced in half of the cities studied; another five cities have definite future plans for realizing projects of this kind. Road toll approaches are also increasingly being discussed on an international scale. Only four of the fifteen cities under consideration are still unwilling to contemplate charges for road use at the present time (Figure 11).

**Are the cities studied in need of a good marketing strategy?**

The across the board analysis of this study also reveals that certain aspects of urban development and transport planning are seen by the international majority as much less significant for the mobility habits of the population than one might suppose,

judging by discussions of the same issues in Germany and Europe. For example, the price of fuel is admittedly an important influencing variable for a third of the cities in relation to future development. All the same, the picture fails to reflect the high level of concern with which this issue is viewed in Europe.

Moreover, the cities investigated assess the individual environmental awareness of road users as hardly relevant to their actual mobility habits, in view of the fact that travel times and the quality of services are the main factor for users of local public transport. This suggests the question whether providers of mobility services, whose publicity frequently relies on this kind of argument, may not have chosen to go with the wrong marketing strategy. This might also help to explain the fact that marketing campaigns in favor of the use of public transport are generally seen by the cities surveyed as a comparatively ineffective instrument.

**Safety is only an issue when people feel unsafe**

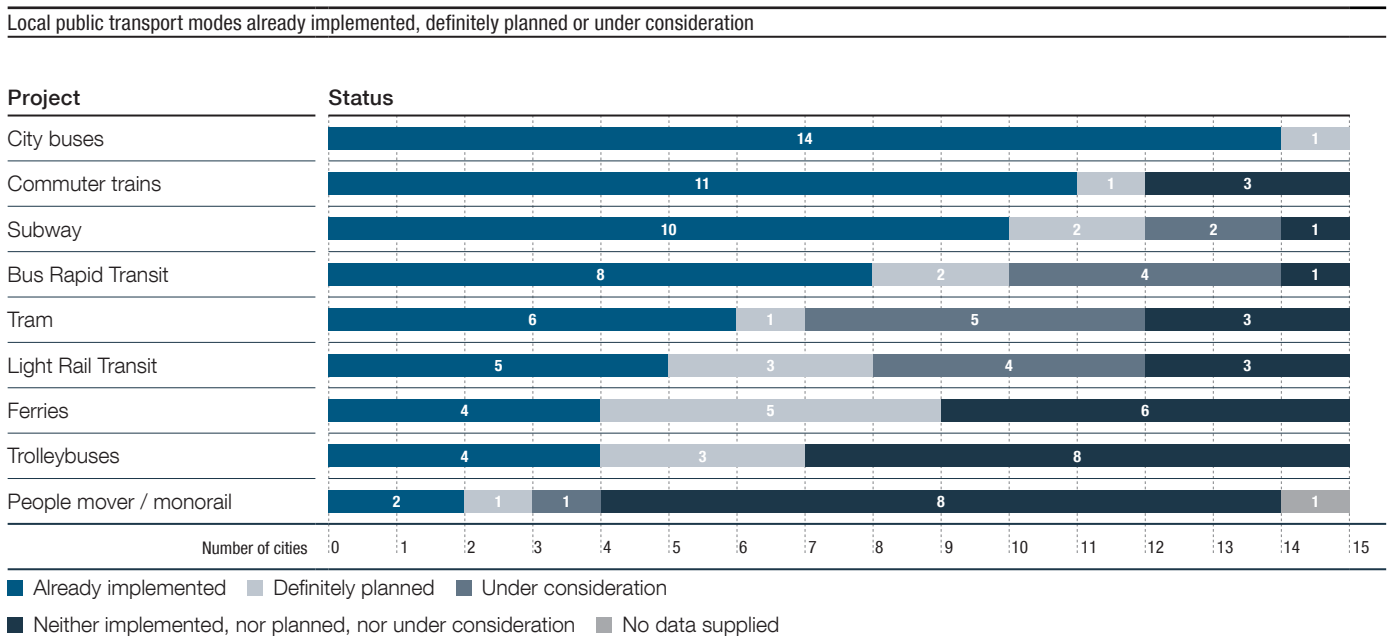
When we consider the question what influence the issue of safety has on the mobility patterns of a population, a diametrically

contrasting picture emerges. Whereas six cities attribute great weight to safety as a factor, four cities see it as being just a weak influence or even completely insignificant for the individual behavior of citizens. Here we need to bear in mind that each city and its population will have their own unique point of view. Safety is only a matter of concern to road users when the roads are actually unsafe.

**Cities attribute little influence to climate change**

It is a similar picture with the cities investigated when we turn to the evaluation of environmental stress and climate change as an influencing factor for transport planning (Figure 7), and also in connection with the setting of objectives for the future development of transport (Figure 9). Explanatory models for the unexpectedly low positioning of this most complex of issues in the cities under consideration are being worked out, based on the system analysis approach of the present study. The findings will be presented in the following section. //

**Figure 12: Past and future local public transport projects**





# PROSPECTS FOR URBAN AND TRANSPORT DEVELOPMENT

The study “What Cities Want” inquires into worldwide challenges and local strategies for mobility in selected cities. At the same time, the study investigates the hypothesis that common features between the various cities and generally valid interdependencies of effects can be seen. The study has shown how different cities all over the world react to the most urgent issues of passenger transport and urban development, against the background of global and local challenges to industry, society and the environment. In contemplating the relationships between the findings of the fifteen urban dossiers published here, the conclusions of our across the board evaluation and our system analysis of urban mobility, we have found and highlighted repeated patterns and commonalities emerging in cities all over the world.

Based on a “generic code” of this kind, in considering the challenges cities are faced with we can identify three fundamental chains of cause and effect that are of primary importance for the development of future strategies of urban mobility. The two global megatrends of urbanization and climate change each unfold a dynamic of their own, but at the same time are closely connected, or may even in some respects be in contradiction with one another.

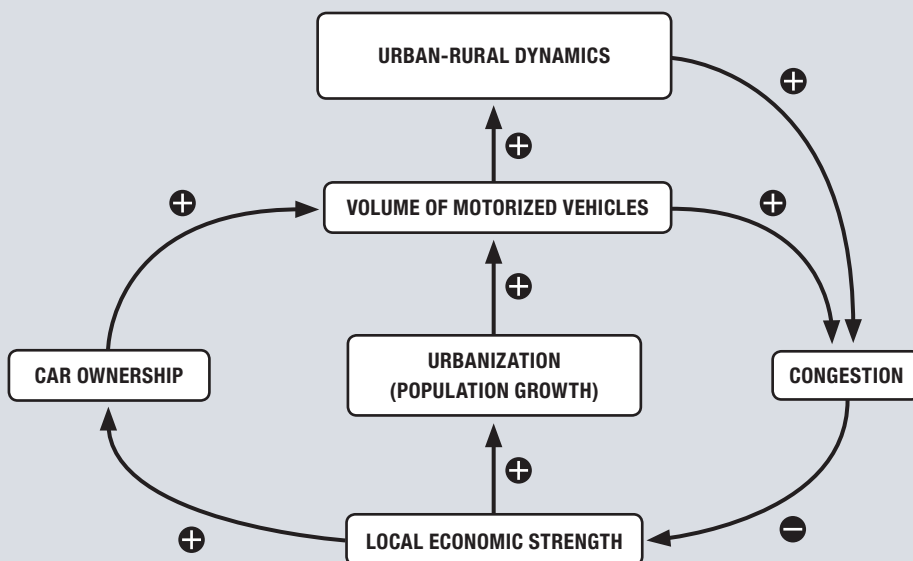
### Industrial development leads to exacerbated transport problems

In the control loop for “industrial development and urbanization” (Fig. 1), starting from the function of the city as a location for companies and jobs we can observe a steady growth of population. In addition, the involvement of the citizens in local

value creation results in a higher level of individual affluence, which makes it possible for them to purchase a car, and so leads to a rise of motorization. In the first phase, without any external intervention, this development is linked to a higher number of motorized vehicles on the roads.

The increasing burden of traffic then has significant negative effects on the quality of life in a city – both for residents and for visitors. The result is a move towards suburbanization, which has ever more extensive ramifications for the city and its surrounding environment. This causes traffic to increase further, and the road infrastructure to reach the limits of its capacity. As a consequence, considerable traffic congestion becomes endemic, with concomitant negative effects on the local economy.

Figure 1: The industrial development and urbanization control loop



Legend

- System variable
- + Strengthening effect
- Weakening effect
- Δt Time delayed effect
- + Effect still relatively inconspicuous

**Connection between gross domestic product and cars**

If we consider these insights against the background of the results of the urban studies, it emerges that both industrial development (the “local economic strength” system variable) and the volume of motorized vehicles could be significant drivers of the control loop. With reference to economic development we recognize the classic connection between gross domestic product and the share of cars in transport as a whole, as in many upwardly mobile economies – and as observed in the cities of Beirut, Bogotá, Istanbul, Johannesburg, São Paulo, Shanghai and St. Petersburg. It is only as a result of countermeasures that this presumed automatic mechanism does not feature in cities like Copenhagen, Lyon, Melbourne, Munich and Singapore.

**Global climate change and local environmental pollution**

Starting from these interdependencies of effect, the “environmental impact and climate change” control loop below (Fig. 2) shows the feedback mechanisms between global greenhouse gas emissions, local environmental pollution and the motivation of cities to implement strategies for sustainable mobility. First of all, the heavy use of motorized transport leads to a high consumption of fossil-based energy, resulting in a rise of climatically damaging CO<sub>2</sub> emis-

sions, noise and local environmental pollution. Our systemic investigation shows the impact these phenomena have on politics, and so supplies an explanatory model for the varying evaluation of climatic and environmental issues in the context of the urban survey.

**Climate change: one of the major challenges cities have to face**

Because traffic noise and air pollution in the cities are directly perceived as having a negative effect on the quality of life, urban policy makers recognize the need to develop strategies to solve these problems. It is a different picture when we consider the issue of climate change. The latter, of course, is heavily implicated with CO<sub>2</sub> emissions, about a third of which are caused by the transport sector, but the process in this case is a long term one. The consequences for local quality of life are not yet perceived as serious in the majority of the cities. This remains true in spite of the fact that Singapore, for example, is already wondering how it will deal with the forecast rise in sea level, and Melbourne is calculating the increasing probability of bush fires. In the majority of cases, climate change becomes an issue for cities as a result of legislation at national level – for example, the establishment of national climate protection targets. In this way cities, too, are called on to strategize and implement policies.

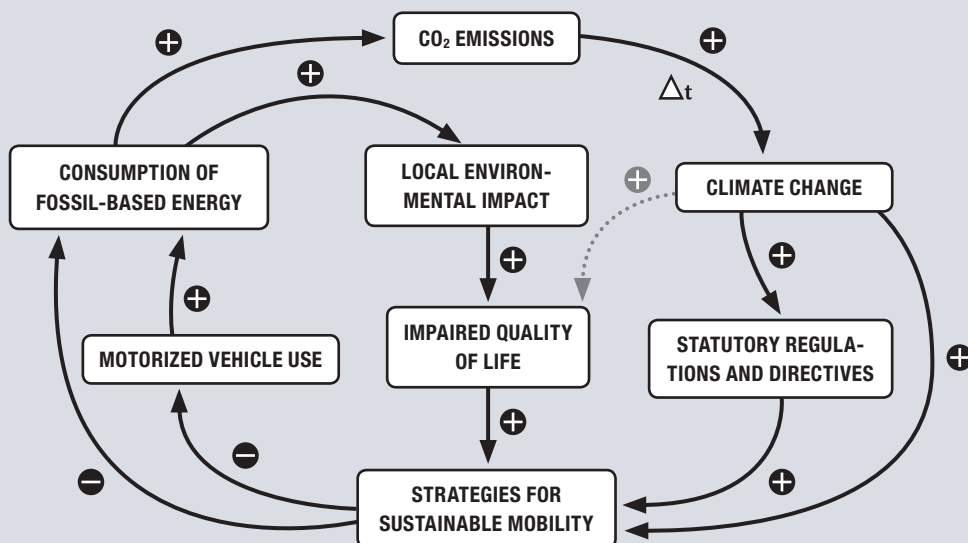
The third aspect of effects resulting from the climate change variable is directly connected with the mobility strategy of the cities. Thus some cities are committing themselves to realization of their own CO<sub>2</sub> reduction targets over and above national statutory requirements. A particularly ambitious example is Copenhagen, which has set itself the goal of being CO<sub>2</sub> neutral by the year 2025 – although not all the measures envisaged have the support of the Danish government. The cities of Melbourne and Munich are planning to make significant reductions in CO<sub>2</sub> emissions as compared with present day levels, in spite of – or perhaps because of – the prosperous development of their economies. These examples illustrate the fact that cities are shouldering responsibility for the global issue of climate change, and are themselves becoming active drivers of development.

**Wide range of strategies for sustainable mobility in cities**

The strategies observed by the study for the planning of more sustainable mobility are many and varied, and are customized to the different prevailing conditions in the city in question. Taken altogether, we can distinguish between the following approaches to sustainable mobility:

- » Strategies for the integration of urban development and transport planning (particularly marked in Ahmedabad, Los

**Figure 2: The environmental impact and climate change control loop**



Angeles, Melbourne, Munich and Singapore)  
 » Encouragement of local public transport (in all the cities investigated)  
 » Encouragement of walking and cycling (a major issue in Ahmedabad, Copenhagen, London, Melbourne and Munich)  
 » Technological approaches (e.g. Lyon’s introduction of Intelligent Transportation Systems, São Paulo’s emphasis on vehicle efficiency) together with traffic restrictions and financial schemes (such as road tolls in London, Singapore and Copenhagen, the environmental zone in Munich and restrictions on vehicle licensing in Shanghai).  
 The concrete measures adopted by the different cities have been described in greater detail in the individual city dossiers included in this publication.

**Successful implementation of strategies for transport and the city**

The control loops shown on the previous pages indicate what factors motivate cities to opt for sustainable mobility systems, and what points of leverage they adopt with a view to bringing about changes. Many cities formulate ambitious targets for the sustainable development of mobility. But a crucial question in this connection still remains open: how do they manage to actually realize transport strategies that offer the promise of success? What obstacles are found, and what factors favor the realization of such projects?

**Effective administration a foundation for the realization of strategies**

The “implementation of strategy” control loop (Fig. 3) below illustrates a scenario for the successful shaping of the process. Above all, effective administration is essential if the political intent of a city is to issue an appropriate strategy. Thus in the case of Ahmedabad, for example, the study shows that the well-organized local planning authority, with its long term development perspective, is principally responsible for what makes the city so very different from other cities in India. Planning organization is the foundation here for successful implementation of a transport strategy.

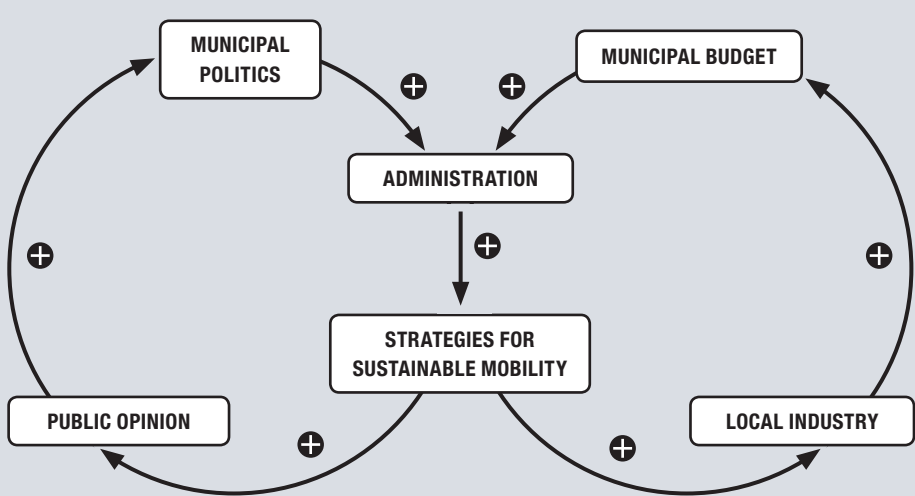
This strategic planning level must be protected against undue influence from changing political majorities and interest groups, if a long term strategy of urban and transport development is to be securely anchored in a city. The opposite can be clearly observed in the city of Bogotá, where priorities in transport planning are frequently transposed with the election of new democratic representatives. It is not an inessential consideration that the administration requires fundamental legitimacy if it is to be in a position to realize the schemes proposed. The case of Beirut shows that this is a stumbling block where the best strategies for transport improvement, and even previously financed projects, can come to grief.

**Consensus with industry and civic involvement**

As well as commanding political support and possessing the required technical competence, the administration of a city must of course also have access to sufficient long-term finance that is needed to implement transport developments. Because municipal budgets are largely dependent on income from local taxes, care must be taken in this control loop that the transport planning strategy shall not be developed in opposition to the industry of the region. On the contrary – it is important that the strategy in fact be developed in consensus with regional industry. This will help to create a commitment on the part of private industry to supporting urban development.

At the same time, the involvement of the citizens is indispensable in order to reinforce the process with the necessary political support. Last of all, it is down to every individual player to make whatever contribution may be possible, from his or her unique point of view, towards a form of urban and transport development that is socially, economically and ecologically capable of meeting the needs of the future. Successfully realized strategies for promoting sustainable mobility will enhance the attractiveness and appeal of cities, and encourage confidence in a city’s ability as a system to maintain itself. //

**Figure 3: The implementation of strategy control loop**



**Legend**

- System variable
- ➔ + Strengthening effect
- ➔ - Weakening effect
- ➔ Δt Time delayed effect
- ➔ + ⋯ Effect still relatively inconspicuous



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