CHAPTER 1

THE URBAN MOBILITY CHALLENGE

Hyper-mobility – the notion that more travel at faster speeds covering longer distances generates greater economic prosperity – seems to be a distinguishing feature of urban areas, where more than half of the world's population currently reside. By 2005, approximately 7.5 billion trips were made each day in cities worldwide.[1] In 2050, there may be three to four times as many passenger-kilometres travelled as in the year 2000, infrastructure and energy prices permitting.[2] Freight movement could also rise more than threefold during the same period.[3] Mobility flows have become a key dynamic of urbanization, with the associated infrastructure invariably constituting the backbone of urban form. Yet, despite the increasing level of urban mobility worldwide, access to places, activities and services has become increasingly difficult. Not only is it less convenient – in terms of time, cost and comfort – to access locations in cities, but the very process of moving around in cities generates a number of negative externalities. Accordingly, many of the world's cities face an unprecedented accessibility crisis, and are characterized by unsustainable mobility systems.

This report examines the state of urban mobility in different parts of the world. It explores the linkages between urban form and mobility systems, with a view to determining the essential conditions for promoting the sustainable movement of people and goods in urban settings. This introductory chapter reviews key issues and concerns of urban mobility and provides a framework for the content of the rest of the report. It outlines development trends impacting on urban mobility and then discusses urban mobility issues of the twenty-first century, including the challenges of fostering sustainable mobility.

Current urbanization patterns are causing unprecedented challenges to urban mobility systems, particularly in developing countries. While these areas accounted for less than 40 per cent of the global population growth in the early 1970s, this share has now increased to 86 per cent, and is projected to increase to more than 100 per cent within the next 15 years, as the world's rural population starts to contract. What is perhaps even more striking is the regional patterns of urban population growth. Figure 1.1 shows how an increasing share of this growth is projected to occur in Africa (19 per cent of total annual growth today, compared to 43 per cent in 2045), while the combined annual urban population increase in developed countries, China, Latin America and the Caribbean is projected to decrease from 46 per cent of the total today to 11 per cent in 2045. Thus, it is the world's poorest regions that will experience the greatest urban population increase. These are the regions that will face the greatest challenges in terms of coping with increasing demands for improved transport infrastructure. In fact, projections indicate that Africa will account for less than 5 per cent of the global investments in transport infrastructure during the next few decades (see Table 8.2).

Despite the increasing level of urban mobility worldwide, access to places, activities and services has become increasingly difficult

A major point of departure for this report is that sustainable mobility extends beyond technicalities of increasing speed and improving the effectiveness and efficiency of transport systems, to include demand-oriented measures (e.g. promoting walking and cycling, and reducing the need to travel), with the latter representing a pivotal factor in achieving relevant progress. It suggests that the prevailing challenges of urban mobility are consequences of the preoccupation with the means of mobility rather than its end – which is the ***realization of accessibility***.

This first chapter of the report starts with a discussion of the need to focus on access as the basis for urban mobility planning. It urges urban planners and decision-makers to move away from a 'transport bias' in urban mobility planning, towards a focus on the human right to equitable access to opportunities. This is followed by a brief analysis of global conditions and trends with respect to the urban movement of people and goods. The last part of the chapter provides a brief discussion of the social, environmental, economic and institutional dimensions of sustainability in urban mobility systems.

Sustainable mobility extends beyond technicalities of increasing speed and improving the effectiveness and efficiency of transport systems, to include demand-oriented measures

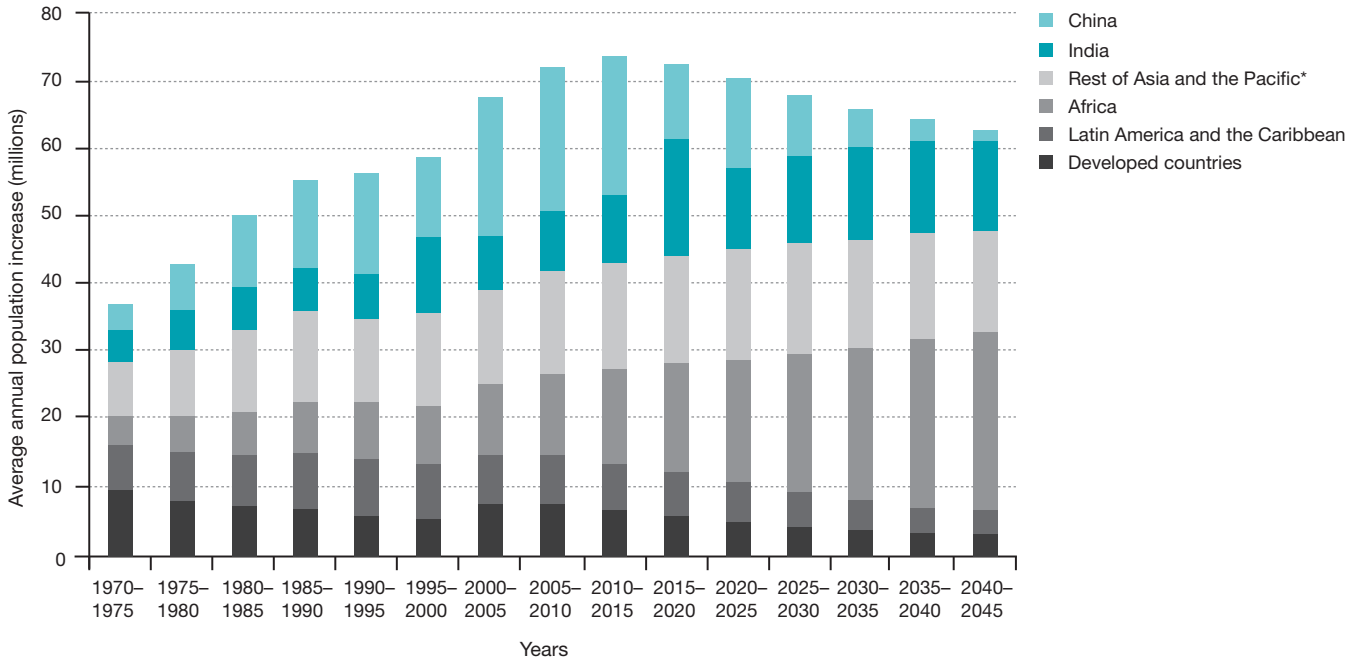


Figure 1.1

Average annual urban population increase, by region (1970–2045)

Note: *The 'rest of Asia and the Pacific' includes all countries in this region except: Australia, China, India, Israel, Japan and New Zealand.

Source: UN, 2012a.

ACCESSIBILITY IS AT THE CORE OF URBAN MOBILITY

This report calls for a paradigm shift in transport policy

In directing attention beyond transport and mobility, and giving prominence to the aspect of accessibility, this report calls for a paradigm shift in transport policy. This alternative approach emphasizes the need to reduce the global preoccupation on mobility enhancement and infrastructure expansion. 'This kind of transportation planning has been implicated in problems of environmental degradation and social isolation.' However, 'most fundamentally, a focus on mobility as a transportation-policy goal neglects the consensus view that the vast majority of trips are not taken for the sake of movement per se, but in order to reach destinations, or more broadly, to meet needs.'[4]

While the speed and efficiency of travel are important, more critical however, is the ease of reaching those destinations in terms of proximity, convenience as well as positive externalities

While the speed and efficiency of travel are important, more critical however, is the ease of reaching those destinations in terms of proximity, convenience as well as positive externalities. Transport and mobility as derived demands are treated as means for enabling people to access other people and places. Reducing the need for such demands and minimizing travel time also entails optimizing the value of being at the destination. 'Mobility is thus properly viewed as a means to the greater end of accessibility.' Nonetheless, it is not the only means to this end: 'accessibility can be enhanced through proximity', as well as 'electronic connectivity'.[5] As a result, enhancing accessibility places human and spatial dimensions at the core of sustainable mobility.

This focus on accessibility emphasizes the need for a holistic and integrated approach to sustainable urban mobility. It establishes a link between urban form (in terms of shape, structure, function as well as demographics) and urban transportation systems. Particular attention is given to the urban form's potential to support the increased proximity of places and functions, thus minimizing the need for extended movement. Land-use planning ensures the proximity and compactness of locations, and diversifies functions, so as to cater to a variety of needs.

The accessibility focus for sustainable mobility also entails paying due consideration to the built form of the city, particularly the optimization of urban density and the fostering of a sense of place. The combination of high-density settlements, strong sense of place and mixed-used functions not only minimize the need for extended movement, but also enhance economies of agglomeration and encourage non-motorized mobility. Furthermore, appropriate design and layout of streets and neighbourhoods, proper allowance for building configuration and density, and streamlined arrangement of arterial streets and roads, should also be taken into account. The backbone of accessibility-based urban mobility is public transport, particularly high-capacity public transport systems that are well integrated in a multi-nodal arrangement.

The bottom line for accessibility is not the hardware; rather it is the quality and efficiency of reaching destinations whose distances are reduced. Equally important is the affordability and inclusiveness in using the provided facilities. Sustainable mobility is thus determined by the degree to which the city as a whole is accessible to all its residents, including low-income earners, the elderly, the

young, the disabled, as well as women with children. Furthermore, transport interventions should be explicitly targeted to prevent negative outcomes. By permitting high levels of innovative services and giving priority to public and non-motorized transport, the need for private cars is reduced. Strategies to change public attitudes and encourage sustainable forms of mobility thus have a key role to play.

This alternative approach also brings to the fore the human rights dimension of sustainable mobility: 'the right to mobility is universal to all human beings, and is essential for the effective practical realisation of most other basic human rights'.[6] Beyond the policy implications of such a profound acknowledgement, the observation also has an important bearing on this report. Recognizing mobility as an entitlement – i.e. to access destinations, functions or services – implies a focus on people, and underscores the need to pay attention to the obstacles that prevent them from reaching destinations. Consequently, mobility is not only a matter of developing transport infrastructure and services, but also of overcoming the social, economic, political and physical constraints to movement. These constraints are influenced by factors such as: class, gender relations, poverty, physical disabilities, affordability, etc. Mobility is thus about granting access to opportunities and empowering people to fully exercise their human rights.

Thus, associating sustainable mobility with human rights takes it beyond the realm of functionality and economic justification. Instead it places the issue at the same level as other essential elements required for the full realization of human rights. Indeed, there is a general consensus that all the political, social, cultural and economic rights cannot be realized without the component of accessibility (and thus equitable mobility). The underlying premise – within a human rights perspective – is that mobility is not simply about reaching destinations; in the final analysis, it is about accessing opportunities. In this regard – and acknowledging that access is a tacit right that all human beings are entitled to – there is a need to ensure that any constraints to enjoying this fundamental entitlement are removed.

This report illustrates the contextual circumstances of urban mobility challenges, which have restricted access to cities by various social groups. Working towards sustainable mobility, renewed efforts within and between governments, are essential in ensuring that solutions are inclusive, participatory, and that all budgetary and resource implications meet the needs of all citizens.

THE TRANSPORT BIAS OF MOBILITY

In many cities of the world, the equation of 'mobility' with 'transportation' has fostered a tendency towards increasing motorization, and a propensity to expand the network of urban roads. Highway structures, including viaducts and flyovers, tunnels and foot-bridges have become standard features of the modern city and urban landscape. Encouraging this whole process is the excessive sectorization of transportation planning and management. Apart from causing a spiral of negative externalities, this approach further distorts the urban form and severely undermines the environmental, social and economic sustainability of cities. A major missing link which this report underscores is that sustainable mobility entails – and indeed requires – a closer connection between transport and land-use planning.

Mobility is not only a matter of developing transport infrastructure and services, but also of overcoming the social, economic, political and physical constraints to movement

Globally, the transport bias of urban mobility is demonstrated by the dominance of motorization, and particularly private motor vehicles as the preferred means of mobility. In 2010, there were more than 1 billion motor vehicles worldwide (excluding two-wheelers).[7] Based on data from 2005, nearly half of all urban trips were made by private motorized modes, a figure that continues to climb.[8] By 2010, developed countries had, on average, ten times as many motor vehicles (excluding two-wheelers) per capita as developing ones.[9]

In many cities of the world, the equation of 'mobility' with 'transportation' has fostered a tendency towards increasing motorization, and a propensity to expand the network of urban roads

Meteoric increases in the number of motor vehicles in developing countries mean that a redistribution of the 'global travel pie' is unfolding. By 2035, the number of light-duty motor vehicles – cars, sports utility vehicles (SUVs), light trucks and mini-vans – is projected to reach nearly 1.6 billion (Figure 1.2). The majority of these will be found in developing countries, especially China, India and other Asian countries. China alone is projected to have approximately 350 million private cars by 2035, nearly ten times as many as they had in 2008.[10] In some rapidly emerging economies such as India, the number of cars, trucks, and motorized two-wheelers on city streets is growing at a rate of more than 20 per cent annually.[11] Mexico City's car population is increasing faster than its human population – two new cars enter into circulation every time a child is born.[12] In India, private vehicle growth exceeds population gains by a factor of three.[13]

Globally, the transport bias of urban mobility is demonstrated by the dominance of . . . private motor vehicles

The extent of global motorization is a major cause for the increasing trends in energy use and carbon emissions worldwide. This has fuelled low-density development and sprawling urban forms, which have gradually increased the dependence on motorized transport. Furthermore, government policies in the United States (US) have contributed towards shaping car-dependent settlement patterns. Following the Second World War, the US government invested heavily in high-capacity highways and freeways and subsidized home mortgages, while most of its European counterparts channelled funds into development of urban rail systems, and social and market-rate housing near public transport stops.[14]

The extent of global motorization is a major cause for the increasing trends in energy use and carbon emissions worldwide

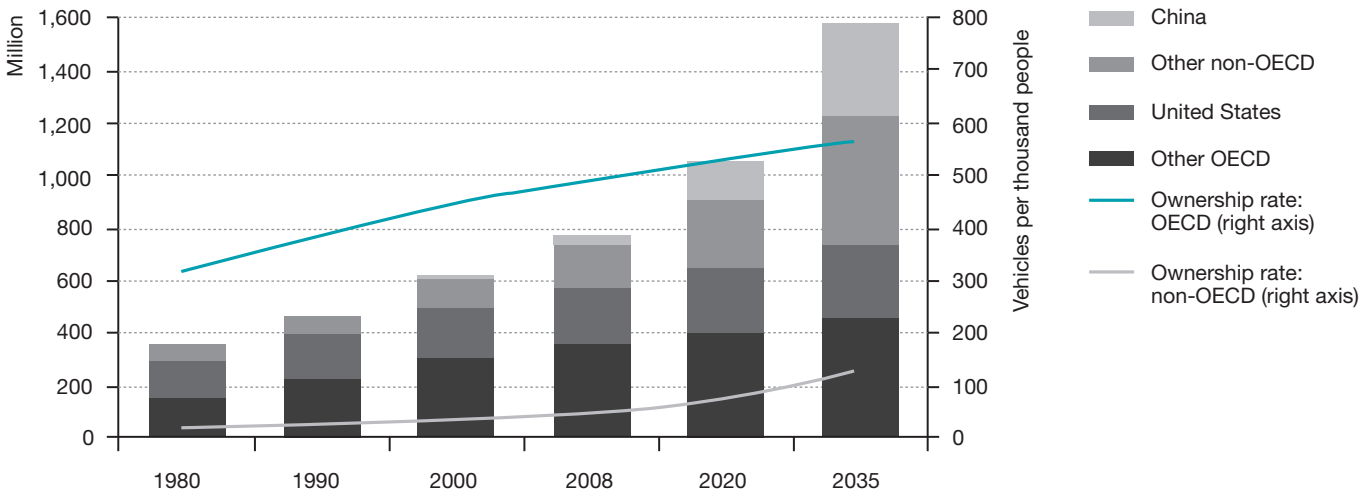


Figure 1.2

Passenger light-duty vehicle fleet and ownership rates by region, estimates and projections (1980–2035)

Source: IEA, 2010.

Factors such as shrinking city sizes and lifestyle changes are contributing to levelling off of car ownership and usage in developed countries

However, global motorization explains only part of the increasing energy use and greenhouse gas emissions worldwide. Other contributing factors relate to economic growth and rising incomes, especially in developing countries. From 2002 to 2007, China's per capita incomes almost doubled, and car ownership nearly tripled.[15] Car dependency is also served by a cultural and commercial system, which promotes the car as a symbol of status and personal freedom. Therefore, many developing countries perceive motorization as a condition for development. Conversely, evidence from an analysis of the relationship between car use and gross domestic product (GDP) per capita levels between 1970 and 2008 in eight developed countries shows that travel distances by cars may have peaked and that further increases in GDP per capita are unlikely to lead to increased travel distances.[16] Another recent study found that the annual increase in car use per capita in developed countries fell from 4.2 per cent in the 1960s, to 2.3 per cent in the 1990s, to 0.5 per cent from 2000 to 2010.[17] Saturation occurs partly because the amount of additional wealth that people choose to spend on travel is reduced when incomes reach a certain point.[18] In the US, for instance, households earning US$50,000 per year averaged more kilometres of vehicle travel in 2009 than households with twice as much annual income.[19] Moreover, factors such as shrinking city sizes and lifestyle changes are contributing to levelling off of car ownership and usage in developed countries. Furthermore, increasingly ageing populations further contribute to the stabilization of motorization rates.[20]

Another feature of the transport bias has been heavy investments in infrastructure

In many transitional countries, the shift to capitalist economies has been accompanied by an explosive growth in the number of freight vehicles, particularly trucks. From 1993 to 2009, truck traffic grew by 165 per cent in Poland, 213 per cent in Croatia, and 247 per cent in the Czech Republic.[21] Many trucks are old and are kept running for longer than the manufacturer's estimated lifetime, aggravating energy requirements, local environmental problems and carbon emissions. In Asia's rapidly industrializing cities, globalization and consumerism have given rise to a wide variety of freight-carrying modes – trucks, pickup vans, trailers, ropeways and railways that coexist with non-motorized modes such as cycle rickshaws, animal-powered carts and head-loading. For every truck in Delhi, India, there are about five feeder informal motorized goods vehicles, five non-motorized vehicles and five to ten head-loaders.[22]

Another feature of the transport bias has been heavy investments in infrastructure. In China, for example, the total length of urban roads more than doubled in the 13-year period between 1990 and 2003.[23] During the same period, the total area allocated to roads more than tripled.[24] Similarly, in Nairobi, Kenya, a total of 143 kilometres of urban roads was either newly constructed or rehabilitated for a total cost of US$537.8 million between 2008 and 2012.[25] This is a substantial amount for a young African economy, and was invested mainly to increase traffic flows and to enable faster mobility. In European countries, road infrastructure accounted for more than two-thirds of infrastructure investments in the transport sector between 1995 and 2010 (Figure 1.3).

The global expansion of mobility encompasses great innovations that have linked transportation with intelligent communication systems, transforming the way in which people organize their travel and communication considerably. The interplay of these systems has redefined the core of social interaction and urban life.[26] Accordingly, the evolving transport system of the last century is firmly rooted in a number of key components including motorized modes, oil industry, consumerist lifestyles, global procurement of oil, spatial and infrastructure planning, urban and street design and societal values that embrace mobility as part of what constitutes high quality of life standards.[27]

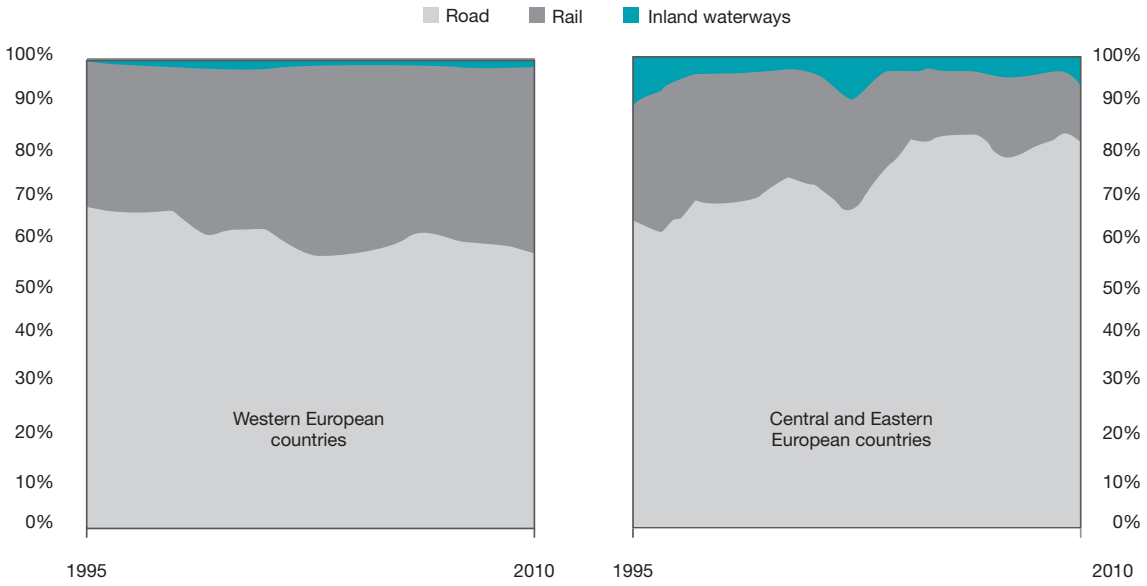


Figure 1.3
Transportation infrastructure investments by mode, Europe (1995–2010)
Source: Based on ITF, 2012.

SOME OF THE FORCES PROMOTING THE TRANSPORT BIAS

The rapid motorization of many of the world's cities is further compounded by expanding globalization, rising trade flows and incomes, leading to an enhanced demand for personal mobility. In many parts of the world, and particularly in developing countries, the private car has become a status symbol, depicting affluence and success in life. A prime example is the largely unregulated large-scale importation of used vehicles to developing countries. Evidence suggests that over 80 per cent of the vehicle stock in Peru was originally imported as used vehicles from the US or Japan.[28] Similarly, in many African countries, import-liberalization policies introduced during the 1990s made it easier and cheaper for households to buy second-hand vehicles imported from overseas.

A number of influential converging factors – such as economic policies that maintain fuel subsidies and planning practices that incentivize suburban residential developments, large malls and retail centres with extensive parking – all play a role in increasing motorization. The suburban development that supported the car culture allowed people to live in low-density residential areas that, although requiring a longer commute, were cheaper in terms of land prices. Some examples include the rise of new 'urban villages' such as Mahindra World City in Chennai (India), Gurgaon satellite town near Delhi (India) and Tlajomulco in the urban agglomeration of Guadalajara (Mexico). Similarly, in Metro Manila, the Philippines, new settlements described as 'exurbia' have emerged during the last two decades, including Bulacan, Pampanga, Rizal, Quezon, Cavite, Laguna and Batangas, all of which have been converted into gated communities and sustained by dependence on car-based transportation.[29] It should also be mentioned that between 1970 and 1990, Los Angeles, US, sprawled an additional 1020 square kilometres, during which time the population increased by 3.1 million residents.[30]

Such planning choices ensured that the car became an essential part of most people's transportation needs. In many instances, governments at all levels have also accelerated sprawl by building more roads to the urban fringe. For example, despite having only 10 per cent more freeway kilometres, Chicago has more than twice as many residents as Houston. The increasing trend to build more roads in Houston has encouraged development to shift to newer areas, with minimal bus service. This has reinforced the vicious circle of car dependency, where the new roads develop their own congestion problems. In 1999 alone, Houstonians lost 36 hours per person as a result of traffic congestion, more than commuters in all but three other American cities (Los Angeles, San Francisco and Dallas).[31]

The fragmentation and sectoralization of the management of urban development in many parts of the world is also reinforcing the dominance of the traditional 'transport bias' in urban mobility systems

The fragmentation and sectoralization of the management of urban development in many parts of the world is also reinforcing the dominance of the traditional 'transport bias' in urban mobility systems. Much has been documented about the proliferation of institutions in both developed and developing countries.[32] The poor linkage between land-use and transport planning has encouraged the tendency towards increased transport investments. The latter delivers immediate visible infrastructural outputs – with direct outcomes and impacts – benefiting a range of interests and having higher political pay-off, at least in the short run.

Beyond the strategic and economic dynamics within countries, global forces in much of the

second half of the twentieth century fostered a spatial pattern that provided a justification for the traditional transport bias of urban mobility systems. The 'Fordist' pattern of accumulation – which prevailed after the Second World War – promoted a distinct spatial urban landscape and system of governance, which was hierarchical and highly fragmented. The core–periphery delineation was replicated across all levels, with a set of cities acquiring the status of global centres for driving the system of globalization. At the city level, the centrality of manufacturing and trading was facilitated through spatial segregation and by maximizing the economies of urbanization.[33] Towards the last quarter of the twentieth century, greenfield land, suburban housing and urban infrastructural investments became the avenues for illicit wealth generation that caused the global financial crisis. In many parts of Europe, the US and Latin America there are swaths of real estate spread out in the suburban areas and exurban regions that were part of such schemes. The highways and boulevards leading to these sites further enhanced the motorization trend.[34]

The 'Fordist' pattern of accumulation – which prevailed after the Second World War – promoted a distinct spatial urban landscape and system of governance, which was hierarchical and highly fragmented

It has been estimated that between 1950 and 2005, raw material extraction (biomass, fossil-energy carriers, ores and industrial minerals, construction minerals) increased from 10 to 60 billion metric tonnes, excluding water and land resources.[35] The most significant increase came from the extraction of construction materials and ores/industrial minerals. In 1900, biomass accounted for almost 75 per cent of total material use; however its share had dropped to only one-third by 2005, indicating that the global economy has gradually reduced its dependence on renewable materials (i.e. biomass) and increased its dependence on finite mineral resources, which cannot be replaced.[36] While demand was increasing, for a long time prices were also declining, thus encouraging increased dependence on the finite resources, including, in this case, motorization as the dominant mode of mobility.

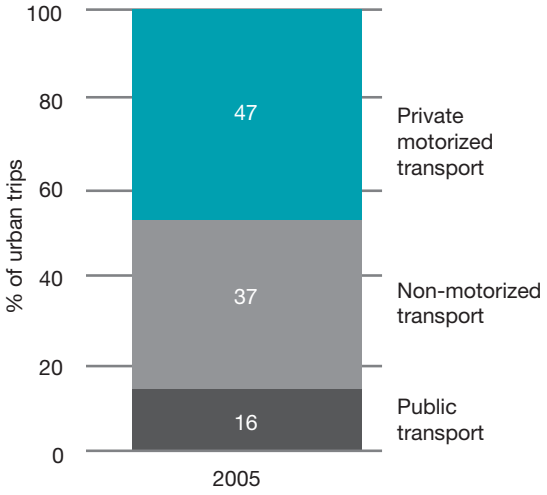


Figure 1.4

Modal splits of urban trips (2005)

Source: Pourbaix, 2012.

TRENDS AND CONDITIONS IN TRANSPORT-ORIENTED MOBILITY SYSTEMS

This section provides an overview of global trends and conditions, with transport as the main focus of improving mobility and enabling access. It examines formal and informal modes of transport, including walking and cycling. Furthermore, the implications of rapid motorization on economic performance and social equity in cities are discussed. An overview of the alternative to transport-oriented mobility will be provided in chapters 5 to 8; specifically, the components of an accessibility-based sustainable mobility.

Varying but declining dominance of public transport

In 2005, 16 per cent of all trips in urban areas worldwide were by some form of public transport (i.e. formal, institutionally recognized services, such as buses and rail-based public transport) (Figure 1.4). The role of public transport in individual cities varies widely, accounting for 45 per cent of urban trips in some cities of Eastern Europe and Asia, 10 to 20 per cent in much of Western Europe and Latin America, and less than 5 per cent in North America and Sub-Saharan Africa.[37] In 2001, more than half of all mechanized trips (i.e. excluding walking) in Hong Kong and Eastern European cities (such as Bucharest, Romania; Moscow, Russia; and Warsaw, Poland) were by public transport, compared to an average of about 25 per cent for Western European cities, and less than 10 per cent in the high-income, car-oriented cities of Dubai (United Arab Emirates), Melbourne (Australia) and Chicago (US). However even within Western Europe, the role of public transport varies sharply, capturing more than a third of all mechanized trips in rail-served cities such as Berlin (Germany), Helsinki (Finland), Lisbon (Portugal) and Vienna (Austria) and fewer than 10 per cent of mechanized trips in European cities such as Ghent (Belgium), Lille (France) and Glasgow (UK).[38]

In cities of developing countries, the role of public transport varies markedly, particularly among African cities. Only a handful of Sub-Saharan Africa cities (such as Addis Ababa, Ethiopia; Abidjan, Côte d'Ivoire; and Ouagadougou, Burkina Faso) have reasonably well-developed, institutionalized public bus services that account for 25 to 35 per cent of all motorized trips.[39] Most other parts of Sub-Saharan Africa are characterized by private paratransit and informal operators, with local buses serving only a small fraction of trips, if any. In fact, in most of Sub-Saharan Africa, and poorer parts of South and Southeast Asia, government-sponsored public transport services are either inadequate or non-existent.[40] However, in North Africa, many cities have well-

developed public transport systems, including formal buses and informal shared taxis, and rail-based modes. In Egypt for example, Cairo's metro has been operational and expanding since 1987. Similarly, a modern light rail system in Tunis, Tunisia, has been successfully operating since the early 1990s. In Cairo, public transport (formal and informal) accounts for more than 75 per cent of daily motorized trips.[41]

In South-Eastern Asia, conventional 50-passenger buses are the workhorse of the public transport networks of most cities. In Bangkok, Thailand, 50 per cent of passenger trips are by bus, rising to 75 per cent during peak hours.[42] In Eastern Asia, buses serve slightly larger shares of mechanized trips than metros in Taipei, China (14.4 versus 12.9 per cent) and Shanghai, China (12.9 per cent versus 5.7 per cent); whereas metros are more dominant in Hong Kong, China (35.5 per cent of mechanized trips); Seoul, Republic of Korea (34.8 per cent); and greater Tokyo, Japan (57 per cent).[43] Throughout Latin America, buses dominate, even in rail-served cities such as São Paulo (Brazil), Santiago (Chile) and Buenos Aires (Argentina). As noted in Chapter 3, the world's most extensive bus rapid transit (BRT) networks are currently found in Latin America, where a total of 18 cities currently have some form of BRT system.[44]

Despite growing concerns over energy supplies, climate change and access for the poor, public transport's modal share of trips is expected to decline over the next decade in all world regions. If recent trends continue, the number of trips made by public transport will increase by around 30 per cent between 2005 and 2025, an estimate that is far less than the 80 per cent growth in trips by private motorized vehicles over the same period.[45] In recent years, public transport's downward spiral has been most pronounced in Eastern Europe. The transition to capitalist economies has brought with it substantial public transport services cuts and disinvestments – the same kind of vicious cycle that has marginalized public transport in more advanced economies.

The declining market share of trips served by public transport is cause for concern since they are the most efficient forms of motorized mobility, particularly for low-income earners. The low and decreasing role of public transport renders it even more complicated to foster an effective linkage between land-use and transport planning. More effort is devoted to control and regulation of the private and informal sector operators whose main motivation is increasing profit.

Informality

Worldwide, the informal transport sector provides much-needed (and much-valued) mobility, particularly for the poor. The lack of affordable and accessible public transport systems in developing countries has led to the proliferation of informal operators, such as private microbus and minibus services. These modes help fill service gaps but can also worsen traffic congestion and air quality. In some settings, informal carriers are the only forms of public transport available. In India, for example, only about 100 of the more than 5000 cities and towns have formal public transport systems. Accordingly, conventional public transport has been replaced by more ubiquitous but less affordable paratransit such as motorcycle taxis, rickshaws, *jeepneys* and *jitneys*.[46]

Since cities in poorer countries seldom have the institutional and financial capacity to increase and sustain public transport systems – and private firms typically lack the capital and incentive to provide comprehensive transport systems – small, private and informal systems prevail. Like many market-based solutions, they provide a service that must be filled, but not without compromises to the environment and lack of service to those who are marginalized or live in less profit-rich locations.[47] These are called informal public transport or paratransit, because they serve the public and are essentially providing a public good.

Public transport's modal share of trips is expected to decline over the next decade in all world regions

The declining market share of . . . public transport is cause for concern since [it is] the most efficient [form] of motorized mobility, particularly for low-income earners

Non-motorized transport

Non-motorized transportation is often the dominant mode of urban mobility when public transport services are poor and incomes are low. In 2005, about 37 per cent of urban trips worldwide were made by foot or bicycle, which are the two major modes of urban non-motorized transport (Figure 1.4). For very short trips, walking is the main mode of transport in both developed and developing countries. The modal share of walking can be very high. In African cities, walking accounts for 30–35 per cent of all trips. In Dakar (Senegal) and Douala (Cameroon) the share is much higher, at over 60 per cent.[48] Evidence shows that non-motorized transport is an important component in poorer and smaller cities, capturing as much as 90 per cent of all person-trips.[49] Furthermore, in densely packed urban centres, non-motorized transport provides access to places that motorized modes cannot reach, and is often the fastest means of getting around. In South Asia's densest, most congested cities, more than half of all passenger and goods trips are by foot, bicycles or rickshaw.[50]

Walking is often ***the*** only form of transport for the very poor, when weather and topography permit. Many people in developing countries are 'captive walkers', meaning that they walk because they cannot afford an alternative. For them, having a well-connected and safe pedestrian environment is critical to meeting their daily needs.[51] As the least costly form of mobility, walking allows the very poor to reduce their daily expenses, and thus has significant poverty impacts. The most visible indicator

Worldwide, the informal transport sector provides much-needed (and much-valued) mobility, particularly for the poor

Non-motorized transportation is often the dominant mode of urban mobility when public transport services are poor and incomes are low

Many people in developing countries are 'captive walkers', meaning that they walk because they cannot afford an alternative

of poverty in many cities, particularly in developing countries, is the presence of slums and squatter communities. Spatially, the field of movement in these slums is very restricted, with such limitations constraining income and employment opportunities for the urban poor. As a result, the affected population is forced to restrict their travel to essential trips related to work, education and shopping.

In pursuit of transport policies reflecting sustainable mobility, the promotion of walking and cycling is very important. The bicycle is by far the most energy-effective means of passenger transport and offers a relatively inexpensive means of improving the accessibility of poor people. In developed countries, bicycles are commonly used as a feeder mode to public transport services. A well-known example is the Netherlands, where bicycles are used for more than 40 per cent of trips in some cities.[52] Historically, bicycles are particularly important in Chinese cities.[53] Non-motorized transport shares are highest in smaller Chinese cities, in the ranges of 70 to 80 per cent.[54]

Traffic congestion is an undesirable by-product of widespread mobility in cities worldwide, and a major factor in restricting access in cities

Bicycles serve relatively small shares of person trips in many major African cities, however, cycling is popular in smaller and secondary cities.[55] Dangerous and crowded roads, and the absence of protected lanes, have discouraged cycling in many African cities.[56] Still, bicycles can be an important source of economic livelihoods, as evidenced in Kisumu, Kenya, where bicycle-taxis (*bodaboda*) ferry commuters across town at half the price of a *matatu* ride or in Bukoba, Tanzania, where some residents carry passengers or haul goods on their *esekidos* to supplement their wages.[57]

In Bangladesh, India, Pakistan and Sri Lanka, bicycles serve as 'mass transport' in the form of cycle rickshaws, serving mostly women and children. In Dhaka, Bangladesh, around 40 per cent of school trips are by rickshaw.[58] Also, rickshaw pulling often offers an entry point into the labour market for unskilled rural migrants to the cities of South Asia. In Dhaka, 20 per cent of the population, or 2.5 million people, rely on rickshaw pulling for their livelihood, directly or indirectly.[59] This notwithstanding, rickshaws are banned from Dhaka's main roads for slowing motorized traffic, and the view of some public officials is that they detract from the city's image as a modern metropolis.

Traffic congestion is a major indication of the disjuncture between land-use planning and transport systems

Traffic congestion

Traffic congestion is an undesirable by-product of widespread mobility in cities worldwide, and a major factor in restricting access in cities. A recent global study of 20 major cities revealed that traffic congestion levels markedly worsened between 2007 and 2010.[60] Motorists in Moscow, Russia, reported an average daily delay of two and a half hours.[61] With a 24 per cent annual growth rate in the number of registered motor vehicles, traffic conditions are deteriorating most rapidly in Beijing, China.[62] In mid-2010, an 'epic' 100-kilometre, 9-day traffic jam was reported in China's Heibei Province – along a freeway that feeds into Beijing.[63] The growing popularity of helicopters is partly a response to the rising congestion problem in Latin American cities such as Mexico City (Mexico), Santiago (Chile) and São Paulo (Brazil).[64]

Congestion has widespread impacts on the urban quality of life, consumption of fossil fuels, air pollution and economic growth and prosperity. World Bank studies from the 1990s estimated that traffic congestion lowered the GDP of cities by some 3–6 per cent, with the higher value applying mostly to rapidly growing cities (e.g. places with busy port traffic, reliance on just-in-time inventorying and manufacturing, and other time-sensitive activities).[65] Time losses from traffic congestion are estimated to cost the equivalent of 2 per cent of GDP in Europe and 2–5 per cent in Asia.[66] The hidden external costs of traffic congestion in Metro Manila (the Philippines), Dakar (Senegal) and Abidjan (Côte d'Ivoire) have been pegged at nearly 5 per cent of those cities' GDPs.[67] Such costs not only exact a burden on the present generation, but also commit future generations to long-term debts, which can eventually slow global growth.

Traffic congestion is a major indication of the disjuncture between land-use planning and transport systems. It not only exposes the limitation of a transport-oriented bias to mobility, but it also reveals the efficiency of land-use systems in a given city. Limited road capacity, in the face of growing demand for motorized mobility, partly explains deteriorating traffic conditions. In general, the percentage of the total land area devoted to streets[68] in developing-country cities is considerably lower than in the cities of developed countries.[69] In India, the annual growth rate in traffic during the 1990s was around 5 per cent in Mumbai, 7 per cent in Chennai and 10 per cent in Delhi. However, none of these cities have expanded their road supply by even 1 per cent annually.[70]

In most developing-country cities, the inadequate quantity and structure of road infrastructure is often associated with rapid population growth. For instance, Nairobi, Kenya – a city with approximately 3.5 million inhabitants – has a shortage of collector streets and major thoroughfares to serve traffic demands, compared to developed-country cities of a similar size. The city's arterials are mostly radial and the lack of circumferential roads force-funnels many peripheral trips through the central business district, with widespread effects on traffic flows.[71] Central Bangkok, Thailand, has a fishbone street pattern, featuring narrow local streets that channel most motorized trips onto oversaturated thoroughfares. The absence of many collector-distributor

roads has contributed to inefficient patterns of traffic flows.[72]

Congested road infrastructure in developing countries, is further exacerbated by forms of encroachment onto the carriageway, or excessive provisions for local access. The most common forms of encroachment are caused by street hawkers and informal transport operators, which combine to block the smooth flow of traffic. In Sub-Saharan Africa, street vendors occupy around a third of road space in crowded cities.[73] A further congestion-related problem is the absence of traffic management in many developing countries. Phnom Penh, Cambodia – a city of nearly 2 million inhabitants – has 864 kilometres of roads, but just 36 traffic signals.[74] In Lebanon, congestion is made worse by inadequate road signage, a failure to manage limited supplies of parking and a culture of aggressive, unruly driving.[75]

Freight movements can also contribute to congestion. In most poor countries, the goods-movement sector lacks basic infrastructure, such as freight terminals, warehousing, parking and staging areas, freight-forwarding centres and other logistical needs. Few developing-country cities specifically plan for freight movements, thus a haphazard, dysfunctional arrangement of urban logistics is often the rule. An example is Lomé, Togo, where the absence of a bypass road around the city causes trucks to leave the port and head directly into the core of the city.[76] Heavy trucks contribute to (and suffer from) poor-quality roads – because wear-and-tear exponentially rises with the dead-axle weight of a vehicle (e.g. one heavily loaded truck can inflict as much road damage as 10,000 passing cars).[77] Consequently, road decay worsens congestion and increases the operating costs.

SUSTAINABILITY CHALLENGES OF URBAN MOBILITY

Building on the seminal Brundtland Report of 1987,[78] a sustainable urban mobility system is one that satisfies current mobility needs of cities without compromising the ability of future generations to meet their own needs.[79] The idea of sustainability in urban mobility has moved beyond a focus on ecology and the natural environment to also include social, economic and institutional dimensions. Furthermore, it has moved beyond the preoccupation with movement and flows within urban settings to looking at enhancing proximity in space. A holistic and integrated approach to urban land-use and transport planning and investment is needed if urban areas are to become socially, environmentally and economically sustainable.

Accordingly, four pillars of sustainability are considered in the review and analysis of urban mobility in this report; namely the ***social***, ***environmental***, ***economic*** and ***institutional*** dimensions. These are not separate or isolated, as there are important synergies and co-benefits. For instance, pursuing economic sustainability can also confer environmental benefits, such as instituting taxation policies that also conserve energy. In the early 2000s, Japan phased in reduced ownership taxes on fuel-efficient vehicles by 25 to 50 per cent and imposed higher charges on large-engine vehicles, including vehicles that were more than ten years of age.[80] While regulatory and fiscal instruments can be used to promote urban sustainability, as mentioned earlier, the most effective mechanism is the effective utilization of the planning process.

Few developing-country cities specifically plan for freight movements, thus a haphazard, dysfunctional arrangement of urban logistics is often the rule

Integration of land-use and transport planning

As pointed out in the preceding sections, the ultimate goal of mobility is the capacity to traverse urban space. Relationships between locations, as well as impediments and conveniences between them, are critical in determining the ease and convenience of accessing them. The development of a sustainable transportation system starts with the organization of urban space. The main objective is to reduce the need for mobility by reducing the number of trips and length of travel distance. As a result, urban density is optimized and functionality of urban places enhanced. Sustainability entails a shift of emphasis from transportation to people and places. In operational terms, it still calls for improvement in transportation systems and even advocates for innovations in other modes of communication, while giving emphasis to streamlining space utilization in its relationship with people.

The development of a sustainable transportation system starts with the organization of urban space. The main objective is to reduce the need for mobility by reducing the number of trips and length of travel distance

Neglecting the connection between land use and mobility has created the urban sprawl evidenced in most cities today. During the period since the Second World War, the urban land area in developed countries has doubled, while it has grown by a factor of five in developing countries.[81] From 1995 to 2005, 85 per cent of the 78 largest cities in developed countries experienced a faster growth in their suburban areas than their urban cores.[82] In Europe, studies of land-cover changes reveal that cities in Estonia, Latvia, Croatia, Slovakia, Poland, Hungary and Bulgaria are experiencing the most sprawl.[83]

Neglecting the connection between land use and mobility has created the urban sprawl evidenced in most cities today

In many developing countries, urban sprawl comprises of two main contrasting types of development in the same city. The first is characterized by large peri-urban areas with informal and illegal patterns of land use. This is combined with a lack of infrastructure, public facilities and basic services, and is often accompanied by little or no public transport and by inadequate access roads. The other is a form

of 'suburban sprawl' in which residential zones for high- and middle-income groups and highly valued commercial and retail complexes are well connected for private motorized vehicles rather than by public transport.

The urban form – emerging either from a haphazard process of locating settlements and activities, or from strategically planned intervention – makes a big difference in mobility systems

In the absence of regulatory controls and far-sighted urban planning, the pace of sprawl will most likely accelerate. Spread-out patterns of growth not only increase the dependence on the private car, but also consume farmland and open space, threaten estuaries and natural habitats, and burden municipal treasuries with the high costs of expanding urban infrastructure and services.

Land-use planning also entails paying attention to the multiple scales of urban mobility. It traverses from the regional and metropolitan levels, through the city linkages and down to the neighbourhood and street level. The urban form – emerging either from a haphazard process of locating settlements and activities, or from strategically planned intervention – makes a big difference in mobility systems. Similarly, the design of streets and neighbourhood blocks promotes a sense of place and determines the accessibility of such neighbourhoods. The very physical configuration of the street may either encourage or discourage walking and bicycling. Key considerations for sustainable mobility include the pattern of street arrangement, the length of blocks and the relationship of buildings to pathways, stations and central places.

The percentage of urban land allocated to streets is one of the factors that influence the level of connectivity within urban areas. Another factor is how appropriately the streets are laid out to cater for the various mobility modes used within the city. A study found that a large number of cities in developing countries have low percentages of urban land allocated to streets; for example, 6 per cent in Bangui (Central African Republic), 6.1 per cent in Yerevan (Armenia), 11.1 per cent in Accra (Ghana) and 12.3 per cent in Ouagadougou (Burkina Faso).[84] This is despite the fact that these cities are experiencing rapid rates of urbanization, a phenomenon which is poised to impact on their mobility and hence levels of accessibility. The same study found that cities in developed countries had significantly higher percentages of land allocated to streets, the average rate being 29 per cent.[85] The linkages between urban land allocated to streets and the planning of accessible cities are discussed further in Chapter 5.

Land-use and transport planning have been called for and to some extent addressed since the 1970s. Nevertheless, a persisting challenge remains the application of integrated land-use and transport planning in practice, as well as dealing with existing transport infrastructure and land-use patterns that cannot always be easily changed, particularly in old middle-size or larger cities. Accordingly, research needs to be directed to such pragmatic issues. It is in making such critical decisions with respect to places and people that the pillars and principles of sustainability can be operationalized.

Social dimensions

Urban transport is socially sustainable when mobility benefits are equally and fairly distributed, with few if any inequalities in access to transport infrastructure and services based on income, social and physical differences (including gender, ethnicity, age or disabilities). Social sustainability is rooted in the principle of accessibility wherein equality exists among all groups in terms of access to basic goods, services and activities – such as work, education, medical care, shopping, socializing – and to enable people to participate in civic life. It recognizes the critical importance of mobility and accessibility in fully enjoying human rights.

Urban transport is socially sustainable when mobility benefits are equally and fairly distributed, with few if any inequalities in access to transport infrastructure and services based on income, social and physical differences

As earlier indicated, one important aspect of accessibility is the affordability of transport modes. Affordable transportation means that people, including those with low incomes, can afford access to basic services and activities (healthcare, shopping, school, work and social activities) without budget strain. For many urban dwellers in developing countries, the availability of reliable and affordable public transport services can be the difference between being integrated into the economic and social life of a city or not. Unaffordable mobility prevents the urban poor from breaking out of the shackles of inter-generational poverty. Furthermore, exorbitant expenditures on public transport take money away from other essential needs, such as food, health care, education and shelter.

Where governments are unable to construct and subsidize public transport services, travellers often have to pay large, sometimes exorbitant, shares of their incomes to private, often informal, paratransit operators. Setting prices at whatever amount the market will bear, informal operators invariably charge more per kilometre travelled than publicly supported ones. In the poor informal housing settlements on the outskirts of Mexico City – beyond the service jurisdiction of the city's metro system – residents sometimes take two to three separate *collectivos* (shared-ride taxis and microbuses) to reach a metro terminal that provides low-cost connections to the city and job opportunities.[86] Travel can consume 25 per cent or more of daily wages.[87] Time costs can also be exorbitant: 20 per cent of workers in Mexico City spend more than three hours travelling to and from work each day.[88] Studies show that taking a series of informal minibuses and motorized tricycles to and from work can cost 20 to 25 per cent of daily wages in rapidly growing cities such as Delhi (India), Buenos Aires (Argentina) and Manila (the Philippines), and as much as 30 per cent in Nairobi (Kenya), Pretoria (South Africa) and Dar es Salaam (Tanzania).[89]

Social sustainability also has gender, age and disability dimensions. A majority of women in many parts of the world are less likely to have access to individual means of transport, be they cars or bikes: in Bamako (Mali), 87 per cent of women versus 57 per cent of men walk for virtually all trips; in Chennai (India), 83 versus 63 per cent; and in Chengdu (China), 59 versus 39 per cent.[90] In addition, women often create complex trip chains – e.g. taking children to school followed by shopping and other errands – so as to make traditional fixed-route bus services impractical, forcing them to rely on more expensive door-to-door services (whether by private car in developed countries or by rickshaws, bicycles, motorcycle taxis in poorer countries). Other transport-related burdens faced by women are: lack of pavements and safe crosswalks; sexual harassment in overcrowded buses; and personal security threats from unlighted streets and public transport stops.

In many developed countries, the elderly and disabled have statutory rights that guarantee equal and full accessibility to public facilities like pavements, rail-based public transport and buses, such as legislated in the Americans with Disabilities Act in the US. Few developing countries provide such protection, or design streets and transport infrastructure, to enable access for the elderly and disabled. Young people constitute a group at further risk of transport disadvantage. In Sub-Saharan Africa, school-age children and youth often walk long distances, along congested corridors, to reach schools, exposing them to accident risks and all sorts of hardships and deprivations.[91]

Safety is a crucial aspect of a high-quality urban mobility system. It includes the safety of infrastructures and of the rolling stock, as well as citizen's safety in reaching the system (e.g. walking from home to the bus stop). Road accidents have become a global pandemic. Each year, around 1.2 million people are killed and a further 20–50 million injured in road traffic accidents worldwide.[92] Road crashes result in economic costs of up to 3 per cent of GDP.[93] The vast majority of road traffic accident deaths (more than 90 per cent) occur in developing countries,[94] despite these countries accounting for only 33 per cent of the world's motor vehicles.[95] Road safety levels differ sharply between developing and developed countries and the gap is widening. In the latter part of the twentieth century, road accident fatalities fell in developed countries but rose sharply elsewhere – e.g. 300 per cent increase from 1980 to 2000 in Africa.[96] The World Health Organization (WHO) predicts road traffic deaths in low-income countries will more than double between 2005 and 2030, while they are expected to fall in wealthier nations.[97] Rapid urbanization, greater reliance on motorized transport to move people and goods, growing income disparities and lax enforcement of traffic laws, are among the factors that account for rising road traffic crashes and fatalities.[98]

Many of the environmental challenges in the urban transport sector are rooted in its reliance on the non-renewable fossil fuel to propel private motor vehicles

Environmental dimensions

Many of the environmental challenges in the urban transport sector are rooted in its reliance on the non-renewable fossil fuel to propel private motor vehicles. The share of the world's oil consumption accounted for by transportation increased from 45.4 per cent in 1973 to 61.5 per cent in 2010, with the sector expected to continue to sustain the increasing demands for oil (Figure 1.5). World reserves of conventional oil exceed what has been used to date, but with rapid motorization, many observers believe it is unlikely that this energy source will last beyond the mid-century mark.[99] As demand for transportation fuels rises, prices increase.[100] End consumers have to cope with a rise in prices of petrol and diesel fuels for motorized travel.

Rising greenhouse gas emissions and global temperatures underscore the urgency of weaning the transport sector from its dependency on oil and automobility

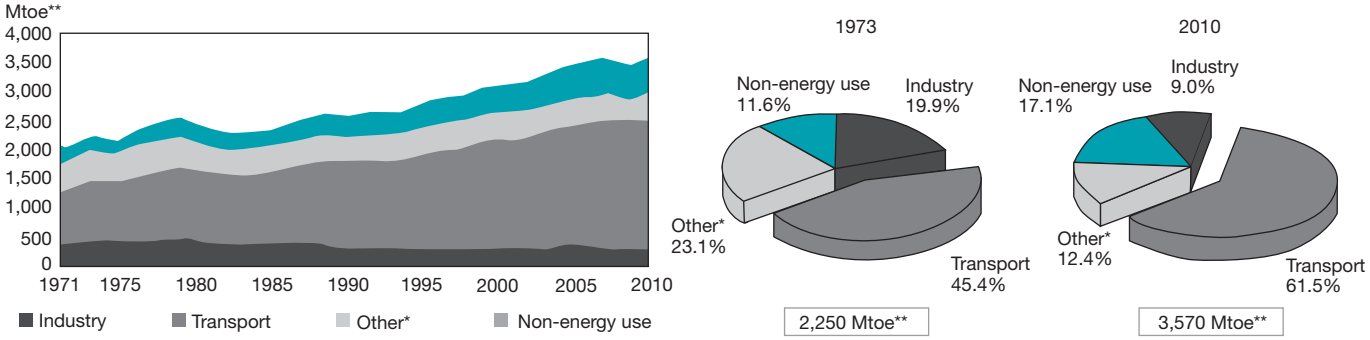
Rising greenhouse gas emissions and global temperatures underscore the urgency of weaning the transport sector from its dependency on oil and automobility. Globally, 13 per cent of all greenhouse gas emissions come from the transport sector and three-quarters of this is caused by road transport.[101] By 2050, global carbon dioxide (CO_2) emissions from motor vehicle use could be three times as large as they were in 2010.[102] The transport sector's footprint, however, varies widely across

Figure 1.5

World oil consumption by sector

Notes: *: Includes agriculture, commercial and public services, residential, and non-specified other; **: million tonnes of oil equivalent.

Source: IEA, 2012b.



cities, accounting for 11 per cent of greenhouse gas emissions in Shanghai and Beijing (China), 20 per cent in New York City (US) and London (UK), 35 per cent in Rio de Janeiro (Brazil) and Mexico City, 45 per cent in Houston and Atlanta (US), and 60 per cent in São Paulo (Brazil).[103] Levels of energy consumption for transport vary significantly even among cities with similar GDPs, depending on urban form, financing and taxation policies, and the quality and affordability of alternative modes. As urban form gets more compact and dense, CO_2 emissions from transport decline. For instance, Austria's urban areas are more than four times denser than Australia's, and generate only 60 per cent of the amount of CO_2 per capita that Australia's urban areas generate.[104] Mode share is also an important factor: energy consumption levels decrease as the share of trips on public transport and non-motorized modes increases. In 2007, per capita energy consumption in the transport sector was more than three times higher in the US than in Japan and Germany.[105] This is partly explained by the modal share in these countries; in Japan, for example, 40 per cent of all urban motorized trips are made by public transport, compared to only 4 per cent in the US.[106] Indeed, greenhouse gas emissions per passenger of public transport (bus, rail and trams) is about one-twelfth that of the car.[107]

The urban transport sector is economically sustainable when resources are efficiently used and distributed to maximize the benefits and minimize the external costs of mobility

The urban transport sector is also a major source of air and noise pollution, with serious public health impacts. Long-term repeated exposure to high levels of ozone and particulates can diminish lung functions and trigger asthma and other respiratory illnesses.

Economic dimensions

The urban transport sector is economically sustainable when resources are efficiently used and distributed to maximize the benefits and minimize the external costs of mobility. This safeguards investments in and maintenance of transport infrastructure and assets. The translation of investments into walkways, bikeways, railways and roadways creates jobs, encourages business expansion and increases economic output. Increasingly, the litmus test of cost-effective transport infrastructure is whether the project is 'bankable' – capable of attracting loans and private investors.

Translating visions and plans for sustainable urban mobility depends on the presence of supportive and nurturing governance, as well as sound institutional and regulatory structures

Urban transport infrastructure is expensive. It can consume a large share of the public budget in emerging economies. In Ho Chi Minh City, Viet Nam, a US$5 billion subway is currently under construction and in Jakarta, Indonesia, a new ring road is expected to cost a similar amount.[108] Crafting reliable and equitable funding programmes for transport infrastructure that reward efficient and sustainable behaviour remains a formidable challenge.

Public transport often faces serious fiscal challenges. Almost universally, public transport systems rely on public subsidies. Cities that finance the costs of public transport operations can face severe fiscal burdens. Experiences show that in many cases operating subsidies are used to finance higher worker compensation and benefit packages, without commensurate improvements in public transport services.[109] In developing countries, cities without adequate fiscal resources end up relying on informal sector operators to fill the gaps. Lower-income cities that borrow funds in foreign currency to build transport infrastructure also face the risk of having to pay back loans with devalued local currency.

Another fiscal challenge cities face worldwide is paying for ongoing road maintenance and expansion. Taxes on fuels are usually the primary means of funding road infrastructure. However, increased fuel economy, combined with travel saturation, has reduced such revenues in developed countries. For example, fuel economy improvements in France that reduce CO_2 emissions of the average diesel car from 160 to 130 grams per kilometre, have at the same time dramatically reduced government revenues.[110] This has called for a shift to kilometre-based taxes, something which is now possible given technological advances such as global positioning systems (GPS) and radio frequency identification devices.

Institutional and governance dimensions

Translating visions and plans for sustainable urban mobility depends on the presence of supportive and nurturing governance, as well as sound institutional and regulatory structures. The ability to manage and respond to escalating demands for urban travel – i.e. to plan, predict, foresee, preserve rights-of-way, build, operate and maintain facilities – is often limited in developing countries. The lack of adequate institutional capacity – whether in the form of a trained and educated civil-service talent pool, or a transparent and largely corruption-free procurement process for providing transport infrastructure and services – poses immense challenges in advancing sustainable urban transport.

Institutional fragmentation undermines the ability to coordinate urban transportation services.[111] Separating urban sector functions into different organizations – each with its own boards, staff, budgets and by-laws – often translates into unisectoral actions and missed opportunities, such as the failure to site new housing projects near BRT stations. Multiple public transport service providers can mean uncoordinated bus and rail schedules, multiple fare payments (which increase user costs) and facility designs that are poorly integrated. In addition, bloated bureaucracies are notorious for waste and delays in the deployment of urban transport projects.

Another institutional void is the minimal involvement of citizens and broad-based community interests in the planning and design of urban trans-

port facilities and services. Decision-making needs to be more inclusive, transparent and democratic. Decentralizing decision-making ensures greater voice and legitimacy to non-governmental organizations (NGOs) and civil society.

Lack of capacity for strategic planning and coordination is a major problem in many cities of the world, particularly in developing countries. Institutions rarely have sufficient time or funds to expand transport infrastructure fast enough to accommodate travel demands. The ability to advance sustainable mobility programmes or introduce efficient pricing schemes presumes something that rarely exists – a well-managed transport authority that sets clear and measurable objectives and rigorously appraises the expenditure of funds in a transparent and accountable manner.[112] Often, the mechanisms for coordinated multi-sectoral planning are either weak or absent. Understanding the linkage between land-use and urban transport planning is important for the multiplicity of actors, levels and institutions involved.

CONCLUDING REMARKS AND STRUCTURE OF THE REPORT

This chapter has provided an overview of the implications of the unfolding events of rapid urbanization, hyper-mobility and the health and climate hazards associated with car-dependent cities – all of which are inextricably linked. During the past 100 years, the structural foundations for today's urban mobility systems were derived from developmental circumstances, when resources were cheap, urban populations were low and modes of communication were limited. However, while the global trends discussed in this chapter pose uncertainties and risks, there are also unprecedented opportunities for advancing sustainable urban mobility.

In order to become more sustainable, cities should be more compact, encourage mixed land use and prioritize sustainable modes of mobility such as public and non-motorized transport. Furthermore, urban mobility systems need to be inclusive, providing mobility opportunities for all. Improved urban planning will be critical toward designing and retrofitting cities to better accommodate sustainable modes. Compact, mixed-use cities with high-quality pedestrian and cycling infrastructure, combined with policy measures that charge the true social cost of using private motorized vehicles, offer the best hope of increasing the modal shares of sustainable modes of mobility.

A paradigm shift is also needed in how transport users think about transportation and its relationship to the city. Of particular significance is the need for government institutions and planning processes to emphasize accessibility over mobility. Furthermore, policies to encourage sustainable urban mobility should take into account social, environmental, economic as well as institutional dimensions of sustainability. This calls for a more holistic and inclusive framework for the planning, design and provision of urban mobility systems and services. Accordingly, translating visions and plans for sustainable urban transport futures depends on the presence of a supportive governance and regulatory structure.

Lack of capacity for strategic planning and coordination is a major problem in many cities of the world, particularly in developing countries

The following nine chapters of this report analyse global trends, conditions and policy responses with respect to urban mobility. They investigate the connection between transport and various aspects of urban form, and suggest measures towards the promotion of sustainable mobility. The discussion in the next three chapters focuses on trends and conditions with respect to the two main categories of urban transport: passenger transport in Chapters 2 and 3 and goods transport in Chapter 4. The evidence presented in these chapters shows that, urban transport policy and planning challenges in developing countries and countries with economies in transition differ significantly from those found in the urban areas of developed countries; as do the resources and institutional frameworks at the disposal of policy-makers and planners. Notwithstanding, the best choice of policy responses will also vary within each region and even within countries.

In order to become more sustainable, cities should be more compact, encourage mixed land use and prioritize sustainable modes of mobility such as public and non-motorized transport

Chapter 5 serves as the anchor of this report, exposing the basis of the prevailing anomalies and opportunities for corrective intervention. It looks at the interrelation between mobility and the spatial structure of the city, while stressing the need to reconfigure urban form to enhance accessibility. The importance of integrating transport and land-use planning is emphasized while the underlying principles of sustainable development provide the normative framework for change. The policy implications discussed in Chapter 5 lay the ground for the subsequent discussion in Chapters 6 to 9, which focus on the social, environmental, economic and institutional dimensions of sustainable mobility. Chapter 10 concludes the report and presents policy recommendations on how to enhance the sustainability of urban mobility systems.

Translating visions and plans for sustainable urban transport futures depends on the presence of a supportive governance and regulatory structure

NOTES

1 Pourbaix, 2012.
2 ITF, 2011.
3 ITF, 2011.
4 SMART, 2008, p2.
5 SMART, 2008, p2.
6 CEMR, 2007, Preamble.
7 See Table 2.3.
8 Pourbaix, 2011.
9 See Table 2.3.
10 IEA, 2010.
11 Pan, 2011; Tiwari, 2011.
12 Jirón, 2011.
13 Jain, 2011; World Bank, 2011b.
14 Altshuler, 1979; Pucher and Lefevre, 1996.
15 Kutzbach, 2010.
16 See Figure 2.12 (and Figure 8.1).
17 Newman and Kenworthy, 2011b.
18 Millard-Ball and Schipper, 2010; ITF, 2011.
19 ITF, 2011.
20 ITF, 2011
21 Suchorzewski, 2011.
22 Jain, 2011.
23 From 95,000 in 1990 to 208,000 kilometres in 2003 (Wenhua, 2005).
24 From 892 million square metres in 1990 to 3156.5 million square metres in 2003 (Wenhua, 2005).
25 New African, 2012.
26 Sheller and Urry, 2003
27 Urry, 2004.
28 Davis and Kahn, 2011.
29 Alcazaren, 2004.
30 Population Connection, 2009.
31 Lewyn, 2003.
32 In varying degrees an observation made by the Governor of New York resonates for many cities in the world. He said that 'the simple truth is that New York's State and local governments have become too big, too expensive, and too ineffective. In fact, there now are more than 1,000 State agencies – an ever proliferating tangle of boards, commissions, councils, departments, divisions, offices, task forces and public authorities. Likewise, New York's antiquated system of local government today consists of more than 10,500 governmental entities. This oversized and inefficient bureaucracy is a luxury taxpayers cannot afford' (Cuomo, 2010, p61).
33 See, for example, Sassen, 2007; Hall, 1997.
34 Baily et al, 2008; Barth et al, 2009.
35 Swilling, 2012.
36 Swilling, 2012.
37 Pourbaix, 2012.
38 UITP, 2006.
39 Pirie, 2011; Godard, 2011b.
40 Cervero, 2000; Hidalgo and Carrigan, 2008.
41 Huzayyin, 2004.
42 Chin, 2011.
43 Pan et al, 2011.
44 Wright, 2011.
45 Pourbaix, 2012.
46 Jain, 2011.
47 Cervero, 2000.
48 UITP, 2011b.
49 Pendakur, 2011.
50 Jain, 2011.
51 Montgomery and Roberts, 2008.
52 Pucher and Buehler, 2008.
53 Pendakur, 2011.
54 Pucher et al, 2007.
55 Pendakur, 2011.
56 Pedankur, 2005.
57 Pirie, 2011.
58 Jain, 2011.
59 Jain, 2011.
60 IBM Corporation, 2010.
61 IBM Corporation, 2010.
62 IBM Corporation, 2010.
63 Guo and Fang, 2010.
64 Jirón, 2011.
65 Kessides, 1993; World Bank, 1994; World Bank, 2002a.
66 London European Partnership for Transport, 2011.
67 Chin, 2011; UITP, 2011b.
68 For the purpose of this report, the term 'streets' includes all categories of road infrastructure, including arterial highways, primary and secondary roads, as well as bikepaths and footpaths.
69 Vasconcellos, 2001; see also UN-Habitat, 2013b.
70 Pucher et al, 2005.
71 Gonzales et al, 2009.
72 Cervero, 1991.
73 Pirie, 2011; Pendakur, 2005.
74 Chin, 2011.
75 El-Geneidy et al, 2011.
76 Godard, 2011b.
77 Papagiannakis and Masad, 2008.
78 WCED, 1987.
79 Black, 1996; Satoh and Law, 2009.
80 Hirota and Poot, 2005.
81 OECD, 2010a.
82 OECD, 2010b.
83 Hirt and Stanilov, 2009.
84 UN-Habitat, 2013b; see also Vasconcellos, 2001.
85 UN-Habitat, 2013b; see also Vasconcellos, 2001.
86 Cervero, 1998.
87 Vasconcellos, 2001; Kaltheier, 2002.
88 World Bank, 2009b.
89 Ferrarazzo and Arauz, 2000; Kaltheier, 2002; Carruthers et al, 2005.
90 Peters, 2011.
91 McMillan, 2011.
92 WHO, 2009.
93 World Bank, 2008a.
94 Aeron-Thomas and Jacobs, 2011.
95 See Table 2.3.
96 World Bank, 2008a.
97 WHO, 2008.
98 Aeron-Thomas and Jacobs, 2011.
99 Black, 2010.
100 See Figure 7.1.
101 UN-Habitat, 2011.
102 ITF, 2011.
103 IEA, 2011d; UN-Habitat, 2011.
104 OECD, 2010a.
105 OECD, 2009.
106 Korea Transport Institute, 2010.
107 Jain, 2011, citing Goodall, 2007.
108 Chin, 2011.
109 Pickrell, 1985; World Bank, 2002a.
110 Van Dender and Crist, 2011.
111 Dimitriou, 2011.
112 Huzzayin, 2005.