

THE EARTHSCAN READER ON

# World Transport Policy & Practice



EDITED BY

JOHN WHITELEGG and GARY HAQ

# **The Earthscan Reader on World Transport Policy and Practice**

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Edited by

**John Whitelegg**

and

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# Acknowledgements

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World transport policy and practice has never before experienced such a volatile mixture of doom-ridden forecasts, radical ideas and an overwhelming tide of political and popular opinion that things simply cannot continue in the same way as they have done in the past. The need to address transport issues has never been so great as it is now at the beginning of the 21st century. Increasing car ownership, concentration of populations, and economic activity in large urban centres cause a number of problems for urban city dwellers. Air and noise pollution, vibration, community severance, road traffic accidents, loss of mobility for the elderly and the young, disease, psychological impairment, hazardous waste, polluted run-off and enormous financial costs are issues that need to be resolved in the development of future regional transport policy and practice.

This *Earthscan Reader on World Transport Policy and Practice* includes a large number of topics, regions, places, innovative solutions and policy suggestions, but inevitably there are still gaps. Our objective has been to create a base-line, set down markers and to accelerate a process of debate, comparison, challenge, diffusion and awareness of the simplicity of sustainable transport scenarios. Transport is still in the vanguard of non-sustainability and this book is about breaking the logjam and setting transport on course towards a socially just and inclusive destination worldwide.

We owe a great deal to the many individuals from around the world who have contributed to this reader. In particular we would like to thank the seven authors who prepared an overview of transport policy and problems in their region. We thank Enrique Peñalosa for sharing with us his own personal experiences of implementing sustainable transport practices in Bogotá, Colombia, in the Foreword to this book.

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The mission of SEI is to support decision-making and induce change towards sustainable development around the world by providing integrative knowledge that

bridges science and policy in the field of environment and development. We believe this reader makes a important contribution to the SEI mission.

*John Whitelegg and Gary Haq*  
Stockholm Environment Institute  
York, UK

# List of Acronyms and Abbreviations

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ABS	Australian Bureau of Statistics
ADB	Asian Development Bank
ARIJ	Applied Research Institute, Jerusalem
ASSIST	African Programme of Advisory, Support, Information Services and Training (ILO)
BIDS	Bangladesh Institute of Development Studies
BMA	Bangkok Metropolitan Administration
BSOM	benzene soluble organic matter
BTE	Bureau of Transport Economics (Australia)
BUND	Bund für Umwelt und Naturschutz Deutschland (Friends of the Earth, Germany)
CAFE	corporate average fuel efficiency (USA)
CBD	central business district
CBS	Central Bureau for Statistics (The Netherlands)
CDM	Clean Development Mechanism
CEC	Commission of the European Communities
CEE	central and eastern Europe
CHI	Canadian Highways International
CMA	census metropolitan area
CMC	Calcutta Municipal Corporation
CO	carbon monoxide
CO <sub>2</sub>	carbon dioxide
COE	certificate of entitlement (Singapore)
CPRE	Council for the Protection of Rural England
CSO	car-sharing organization
dB(A)	decibel
DoT	Department of Transport (UK)
DPWH	Department of Public Works and Highways (Metro Manila)
DTLR	Department of Transport, Local Government and the Regions (UK)
EBPP	Energy Best Practice Programme (UK)
ECMT	European Conference of Ministers of Transport
EEA	European Environment Agency
EIB	European Investment Bank
ERTA	Expressway and Rapid Transit Authority (Bangkok)
ESD	ecologically sustainable development
EU	European Union

EVS	Einkommens und Verbrauchsstichprobe (income and consumption sampling, Germany)
GDP	gross domestic product
GHG	greenhouse gas
GIS	geographical information systems
GNP	gross national product
GOB	government of Bangladesh
GTZ	Gesellschaft für Technische Zusammenarbeit
ha	hectare
HC	hydrocarbon
HGV	heavy goods vehicle
HIV	human immunodeficiency virus
HOV	high occupancy vehicle
ICBS	Israeli Census Bureau of Statistics
IEA	International Energy Agency
IFPRI	International Food Policy Research Institute
IHE	International Institute for Infrastructural, Hydraulic and Environmental Engineering
IIEC	International Institute for Energy Conservation
ILO	International Labour Organization
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IPPUC	Curitiba Institute for Urban Planning and Research (Brazil)
ISTEA	Inter-modal Surface Transportation Efficiency Act (USA)
ITDP	Institute for Transportation and Development Policy (USA)
JICA	Japanese International Cooperation Agency
KIP	Kampung Improvement Programme (Indonesia)
kph	kilometres per hour
MIST	Maidstone Integrated Sustainable Transport (UK)
MIT	Massachusetts Institute of Technology
mt/c	megatonnes of carbon
N <sub>2</sub> O	nitrous oxide
NAO	National Audit Office
NGO	non-governmental organization
NMT	non-motorized transport
OFIS	Ozone Fine Structure model
NO <sub>2</sub>	nitrogen dioxide
NO <sub>x</sub>	nitrogen oxides
NTPT	National Transport Planning Taskforce (Australia)
O <sub>3</sub>	ozone
OECD	Organisation for Economic Co-operation and Development
PAH	polynuclear aromatic hydrocarbons
PCPME	per capita per month expenditure
pkm	passenger kilometres
PM	particulate matter
PPG 13	Planning Policy Guidance Note 13: Transport (UK)



PQLI	physical quality of life index
R&D	research and development
RTA	road traffic accident
RSN	Road Safety Network (Kenya)
SEI	Stockholm Environment Institute
SO <sub>2</sub>	sulphur dioxide
SOV	single occupancy vehicle
SO <sub>x</sub>	sulphur oxides
SPM	suspended particulate matter
SRT	State Railway of Thailand
SSA	site-specific advice
SSATP	Sub-Saharan African Transport Programme
SUV	sports utility vehicle
TDRI	Thailand Development Research Institute
tkm	tonne(s) per kilometre
TRL	Transport Research Laboratory (UK)
TSP	total suspended particulate(s)
UAQAM	Urban Air Quality Assessment Model
UN	United Nations
UNCHS	United Nations Centre for Human Settlements (now UN-Habitat)
UNCSD	United Nations Commission for Sustainable Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the South Pacific
UN-Habitat	United Nations Human Settlements Programme (formerly UNCHS)
UPI	Umwelt und Prognose Institut
USAID	United States Agency for International Development
US DOT	United States Department of Transportation
VAT	valued added tax
vkm	vehicle kilometres
vkt	vehicle kilometres travelled
VOCs	volatile organic compounds
WA	Western Australia
WB	World Bank
WBCSD	World Business Council for Sustainable Development
WHO	World Health Organization
WRI	World Resources Institute
WTO	World Trade Organization

# Foreword

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The papers presented in this book are valuable contributions to the analysis of one of the most difficult development challenges: urban transport. For a variety of reasons the book is of particular importance for cities in developing countries. While sanitation, health, education and employment tend to improve through economic development, transport problems tend to worsen. There are also no successful development models to be followed, particularly models within the developing countries' investment possibilities; and even if resources were unlimited it is questionable whether the developed countries' model should be followed.

Over the next 25 years the urban population in developing countries is expected to increase to 2 billion. While cities in the developed world may have more than 650 cars per 1000 inhabitants, developing country counterparts have fewer than 200 and, in most cases, fewer than 100. Unchecked, the combined effect of population growth and motorization can create severe quality of life problems. Moreover, almost by definition, in developing-country cities only a minority of the population use private cars for daily transport. Road transport absorbs massive public investments for the building and maintenance of road infrastructure; creates congestion which affects the mobility of the bus-riding majority; causes air and noise pollution; and results in road arteries, primarily for private vehicle users, becoming obstacles to lower income pedestrians.

Urban transport is a political rather than a technical issue. The technical aspects are simple. The difficult decisions relate to who is going to benefit from the models adopted. Do we dare create a transport model different from that in the so-called advanced world cities? Do we dare create a transport system that gives priority to the needs of the poor majority rather than the automobile-owning minority? Are we trying to find the most efficient, economical way to move a city's population, as cleanly and comfortably as possible? Or are we just trying to minimize traffic jams for the upper classes?

Thousands of kilometres of road can be found in many developing-country cities. If private cars are kept off the streets during peak hours every day, it is easy to structure an efficient, low cost bus system which could transport all citizens with speed and dignity. The technical solution is simple. The challenge, of course, is political: to remove cars and non-system buses from the streets. The removal of private cars from the streets sounds radical and strange. Over the last 80 years we have been developing cities for increased car mobility rather than for pedestrians' and children's happiness and safety. Just for a moment, let's imagine a city as follows:

Car use is banned during six peak hours every weekday. During those hours everybody uses public transport or bicycles for his or her mobility. All citizens, regardless of their

socio-economic standing, meet as equals on trains, buses or bicycles. There is little air and noise pollution. There is a park only a short distance from any home. Large tree-lined pedestrian avenues cross the city in all directions, and there are as many exclusively pedestrian streets as roads for vehicles. There is as much space for pedestrians as road space.

At first it is difficult to think differently because we are subject to the most pernicious kind of imperialism: self-imposed cultural imperialism.

Developing-country cities are different in aspects such as:

- income inequality;
- poverty;
- illegal housing development with a lack of basic infrastructure and public space;
- scarcity of public funds;
- density;
- climate; and
- low motorization – only a minority of households own a car, and an even smaller minority of people use cars for daily mobility.

For the aforementioned reasons, and because developed-country cities have failed in many ways, we must create a different city model for a different way of living.

We cannot talk about urban transport until we know what kind of city we want. If we want a city for people, and particularly for children, road infrastructure must be limited and car use restricted. Any street with motor vehicles is dangerous to children, but more so if it is a multi-lane artery or a high velocity road. Such arteries become fences that separate segments of the city and isolate people, thus dehumanizing the city.

The unsustainable nature of car-based transport is illustrated by the fact that the problem becomes worse as societies grow richer. Unless car use is restricted severely, society will be worse instead of better, resulting in:

- more traffic jams;
- more noise;
- more air pollution;
- more health problems;
- more low density city expansion and suburban development; and
- more expenditure on road building and maintenance that benefits primarily the car-owning upper middle classes. In a poor city such as Delhi, road building and improvement in order to relieve congestion are very regressive. Scarce government resources are taken up, leaving the needs of the poor untended.

All the national constitutions in the world, and of course the Universal Declaration of Human Rights, are based upon the equality of all citizens before the law and the state. If all citizens are equal, the public good or the good of the majority must prevail as the guiding criteria for governmental decisions. When only a minority use motor vehicles for their mobility, as is the case in developing-country cities, is there any doubt that the

public good would be served if private car use were severely restricted, such as not allowing it during peak hours?

Trying to solve traffic problems by building more extensive roads is like trying to put out a fire with petrol. In the USA, time lost due to traffic congestion increases every year, despite enormous highways. A new highway stimulates new development around it, particularly at its extremes, and thus generates its own traffic. Let us imagine a new ten-lane highway from the centre of a city to any location on its outskirts. Immediately after it is completed, or even before, new housing projects, shopping malls and factories are built around the new road and in the countryside near its extreme. The new road stimulates urban expansion, lower densities and longer trips. Ten years after the road is built, traffic jams are just as bad as ever, but now average trips are longer. For traffic considerations, doubling the number of vehicles is the same as having the original number of vehicles travelling twice the distance.

If car use is not restricted there will be traffic congestion. This will cause a greater pressure to invest in more and larger road infrastructure, which in turn stimulates low density suburban development. Low density US-type suburban development, or any kind of development that reduces population densities, creates the following problems:

- extensive and inefficient land use;
- difficulties in providing low cost, high frequency public transport;
- exclusion of non-drivers, such as the poor, children and the elderly, who depend on public transport, walking and cycling; and
- deserted, lonely streets.

Do we want to create a city for children and the elderly, and therefore for every other human being, or a city for automobiles? The important questions are not about engineering, but about ways of living.

Most developing-country cities have relatively high population densities, not as a result of good planning but because of a lack of cars and resources to build extensive roads. Such high density is an asset. It provides people with their main source of enjoyment – being close to other people – and it facilitates high quality, low cost public transport. High density implies relatively short distances and, thus, low transport costs. More importantly, it means that a high frequency public transit system can work efficiently. Developing-country cities should, at all costs, try to avoid suburban development, which will probably be sought by some higher income citizens.

In October 2000, the people of Bogotá in Colombia voted in a referendum to exclude cars from the streets every weekday between 6am and 9am and 4.30pm and 7.30pm from January 2015 onwards. Constitutional interpretations later demanded a higher voter turnout for the referendum to provide a legal mandate. Nevertheless, it proved that it is possible for people to conceive a different, perhaps better, city for themselves, and other ways of organizing city life and city transport. Beyond the environmental advantages of a city that moves basically without cars, the economic implications are significant. The private savings on garages, vehicle depreciation and fuel can be spent on other goods.

A city may follow a more timid approach and simply structure an excellent bus-based transit system on exclusive lanes without restricting automobile use. But why

should the rest of society tolerate that car-using minority which generates noise, air pollution and other costs to society?

The public savings on road construction and maintenance, traffic police, and hospital costs of people injured in traffic accidents can be used not only to provide excellent public transport, but also for schools, libraries and parks, to mention but a few things. Of course, people could always own cars to use at off-peak hours or to travel to the countryside at weekends; or they could simply rent them when necessary. Free from the pressure to find ever more room for cars, authorities can concentrate on more citizen-orientated endeavours such as creating more public pedestrian space.

A city such as that proposed here would become a world example of sustainability, quality of life, social justice and social integration. In addition, it would become extremely attractive to highly qualified professionals and investors. If in the past capital investments were attracted by subsidies of different sorts, in the new knowledge economy perhaps the most crucial competitive factor is urban quality of life.

Let us imagine that 1000 wealthy individuals in a large city decide to use private helicopters for their daily transport. Helicopters are very loud. Why should the rest of society forego its silence when the atmosphere belongs to all of us? Why should the majority suffer noise pollution for the benefit of the minority? Yet the car-using minority generates heavier costs for the majority than helicopters would, because cars destroy the common silence, pollute the air and require extremely costly road space and infrastructure, which absorb public funds that could be used to meet the needs of the poor. The most important point illustrated by the helicopter example is that while it would be possible for a few hundred people to use helicopters for their transport, it would be impossible for everyone in a city to do so. The same happens with private cars. While only an upper middle class minority use cars, despite enormous costs and injustice, the system works. But it would not be possible for every citizen to use a private car for his or her mobility, or there would be gridlock and high velocity roads would destroy the city's human qualities and structure.

During my term as mayor of Bogotá we implemented several schemes to reduce car use. Through a tag number system, 40 per cent of all cars had to be off the streets during peak hours for two days every week. This reduced daily travel times by about 58 minutes and lowered pollution levels. Petrol consumption went down by 10.3 per cent.

Bogotá has had a tradition of *Ciclovía*, the closing of main arteries to motor vehicle traffic for seven hours every Sunday so that people can use the roads for cycling, jogging and meeting up. The total amount of road space closed to traffic has doubled: now 120km of main city arteries are closed to motor vehicles. Approximately 2 million people come out every weekend in a marvellous community-building celebration. A new tradition was started, closing the same 120km on a night close to Christmas, allowing citizens to come out and see the Christmas lights decorating the city. Almost half the city's population, nearly 3 million people of all ages and social standings, take advantage of this and the exercise creates a sense of belonging and community.

Another collective adventure was the car-free day. One Thursday, the city (of nearly 7 million inhabitants) went to work leaving all cars at home. The experiment ran smoothly, with 98 per cent of people going to school and work as usual by bus, bicycle or taxi. People enjoyed the adventure. Afterwards, in the referendum of October 2000, approximately 64 per cent of voters approved establishing a car-free day on the first

Thursday of February every year. Polls taken the day after the 2002 car-free day found that 82.7 per cent of the population supported the concept. The importance of the exercise, beyond transportation or the environment, has to do with social integration, as people of all socio-economic conditions meet as equals on their bicycles or on public transport.

More than 300km of protected bicycle paths were built, and usage is increasing steadily. Moreover, bike paths are a symbol of respect for human dignity and of a more egalitarian city, as are high quality pavements. Both show that a city is for *its people* and not for the motor vehicles of its upper classes, as it is so often the case. Bicycles can also provide very efficient feeder systems to mass transit.

All that I have described here was important in order to change the attitude of our people towards their city. However, what dramatically improved the quality of life and gave citizens confidence in a better future was the implementation of a bus-based transit system. Starting from scratch and inspired by the system in Curitiba, Brazil, we were able to design and build the infrastructure, identify the private partners that would operate it, remove the thousands of buses that previously used the roads, and had the system in operation within three years. Today the incipient system, which we called TransMilenio, accounts for more than 540,000 daily trips, and the main line carries more than 50,000 passengers per hour, more than many rail systems. TransMilenio users are saving an average of 223 hours annually; 9 per cent of them used to go to work by car.

Although the system is bus-based, its operation is similar to that of a rail-based system. Articulated buses operate on exclusive bus-ways, using one or two lanes in each direction. Passengers board the buses only at stations. They buy a ticket when they enter the station or in stores outside. In this way, when the bus arrives and opens its two doors simultaneously with the station doors, a hundred passengers can exit and a hundred may enter in seconds. The bus floor is at the same level as that of the station, making entering and exiting the bus a rapid and safe operation, as well as making the buses fully accessible to the disabled.

TransMilenio uses articulated 165-passenger buses with clean diesel engines that comply with Euro II vehicle emission standards. Contractual arrangements guarantee that the buses are clean and well lit, and are replaced before they are in less than perfect shape. Drivers wear uniforms and have to complete training courses. While some buses stop at all stations, others operate express routes with limited stops. Passengers can change from a local to an express bus on the same ticket; they can also change from a bus on one route to another on a different route without any extra cost. Although feeder buses do not use exclusive bus lanes and share streets with the rest of the traffic, they do give people in marginal neighbourhoods access to the system. TransMilenio buses run in the middle of the road and not on the sides, so that vehicles entering and exiting driveways or delivery vehicles do not become obstacles. Also, in this way, just one station is required in each place instead of one in each direction. Passengers access most stations through disabled-friendly pedestrian bridges. Although TransMilenio is the fastest way to move around in Bogotá today, it could be made even faster at a low cost by building underpasses for the buses at busy intersections. This can easily be done at any time in the future. There is nothing technically complex about TransMilenio. The issue is whether a city is ready to remove cars from several lanes of its main arteries

in order to assign them exclusively to articulated buses. If the common good is to prevail over private interests, it is very clear that this must be done.

The main advantage of TransMilenio over rail systems is its low cost. Our public investments were US\$5 million per kilometre. Even though this cost is high, we chose not only to build a transit artery but also to dramatically improve the public pedestrian space around it with sidewalks, plazas and trees to enhance the city's quality of life and to attract more users to the system. Operating costs are also low. While almost all rail systems in the world require operational subsidies at US\$0.40 per passenger, TransMilenio's private operators not only cover their costs but also make a profit. With problems of malnutrition, lack of clean water, sewage, schools, parks and paved roads, developing-country cities cannot afford costly rail transit systems. There are too many critical investments required for the poor that would be left unattended if expensive rail solutions were chosen. Often the political attraction of rail projects, or the financial facilities offered by the vendor countries, lead local or national governments to acquire sophisticated subway systems. But at US\$100 million or more per kilometre, and given that they are usually unable to generate sufficient revenues to cover even their operating costs, such systems are an enormous financial drain for developing-country cities. With resources of that magnitude, basic water and sewage infrastructure, schools, housing projects or huge parks to improve the quality of life of many generations could be created.

Often the upper classes in developing countries insist on rail systems because they oppose bus systems' use of space, which they would rather have for their private cars. Generally they prefer subways, not because they use them, but simply because they imagine that by putting the poor underground traffic problems will go away. Rail- or bus-based surface transport systems are more humane. It is much nicer to travel while looking at buildings, people, trees and stores than to travel underground like a rodent. When rail systems are chosen in developing-country cities, limited funds only permit building a few lines, which rarely serve more than 15 per cent of daily trips. Buses serve the rest of public transport trips. In all developing-country cities the majority of public transport is bus-based.

The local government of Bogotá built TransMilenio's infrastructure for passenger transport users, just as roads are built for private car use. We have established a 20 per cent tax surcharge on all petrol sold in the city, and half of it, approximately US\$40 million annually, goes in to TransMilenio infrastructure investment. If the national government contributed approximately US\$100 million annually in this way, then we could have TransMilenio moving more than 80 per cent of the city's population by 2015. The buses are privately owned and operated, but it is not the case that just anyone can be an operator. Only owners of the former buses that operated chaotically can participate in the bids to own and operate the new buses. All the contractors are private: large bus operators, feeder bus operators, ticketing system operators and the financial fiduciary who handles the money. The public company receives just 5 per cent of the system's income. Bus operators share in the system's income according to the number of kilometres their buses have travelled.

We have been building cities more for the use of the motor vehicle than for pedestrians. It is now time to give more importance to public pedestrian space than to motor vehicle roads. As mayor, I was almost impeached for getting cars off the pavements

(where they were often parked), sometimes carving special bays for them out of the pavement. At first it may appear that pavements are a frivolous issue in a developing country; but the privations of low income people are not really felt during working hours – it is during leisure hours that the differences are felt. While higher income people have cars, clubs, country houses, theatres, restaurants and vacations, for the poor, public space is the only alternative to television. Parks, plazas, pedestrian streets and pavements are essential for social justice. High quality pavements are the most basic element of respect for human dignity, and of consideration for society's vulnerable members such as the poor, the elderly and children. Images of high-rise apartment blocks and highways are frequently used to portray a city's advance. In fact, in urban terms, a city is more civilized not when it has highways, but when a child on a tricycle is able to move about everywhere with ease and safety.

This book is an important contribution to the construction of a new paradigm of urban structure and urban transport. Particularly in cities in the developing world, there is still time to address the challenge of mobility in a more socially and environmentally sustainable manner than has been the case in Western nations. If radical changes are not implemented (as could be the case judging from current international experience) transport problems will become the most serious obstacles to quality of life and competitiveness in developing-country cities in the near future.

*Enrique Peñalosa*

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Part 1

# Introduction

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