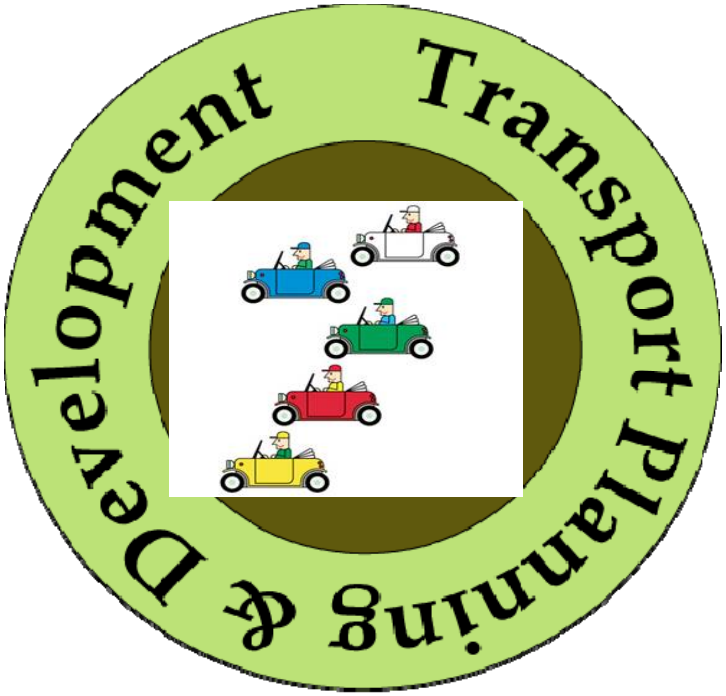
Shanghai Manual

A Guide for Sustainable Urban Development in the 21st Century

The fundamental question?



-OR-

Major Issues and Challenges

“ Asian cities today face a transport and environmental crisis ”

- EST Sourcebook, UNCRD

“The cacophony of noise generated from chaotic transport systems harms human health and undermines city-wide productivity”

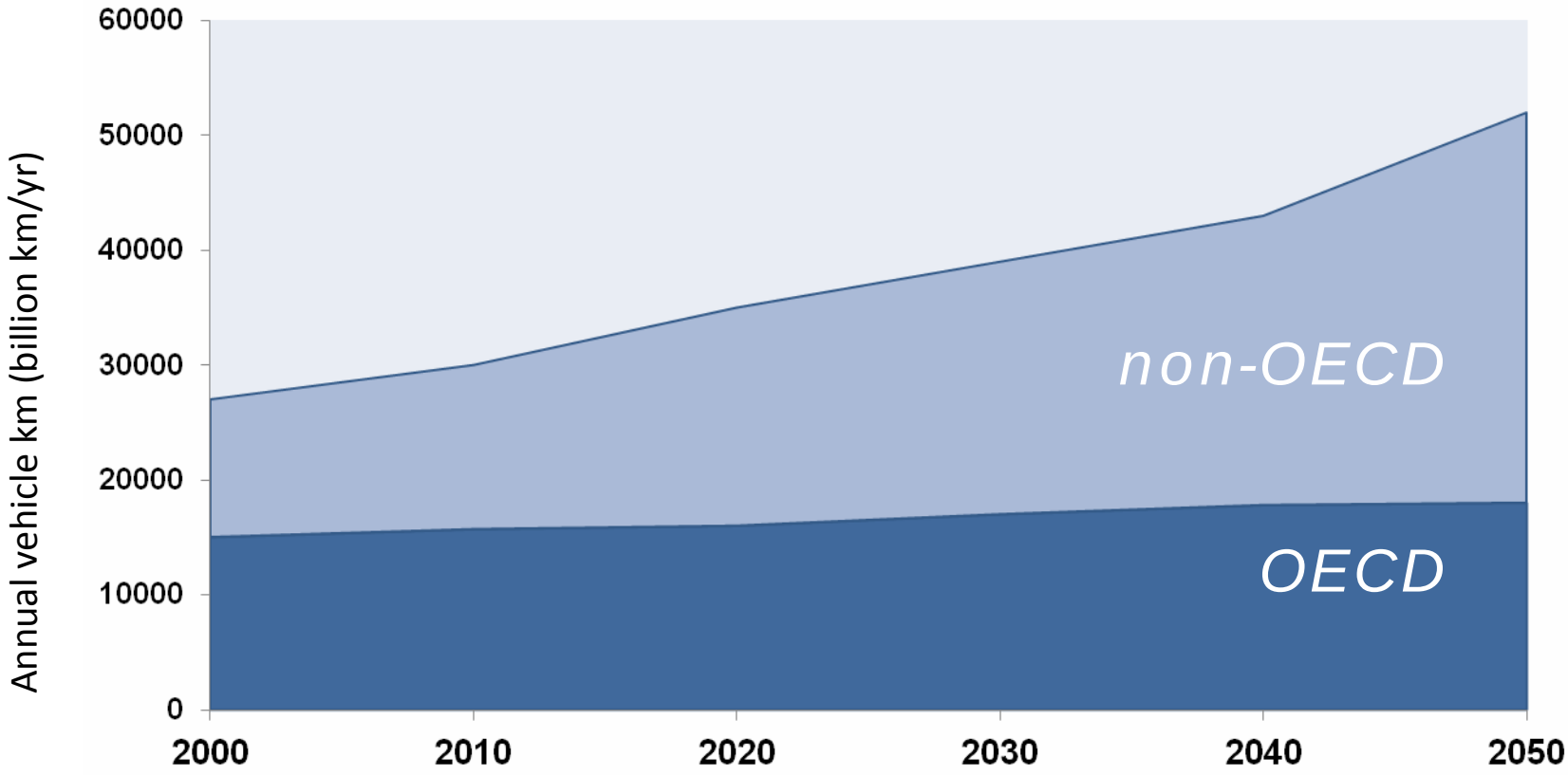
- EST Sourcebook, UNCRD

“ The race to motorization is fully moving ahead in Asia ”

- EST Sourcebook, UNCRD

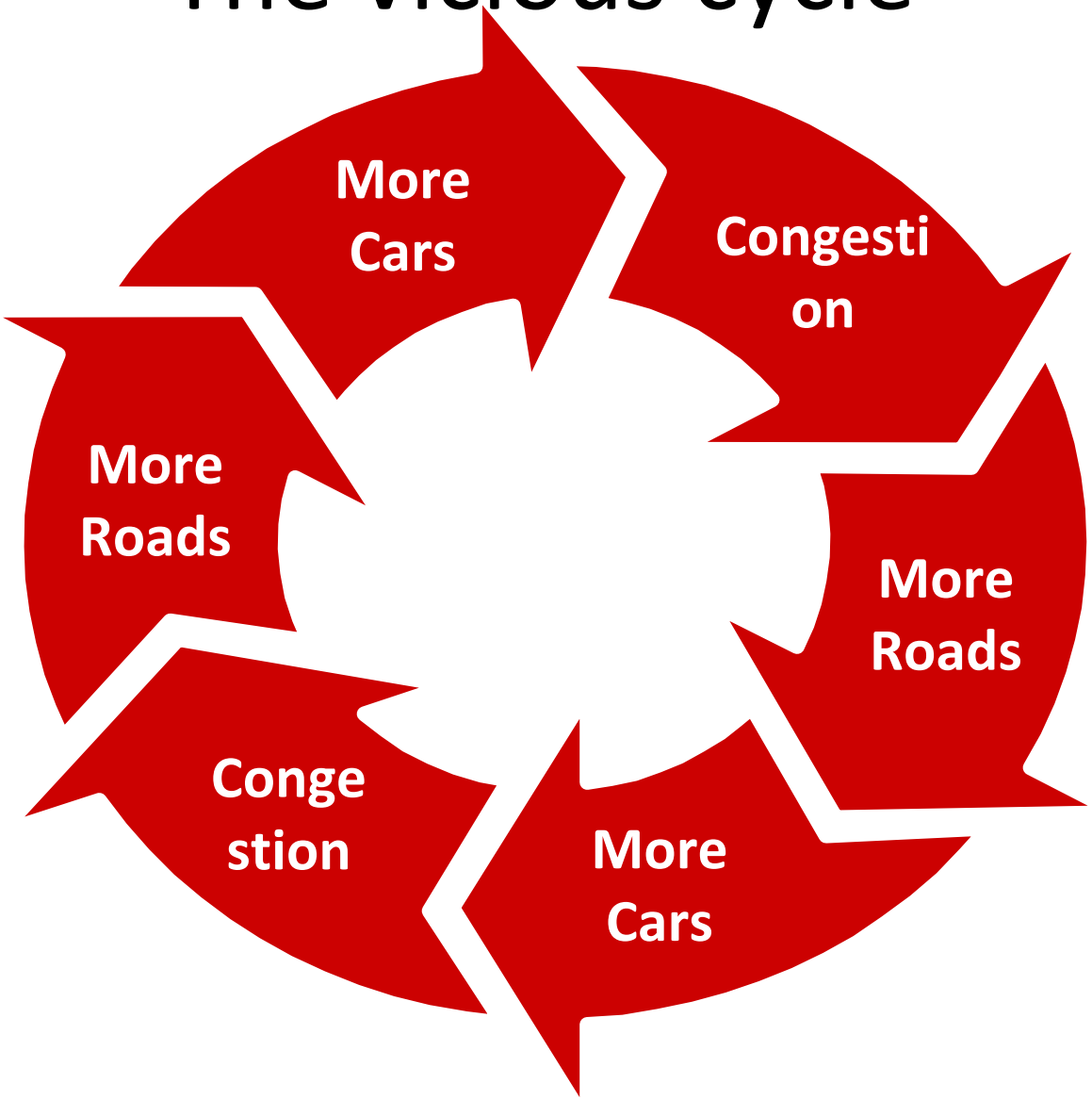
Global vehicle usage

Not only more cars, but also ***more driving***

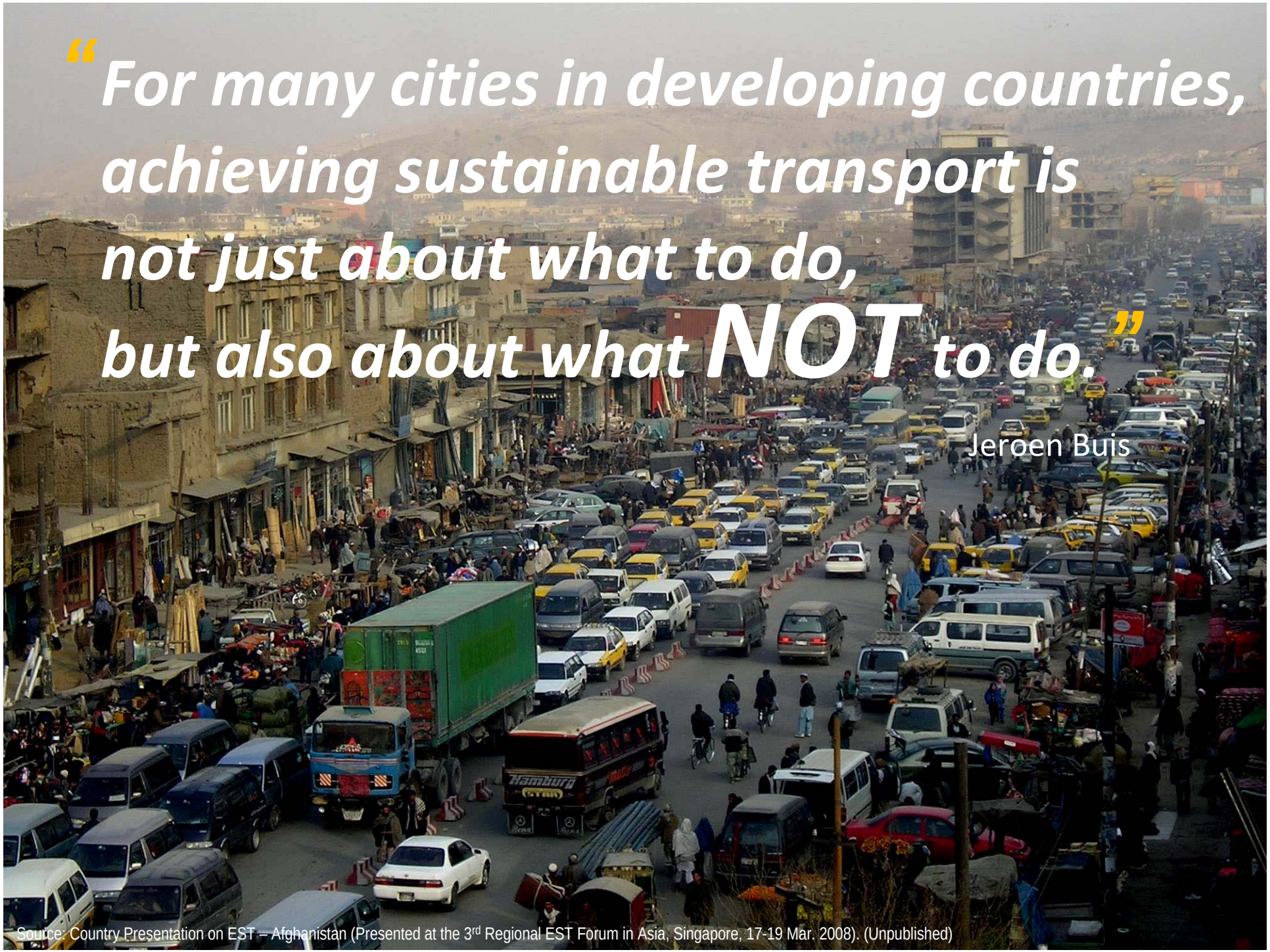


Source: : IEA/SMP, 2004

The vicious cycle




More & more road policy has failed to Keep up with demand and also undermined asthetics of cities
(Source: Karl Fjellstrom, ITDP)



Source: Country Presentation on EST – Afghanistan (Presented at the 3rd Regional EST Forum in Asia, Singapore, 17-19 Mar. 2008). (Unpublished)

Car-oriented transport needs vast spaces for parking

Source: S. Kodukula, GTZ, "NMT & Environmentally Friendly Infrastructure" (Presented at the National EST Training Workshop-cum-Policy Dialogue, Dhaka, Bangladesh, 26-28 April 2009). (Unpublished)

and for roads at the expense of natural habitat

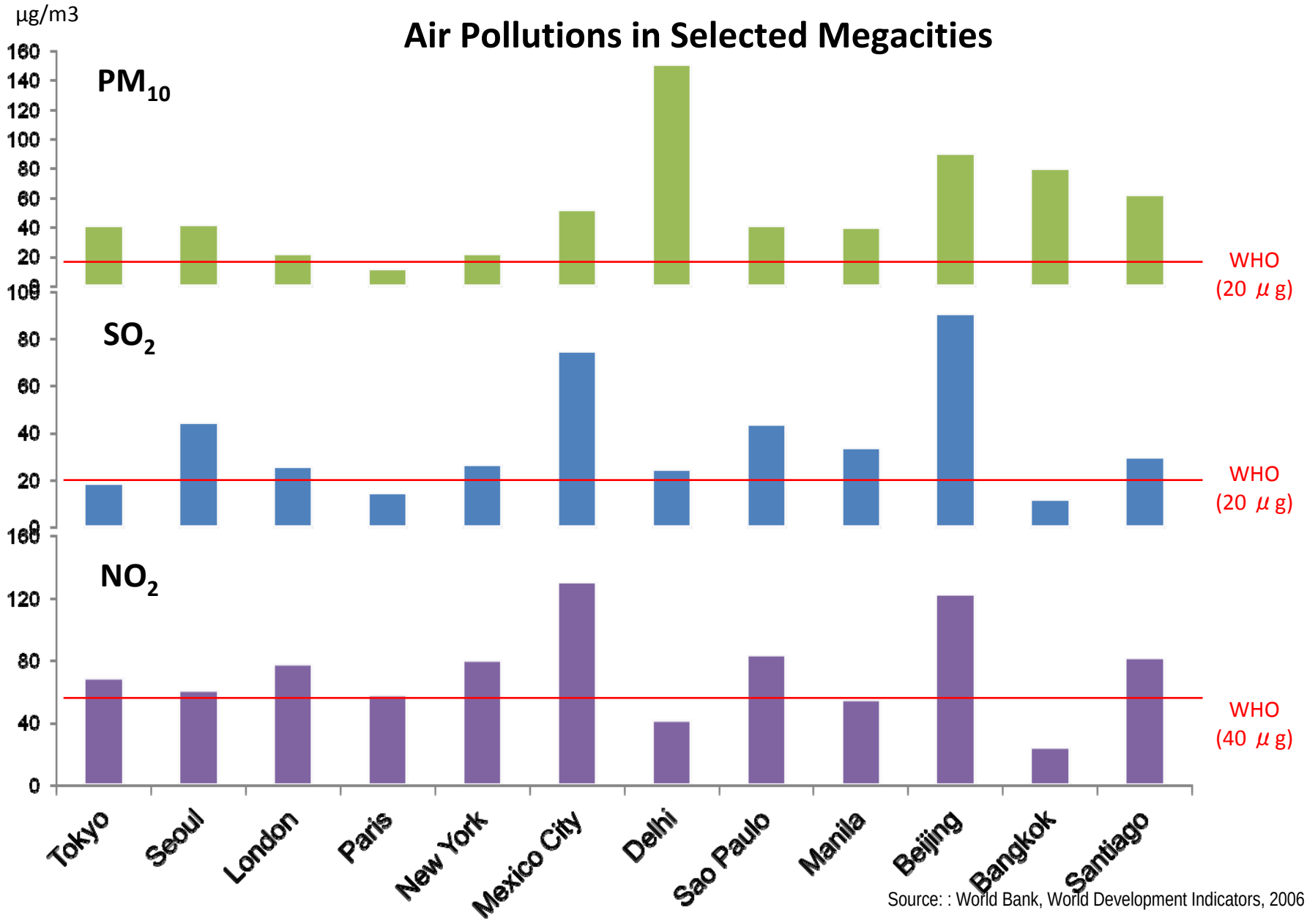
Los Angeles. Photo: Paul Barter

Source: S. Kodukula, GTZ, "NMT & Environmentally Friendly Infrastructure" (Presented at the National EST Training Workshop-cum-Policy Dialogue, Dhaka, Bangladesh, 26-28 April 2009). (Unpublished)

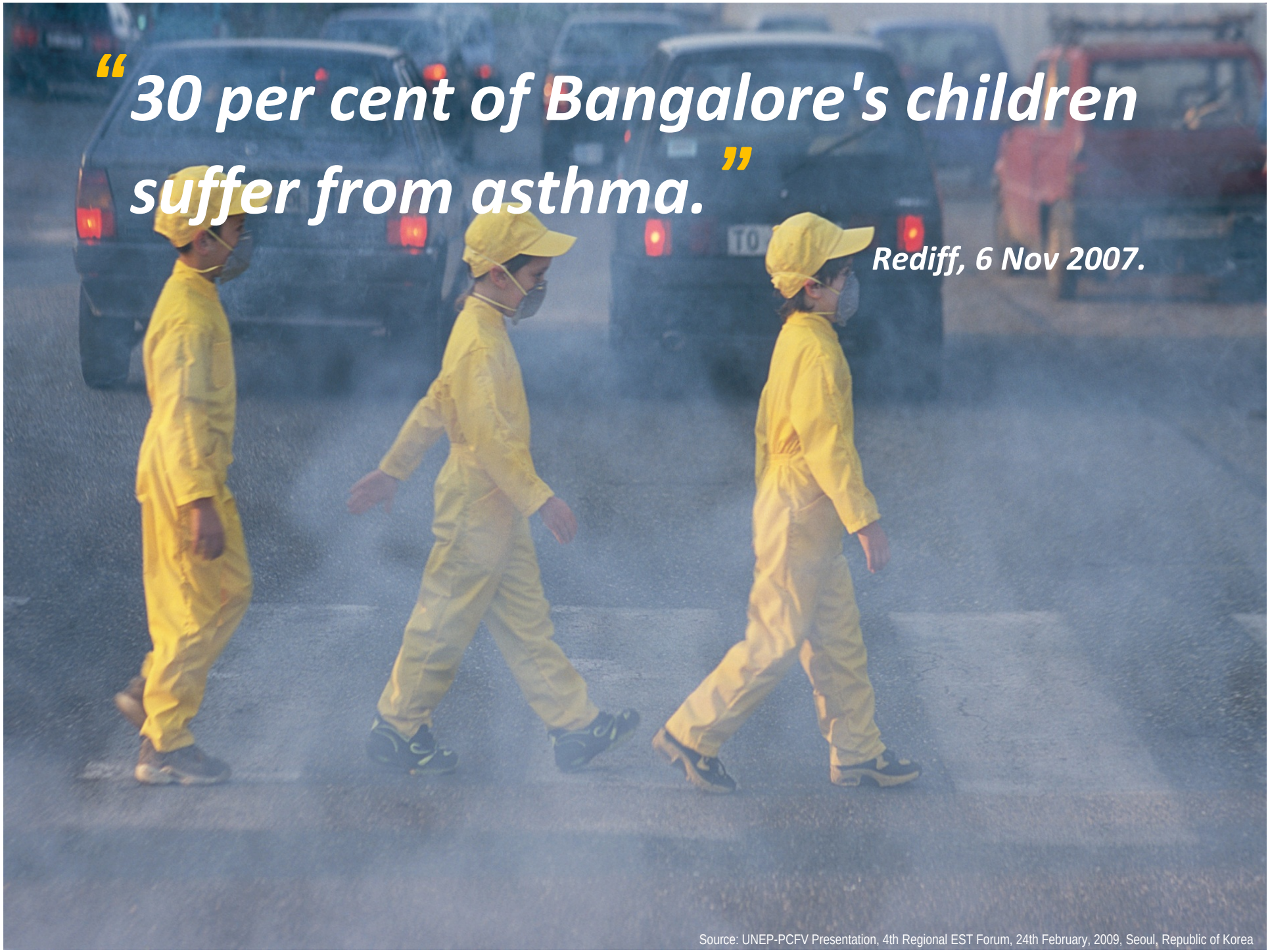
Think ***outside the box*** *of motorization*

(Source: Press Office, City of Münster, Germany, August 2001)

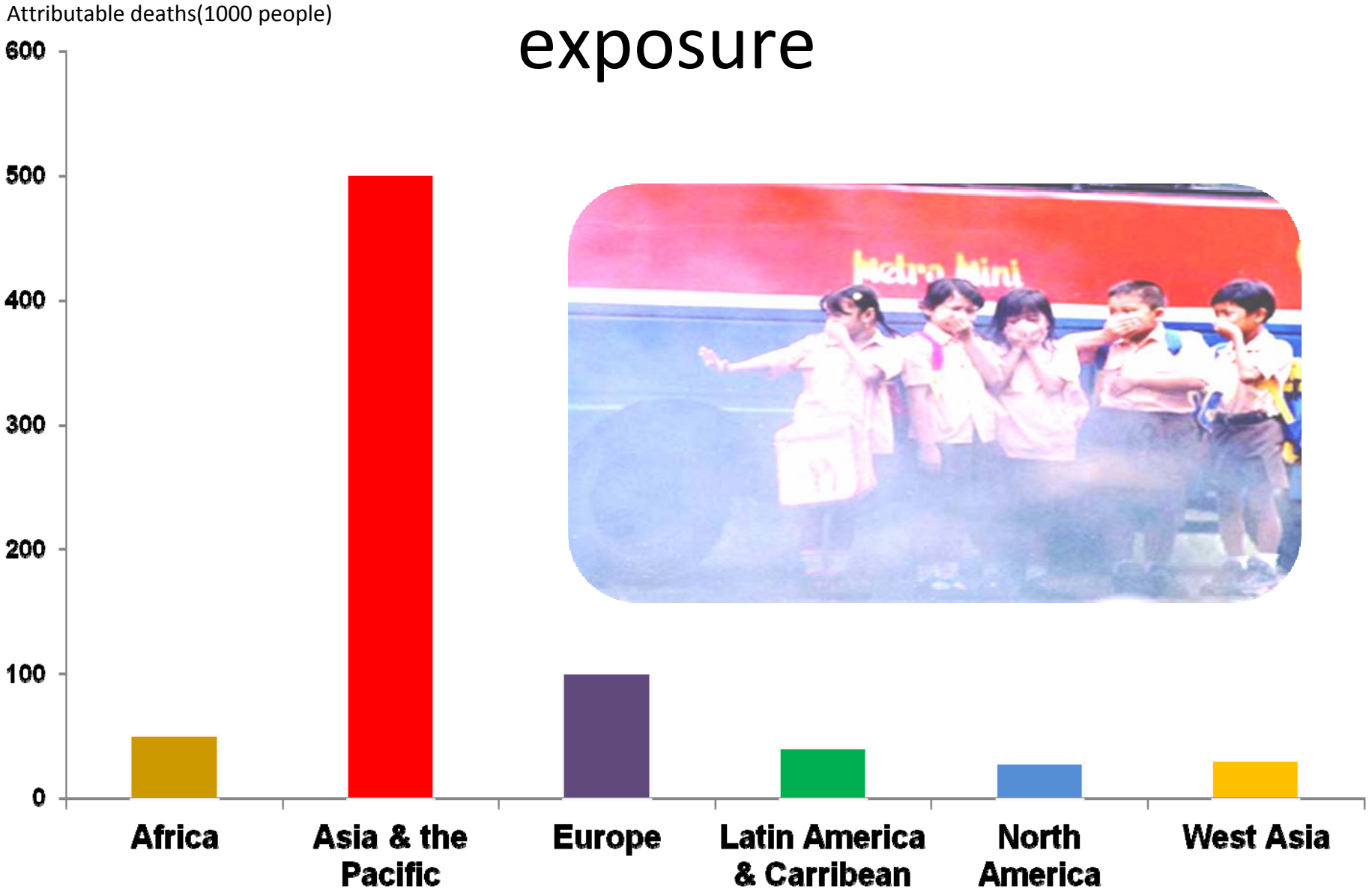
It is still a major ongoing problem



Source: : World Bank, World Development Indicators, 2006


“30 per cent of Bangalore's children suffer from asthma.”
Rediff, 6 Nov 2007.
Source: UNEP-PCFV Presentation, 4th Regional EST Forum, 24th February, 2009, Seoul, Republic of Korea

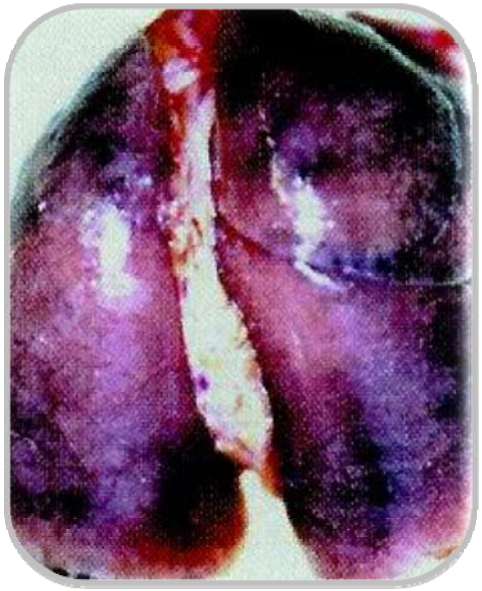
Premature deaths due to PM_{10} exposure



(Source: GEO-4, UNEP)

Llungs of a rat after exposure to exhaust

Exposed to Diesel Exhaust



Who are the ultimate victims, the poor or the rich?

Expose to Clean Air

Compared to the normal pink lung, it has been blackened by soot

(Source: NIES, Japan)

Health and economic costs of PM_{10}

Manila	About 8,400 cases of chronic bronchitis and about 1,900 cases of excess deaths associated with PM_{10} resulted in a cost of US$ 392 million in 2001
Bangkok	About 1,000 cases of chronic bronchitis and about 4,500 cases of excess deaths associated with PM_{10} resulted in a cost of US$ 424 million in 2000
Shanghai	About 15100 cases of chronic bronchitis and about 7200 cases of premature deaths associated with PM_{10} resulted in a cost of US$ 880 million in 2000
India (for 25 most polluted cities)	Estimated annual health damage of pre-Euro standards for vehicle exhaust emissions is estimated about US$ 14~191.6 million per city

(Source: GEO-4, UNEP)


WORLD HEALTH ORGANIZATION
ORGANISATION MONDIALE DE LA SANTE
90% OF DEATHS DUE TO ROAD CRASHES OCCUR IN DEVELOPING COUNTRIES, MOSTLY AMONG PEDESTRIANS, BICYCLISTS AND MOTORCYCLISTS – THOSE LESS LIKELY TO OWN A CAR.
ROAD SAFETY IS NO ACCIDENT.
WWW.WHO.INT/VIOLENCE_INJURY_PREVENTION

RANK	0–4 YRS	5–14 YRS	15–29 YRS	30–44 YRS	45–69 YRS	70 + YRS	TOTAL
1	Perinatal causes	Lower respiratory infections	Road traffic injuries	HIV/AIDS	Ischaemic heart disease	Ischaemic heart disease	Ischaemic heart disease
2	Lower respiratory infections	Road traffic injuries	HIV/AIDS	Tuberculosis	Cerebrovascular disease	Cerebrovascular disease	Cerebrovascular disease
3	Diarrhoeal diseases	Malaria	Tuberculosis	Road traffic injuries	HIV/AIDS	Chronic obstructive pulmonary disease	Lower respiratory infections
4	Malaria	Drownings	Violence	Ischaemic heart disease	Tuberculosis	Lower respiratory infections	Perinatal causes
5	Measles	Meningitis	Self-inflicted injuries	Self-inflicted injuries	Chronic obstructive pulmonary disease	Trachea, bronchus, lung cancers	Chronic obstructive pulmonary disease
6	Congenital anomalies	Diarrhoeal diseases	Lower respiratory infections	Violence	Trachea, bronchus, lung cancers	Diabetes mellitus	Diarrhoeal diseases
7	HIV/AIDS	HIV/AIDS	Drownings	Lower respiratory infections	Cirrhosis of the liver	Hypertensive heart disease	HIV/AIDS
8	Whooping cough	Tuberculosis	Fires	Cerebrovascular disease	Road traffic injuries	Stomach cancer	Tuberculosis
9	Meningitis	Protein–energy malnutrition	War and conflict	Cirrhosis of the liver	Lower respiratory infections	Colon and rectum cancers	Trachea, bronchus, lung cancers
10	Tetanus	Fires	Maternal haemorrhage	Poisonings	Diabetes mellitus	Nephritis and nephrosis	Road traffic injuries

14	Road traffic injuries

20

Road traffic injuries

Source: WHO, Global Status Report on Road Safety, 2009. p3.

Road Safety

Change in rank order of DALYs for the 10 leading causes of the global burden of disease

1990		2020	
Rank	Disease or injury	Rank	Disease or injury
1	Lower respiratory infections	1	Ischaemic heart disease
2	Diarrhoeal diseases	2	Unipolar major depression
3	Perinatal conditions	3	Road traffic injuries
4	Unipolar major depression	4	Cerebrovascular disease
5	Ischaemic heart disease	5	Chronic obstructive pulmonary disease
6	Cerebrovascular disease	6	Lower respiratory infections
7	Tuberculosis	7	Tuberculosis
8	Measles	8	War
9	Road traffic injuries	9	Diarrhoeal diseases
10	Congenital abnormalities	10	HIV

DALY: Disability-adjusted life year. A health-gap measure that combines information on the number of years lost from premature death with the loss of health from disability.

Source: reference *1*.

Table source: WHO

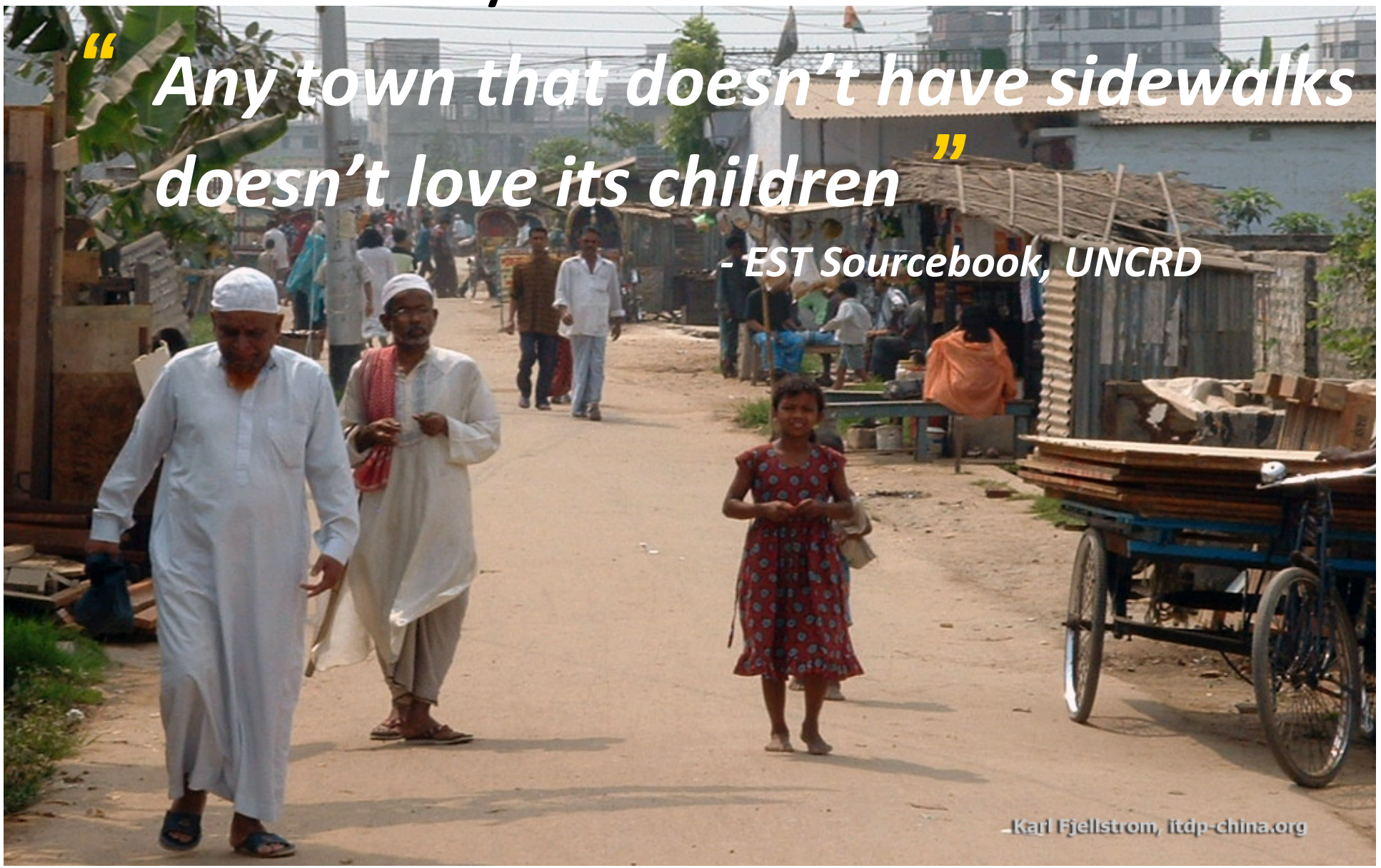
Economic impacts of road accidents

Country	$ Million	Percentage of Annual Gross Domestic Product
Brunei Darussalam	65	1.00
Cambodia	116	3.21
Indonesia	6,032	2.91
Lao People's Democratic Republic	47	2.70
Malaysia	2,400	2.40
Myanmar	200	3.00
Philippines	1,900	2.60
Singapore	457	0.50
Thailand	3,000	2.10
Viet Nam	885	2.45
Total ASEAN	**15,102**	**2.23**

ASEAN = Association of Southeast Asian Nations.
Source: Study estimates.

Source: ADB

Mobility of the Urban Poor

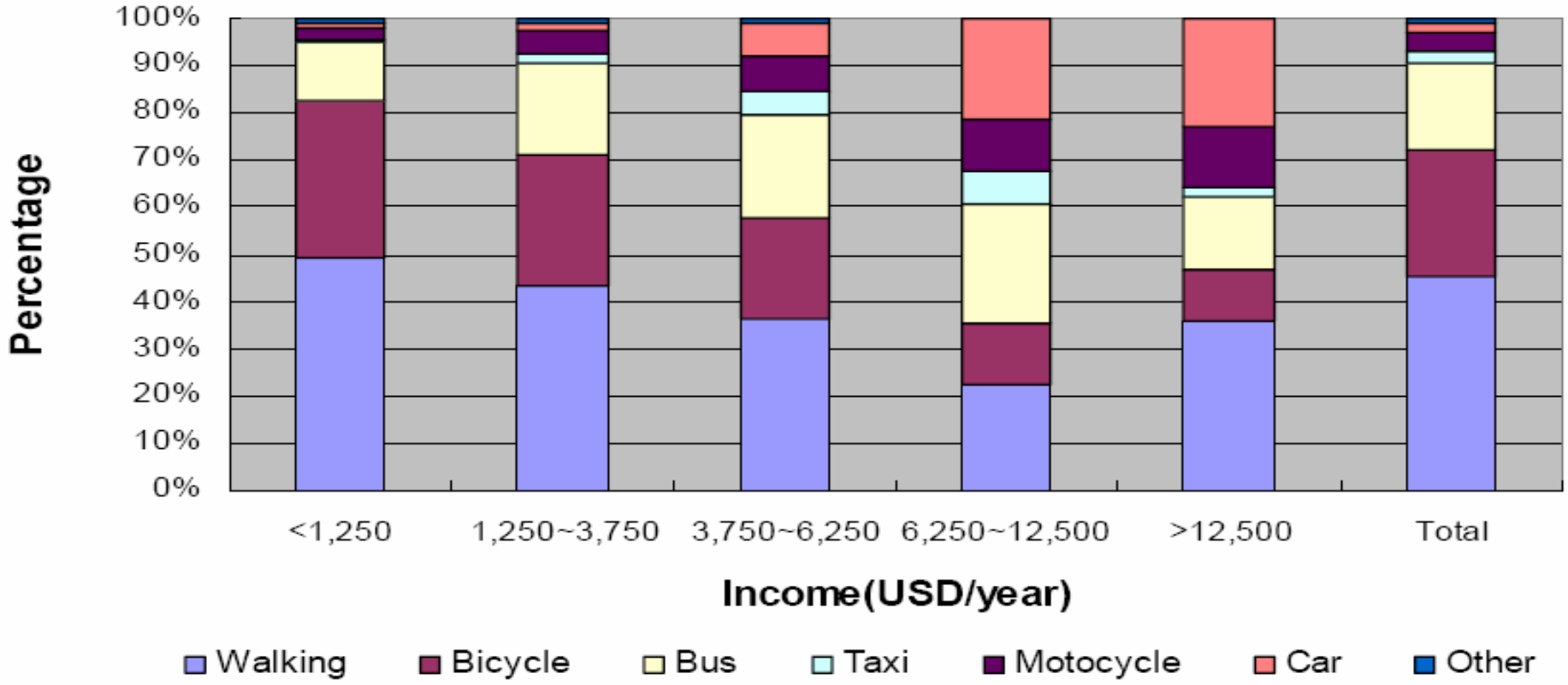


Social Equity & Gender Issues

- women often carry out frequent and short trips during off-peak hours and off the main-routes for child care, household management activities, informal sector employment, etc.
- social safety and security of public transport for women given that women commuters are on rise due to increased women work force in many business and commercial sectors.
- trip making is deterred for the poor, particularly for women, children, and the elderly, due to their vulnerability as pedestrians to traffic accidents and to personal violence.
- for the physically impaired and the elderly, public transport accessibility is often very poor.

Modal split and income in China

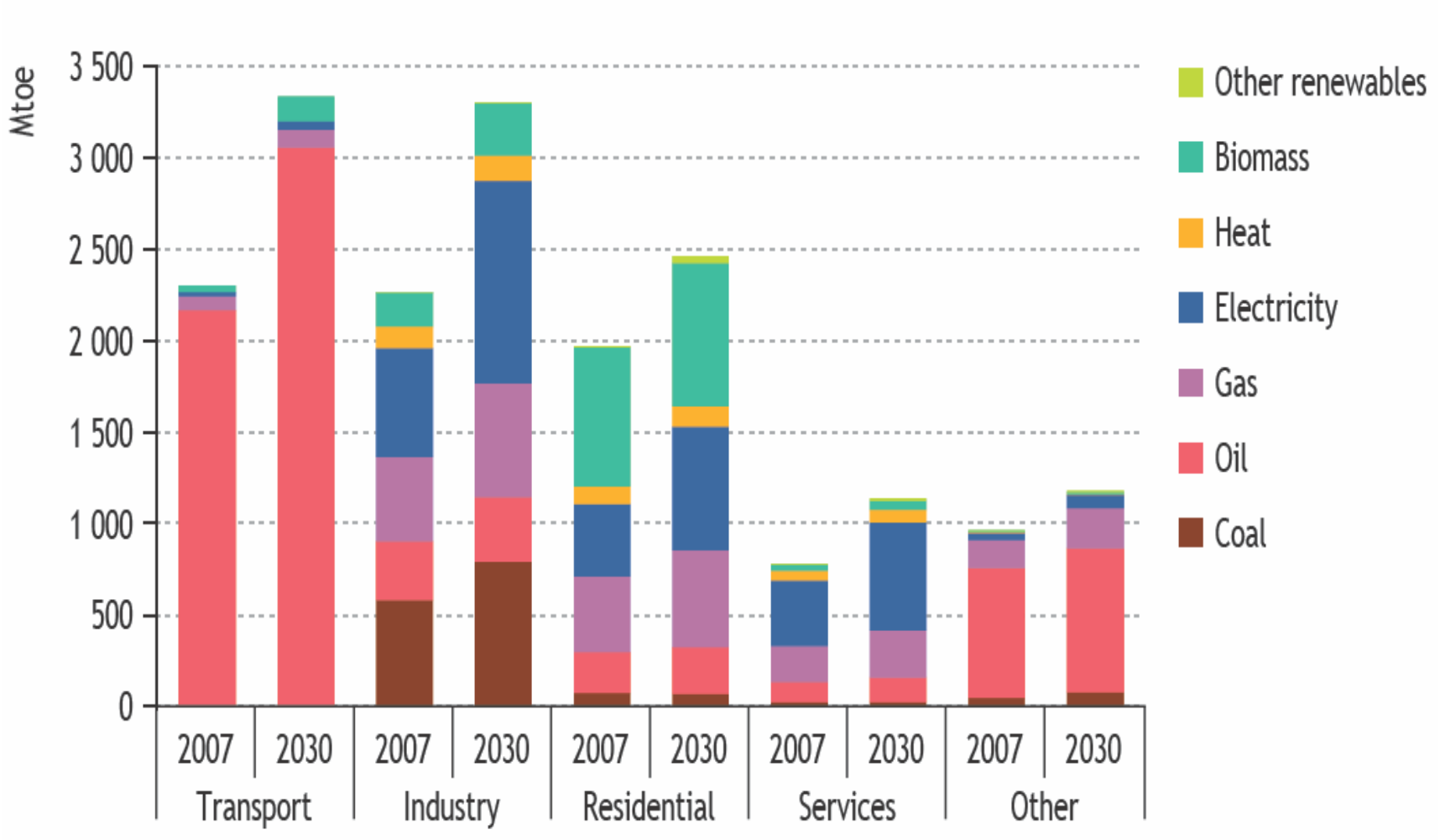
- Even though walking and cycling constitutes a major share of the total annual trips, NMT is still considered as a peripheral issue rather than a core issue in the overall transport policy, planning, and development



Source: Peng *et al.*, Mobility of the Chinese Urban Poor – A Case Study of Hefei City, Dec 2006, UNR Economics Working Paper Series No. 06-004

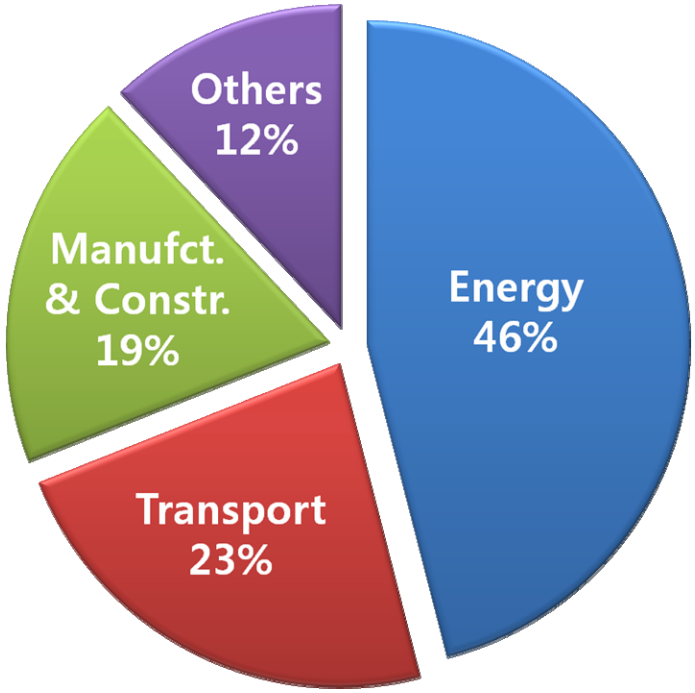
Energy consumption by sector

Extreme dependence on fossil fuel based energy is not sustainable and affects national energy security.



Source: OECD/IEA, 2009 World Energy Outlook

Global CO_2 emissions by sectors

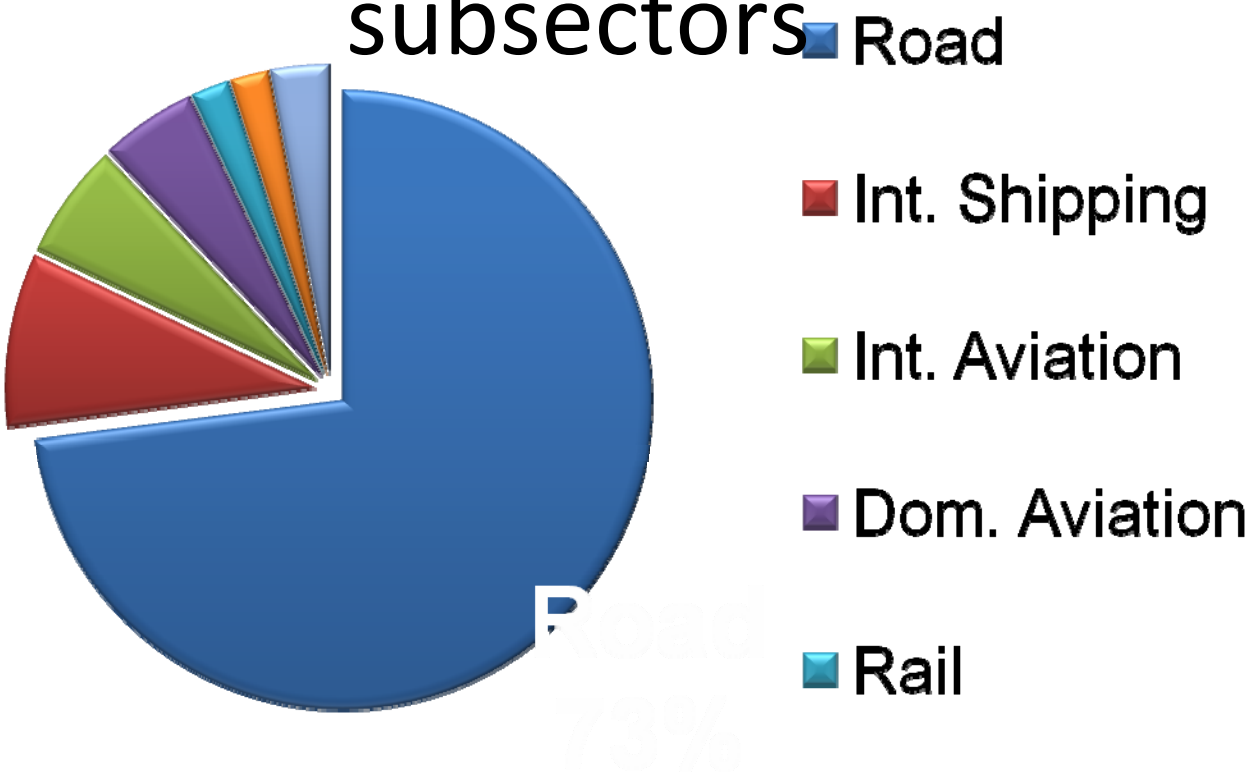


"Urban transport represents one of the fastest growing sources of greenhouse gas emissions that countribute to global climate change"

- EST Sourcebook, UNCRD

Source: UNEP, 2009 Annual Report, Nairobi

Transport CO_2 emissions by subsectors



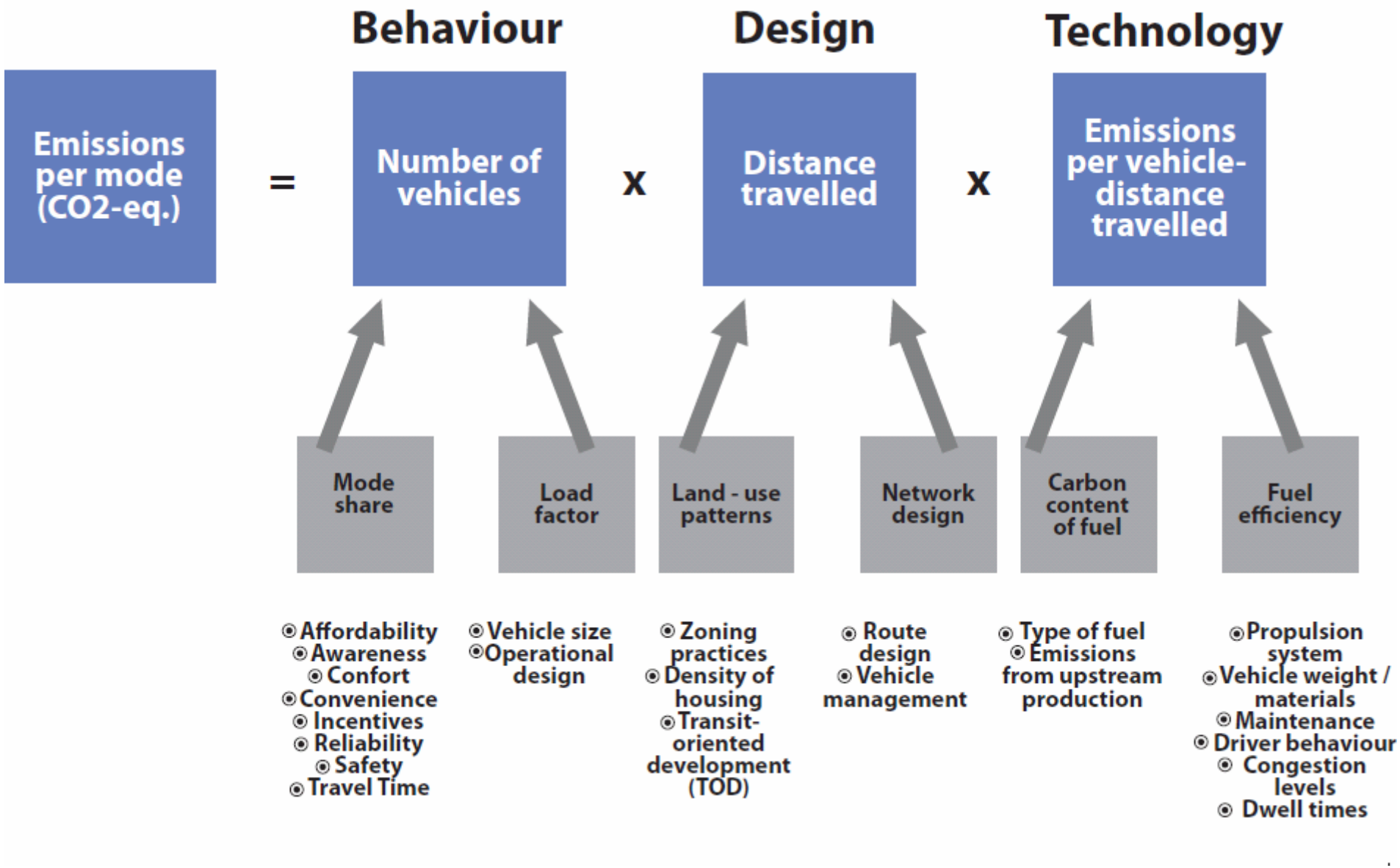
"Non-motorized transport is perhaps the most most-effective climate change mitigation strategy for the transport sector, and it is amongst the strongest in terms of the co-benefits generated

- EST Sourcebook, UNCRD

Source: UNEP, 2009 Annual Report, Nairobi

Better City, Better Life - Policy Options for Sustainable Urban Transport

Calculation of Transport Emissions



Source: Wright and Fulton, 2005

Integrated Approach - A Vision for Sustainable Transport

Three primary strategy to reduce GHG emission from Vehicles

- Avoid – avoid or reduce travel or the need to travel
- Shift – shift to more environmentally friendly modes
- Improve – improve the energy efficiency of transport modes and vehicle technology

(Source: GTZ, 2007)

The push and pull approach

Measures with push-effects
Area-wide parking management, parking space restrictions in zoning ordinances, car limited zones, permanent or time-of-day car bans, congestion management, speed reductions, road pricing...

Measures with pull-effects
Priority for buses and trams, high service frequency, passenger friendly stops and surroundings, more comfort, park-and-ride, bike-and-ride..., area-wide cycle-networks, attractive pedestrian connections...

Measures with push- and pull-effects
Redistribution of carriageway space to provide cycle lanes, broader sidewalks, planting strips, bus lanes..., redistribution of time-cycles at traffic lights in favour of public transport and non-motorized modes, public-awareness-concepts, citizens' participation and marketing, enforcement and penalizing...

Source: Müller, P., Schleicher-Jester, F., Schmidt, M.-P. & Topp, H.H. (1992): Konzepte flächenhafter Verkehrsberuhigung in 16 Städten", Grüne Reihe des Fachgebiets Verkehrswesen der Universität Kaiserslautern No. 24.

“ Efforts to promote environmentally sustainable transport will result not only in the improvement of human health through the reduction of urban air pollution but will also have important complimentary benefits, including the reduction of GHG emissions, the reduction of deaths and injuries from road accidents, the reduction of harmful noise levels, and the reduction of traffic congestion levels ”

- Aichi Statement, 2005

Co-benefit Impact from Land Use Planning Measures (as possible opportunities for NAMAs)

Economic benefits	Smart growth polices	Transit-oriented development
Congestion reduction	√	√
Consumer spending savings	√	√
Employment creation	√	√
Small-enterprise development	√	√
Traffic accident reduction		
Technology transfer	√	√
Energy security	√	√
Economic productivity		
Environmental benefits		
Greenhouse gas reductions	√	√
Particulate matter reduction	√	√
Sulphur oxides reduction	√	√
Nitrogen oxides reduction	√	√
Carbon monoxide reduction	√	√
VOC reduction	√	√
Noise reduction	√	√
Solid waste reduction	√	√
Water contaminant reduction	√	√
Social benefits		
Health (e.g. obesity reduction)	√	√
Crime reduction	√	√
Gender equity promotion	√	√
Universal access for disabled	√	√
Scholar access improvement	√	√
Convenience and comfort	√	√
Community sociability	√	√
Reduction in severance	√	√

Source: Win-Win Solutions to Climate Change and Transport, UNCRD, 2009.

Oyumino (Chiba, Japan) is a smart growth community that inter-connects residential and commercial areas with a large network of NMT routes. Photo: Lloyd Wright

Singapore's LRT System developed around purpose-built-communities in which residential, shopping, education, public services and workplaces are all co-located. Photo: Lloyd Wright

Smart growth refers to a set of policies that promote more accessible land –use policies. Smart Growth policies include the mixed-use development patterns that allow the close proximity of residential areas to shopping, work and services. ***TOD*** refers to integrating development and public transport along high density corridors and at key nodal points brings benefits to all. Such planning focuses largest number of destinations (work, residential, public services, schools near public transport stations, and thus encouraging both NMT as well as public transport usage.

Land-Use Planning & TOD

Nagoya Station in Japan, one of the world's largest train station by floor area (446,000 m²) and highest station building (245m)

Curitiba, Brazil has long provided a global model for successful integration of transportation and land use planning, with a focus on environmental preservation

Oyumino (Chiba, Japan) is a smart growth community that inter-connects residential and commercial areas with a large network of NMT routes

Singapore's LRT System developed around purpose-built-communities in which residential, shopping, education, public services and workplaces are all co-located.

Co-benefit Impact from Non-motorized Transport (NMT) (as possible opportunities for NAMAs)

Economic benefits	Pedestrian upgrades	Pedicabs	Bicycle rentals	Car-free day
Congestion reduction	√	√	√	√
Consumer spending savings	√	√	√	√
Employment creation	√	√	√	√
Small-enterprise development	√	√	√	√
Traffic accident reduction	√	√	√	√
Technology transfer		√		
Energy security	√	√	√	√
Economic productivity	√	√	√	√
Environmental benefits				
Greenhouse gas reductions	√	√	√	√
Particulate matter reduction	√	√	√	√
Sulphur oxides reduction	√	√	√	√
Nitrogen oxides reduction	√	√	√	√
Carbon monoxide reduction	√	√	√	√
VOC reduction	√	√	√	√
Noise reduction	√	√	√	√
Solid waste reduction	√	√	√	
Water contaminant reduction	√	√	√	
Social benefits				
Health (e.g. obesity reduction)	√		√	√
Crime reduction	√	√	√	√
Gender equity promotion	√	√	√	√
Universal access for disabled	√			√
Scholar access improvement	√	√	√	√
Convenience and comfort	√	√	√	√
Community sociability	√		√	√
Reduction in severance	√			

Source: Win-Win Solutions to Climate Change and Transport, UNCRD, 2009.

'. Each Sunday, Bogotá gives 120 kilometres of road space over to cyclists, skaters, joggers, and families. Photo by Lloyd Wright.

Bicycle rental facility in Seoul, Photo: Lloyd Wright

Delivery service by Pedicab/bicycle taxi in London, Photo: ITDP

Co-benefit Impact from Transport Demand Management (TDM)

Economic benefits	Vehicle use restrictions	Fuel taxes	Parking levies
Congestion reduction	√	√	√
Consumer spending savings	√		
Employment creation			
Small-enterprise development	√	√	√
Traffic accident reduction			
Technology transfer	√	√	√
Energy security	√	√	√
Economic productivity			
Environmental benefits			
Greenhouse gas reductions	√	√	√
Particulate matter reduction	√	√	√
Sulphur oxides reduction	√	√	√
Nitrogen oxides reduction	√	√	√
Carbon monoxide reduction	√	√	√
VOC reduction	√	√	√
Noise reduction	√	√	√
Solid waste reduction	√	√	√
Water contaminant reduction	√	√	√
Social benefits			
Health (e.g. obesity reduction)	√	√	
Crime reduction	√	√	√
Gender equity promotion		√	√
Universal access for disabled	√	√	√
Scholar access improvement			
Convenience and comfort	√	√	√
Community sociability	√		√
Reduction in severance			

Source: Win-Win Solutions to Climate Change and Transport, UNCRD, 2009.

TDM generally refers to policies and measures:

- *to reduce the total volume of traffic*
- *to promote effective shifts towards more sustainable modes of transport.*

(Lloyd Wright)


(City of Seoul)

Public transport infrastructure costs

BRT is an attempt to achieve a metro-level of transit quality using bus technology

Bus Rapid Transit
US$ 0.5 - 10 million / km

(Source: William H.K. Lam, Lloyd Wright, and Fumihiko Nakamura)

Light rail
US$ 12 – 30 million / km

Urban rail
US$ 25 – 50 million / km

Metro
US$ 50 million – 320 million / km

The successes….

- ✓ **Amsterdam**
- ✓ **Bogotá**
- ✓ **Curitiba**
- ✓ **Copenhagen**
- ✓ **Hong Kong**
- ✓ **Seoul**
- ✓ **Singapore**

All of these successes featured an integrated and packaged approach:

1. **High-quality public transport**
2. **Promotion of walking and bicycling**
3. **Promotion of new technologies**
4. **Better environmental protection**

(Source: William H.K. Lam, Lloyd Wright, and Fumihiko Nakamura)

Case studies

Case Study 1 - Guangzhou BRT – a cost effective option

“ BRT provides a sophisticated metro-quality transit service at a cost that most cities, even developing cities, can afford ”

- GTZ BRT Sourcebook

Guangzhou BRT System

Main features:

- 29 stations and 23km dedicated busways
- free transfer in the same direction (smart card with discount)
- direct physical connections between BRT and metro stations
- integration between BRT and bicycle parking & bicycle sharing
- the world's longest BRT stations

Impacts:

- saves commuting time (1 hour shorter in daily journey)
- daily passenger ridership : 800,000 boardings per day
- the cost of the BRT system infrastructure has been estimated to be equivalent to building around 800 meters of underground metro.

Learning Objectives:

- BRT is one of the most cost-effective transit systems for cities to provide fast, comfortable and high quality public transport service
- Integration with rail-based metro has proven to be an indispensable feature of the BRT and the mass transit network of the city

Case Study 2
A tale of two bicycle cities: Bogotá and Copenhagen

Case of Bogotá Bicycle Promotion

Main features:

- Redirected transport policy in later part of 1990s: people would be at the center
- Sidewalks widened: new space for pedestrians and fully segregated two-way cycletracks.
- space was taken away from cars
- Public transport network was designed (TransMilenio) and integrated to bicycle infrastructure
- Citywide cycletrack network was designed and its first 200 kms were built during his mandate
- 2011: 357 kms of cycleways network and is still expanding

Impacts:

- Increased mode share of bicycles
- Before (1996): 0.58% of all trips
- After: 4% in 2003 & 5% by 2010

Learning Objectives:

- Cycling can be a suitable and cheapest mode of transport with significant co-benefits
- Promoting cycling by means of infrastructure, policies and education results in higher levels of use
- Risks associated with promoting cycling: can be overcome
- Bicycle policies must not be isolated from general transport and urban planning policy
- Stakeholders must be engaged for the development of these policies
- Citizens can act as powerful agents of change

Infrastructure (cont)

- Free bike parking in TransMilenio (BRT) terminals
- (no cost for BRT users)

Photo Carlosfelipe Pardo


Photo: Mario Andrés Pardo

Case of Copenhagen Bicycle Promotion

Main features:

• 1970s : redirect their transport policy to one where bicycles would have a predominant role.
•Urban development plan: “five finger plan” in which development plan followed along five main rail lines that started from the city centre.
•A cycletrack network (part of their National Bicycle Route network)
•2010: 350 kms of segregated cycletracks; 1.2 million kms ridden on bicycles every day
•37% of daily transport trips in the city being done by bicycle
•“Green Waves” of cyclists based on traffic light phases; 6-second “green advance” for cyclists at stop lights
•Green Cyclists Routes, which are essentially a very high level network of cycle routes which have little or no contact with other traffic, making trips in the city more agile and safer.
•The redevelopment of infrastructure to improve safety for cyclists, reducing risks especially in crossings where conflicts with other road users may arise.

Impacts:

• Bicycles now account for 37% of trips in the city.
•Traffic accidents have been reduced (“safety in numbers”)
•Cultural/fashion approach to cycling: “Cycle Chic” which is now spreading all over the world
•Report “Bicycle Account” from year 2000 to improve the situation of cyclists in Copenhagen.

Learning Objectives:

• Cycling can be a suitable and cheapest mode of transport with significant co-benefits
•Promoting cycling by means of infrastructure, policies and education results in higher levels of use
•Risks associated with promoting cycling: can be overcome
•Bicycle policies must not be isolated from general transport and urban planning policy
•Stakeholders must be engaged for the development of these policies
•Citizens can act as powerful agents of change

Case Study 3
Goteborg’s road safety Vision Zero

Case Study 3 - Sweden's Vision Zero Initiative

Main features:

- The Vision Zero is the Swedish approach to road safety thinking.
  : **"No loss of life is acceptable"**
- we are human and make mistakes →. the road system needs be designed to protect us at every turn.
- mistakes should not be punishable by death

"Those who design the road transport system bear the ultimate responsibility for safety: road managers, vehicle manufacturers, road transport carriers, politicians, public employees, legislative authorities and the police."

Source: Vägverket(Swedish Road Administration), Vision Zero on the Move

Case Study 3 - Sweden's Vision Zero Initiative

Main Features - Policy options and measures: Cont'd..

- **Two main policies to improve road safety**
  - traffic-calming
  - "Vision Zero": having zero fatalities due to road accidents
- **Vision Zero: four main components**:
  - infrastructure (planning and building roads and related infrastructure to improve road safety)
  - vehicle technology (improving driver, passenger and pedestrian safety)
  - services and education (ranging from driver education to planning services)
  - control and surveillance (systems for monitoring traffic and weather)
- **Guidelines for policy makers**:
  - Focus on fatalities and serious injuries
  - Integrate the failings of human beings in design
  - Share responsibility between system and design
  - Stimulate industry to improve safety design
  - Saving lives is cheap.

Case Study 3 - Sweden's Vision Zero Initiative

Impacts:

•Reducing deaths and injuries on the road.

•Three quarters of the significant reduction of deaths and injuries due to Traffic-calming measures

•Reduced the number of killed and seriously injured by 60% by 2005

•Total reduction 1985-2003: 2460 people: (a reduction of 47%)

Learning objectives:

•Measures were difficult to implement at the beginning, both for technical reasons and for reasons of public acceptance.

•Results showed they were well worth the trouble

•Adopting speed limits: implied lots of work

•Reducing traffic speeds has impact on road safety

•Citizens felt areas had improved

-in terms of road safety

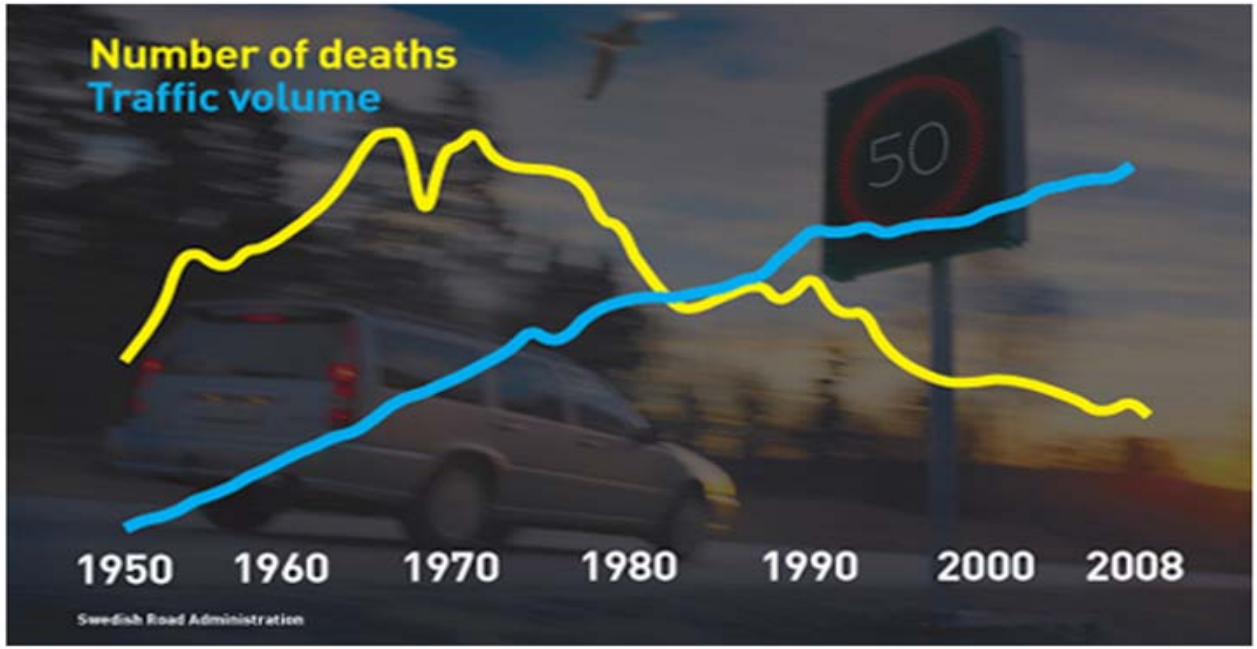
- in terms of livability

How did it work?

Impacts:

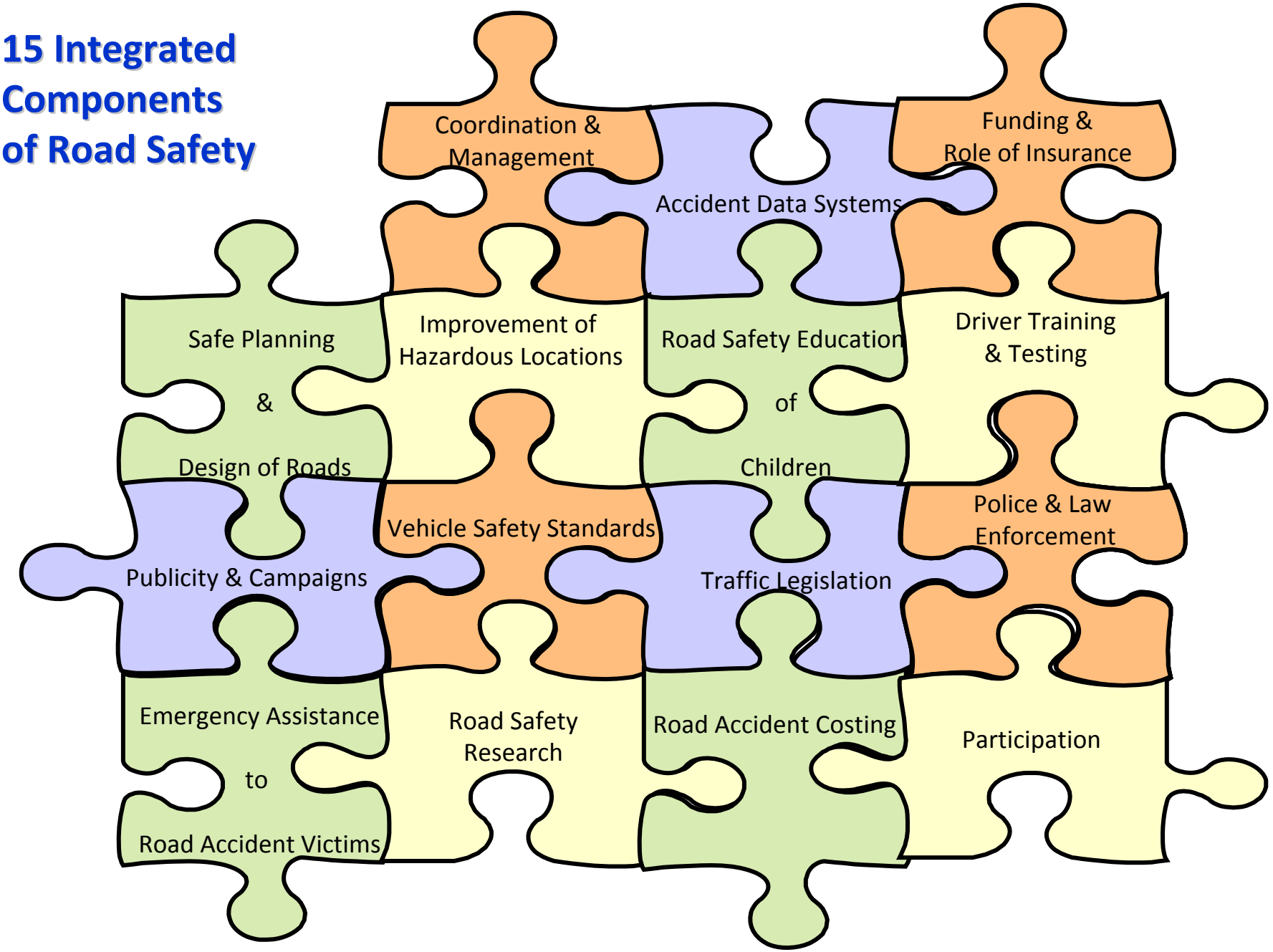
- road deaths have continued to decrease despite a steady rise in traffic.
- fatalities involving unprotected pedestrians have fallen by almost 50%
- the number of children killed in traffic accidents has also been cut.

  → In 2008, the first traffic death involving a child did not occur until 22 October that year.



Source: available at www.visionzeroinitiative.se

15 Integrated Components of Road Safety



Source: Charles M. Melhuish,, "Road Safety Issues and Measures" (Presented at the National EST Training Workshop-cum-Policy Dialogue, Dhaka, Bangladesh, 26-28 April 2009). (Unpublished)

Case Study 3

Singapore's approach to reducing congestion through TDM

Singapore's approach to reduce traffic congestion

Main features:

• 1975: aggressive approach - great network of public transport which placed a mass transit stop no more than 500 meters from any place in the city;

TDM measures:

1975: manually-operated scheme - pay to access the city center during the morning peak hours (Area Licensing Scheme - ALS).

1998 - Electronic Road Pricing (ERP) Scheme: in-vehicle units & charge for road use depending on time and level of congestion

1990: "Vehicle Quota System" (VQS) , Certificate of Entitlement" (CoE).

1996: LTA White Paper: become a "World Class Transport System":

- prioritize public transport; integrating land use and transport planning; comprehensive road network;

Impacts:

• Public transport remains the main mode of choice

•Congestion kept constant at 50% of gridlock levels, despite growth of motorization

•Considerable revenue has been earned by the ALS, ERP and CoEs schemes: US 75 million in 2008

•Replicated successfully in London, Stockholm, Oslo, Trondheim.

Learning Objectives:

• Congestion charging is feasible to implement and retains its strength and effectiveness through the years.

•Needs complementary measures in public transport (such as the comprehensive public transport network in Singapore) and an overall framework on which it can stand

•Measures must evolve into something better that adapts to newer circumstances.

- ALS evolved into the ERP
- ERP also had subsequent adjustments in 2008
- Constant development of the public transport network which has been crucial to the ongoing success of the overall transport policy.

ERP in Singapore Today

- 65 ERP gantries

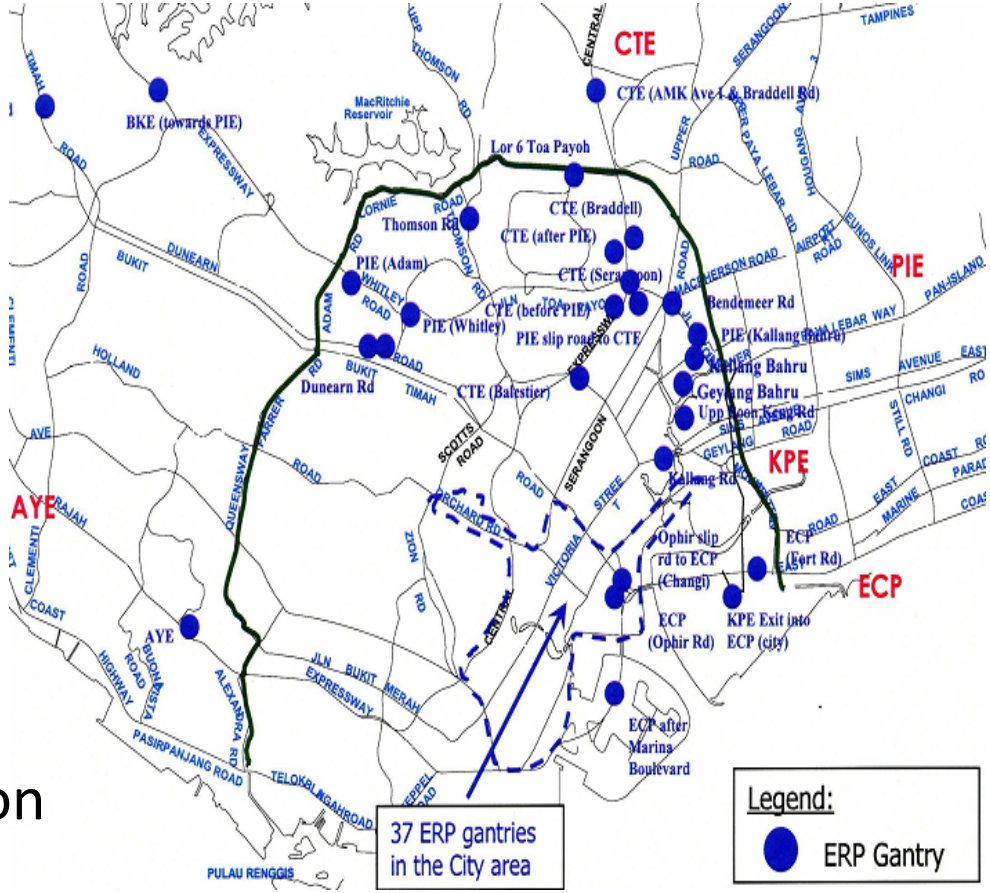
  island-wide

- Smooth traffic flow

  during peak hours

- Continuously fine-tuned and enhanced

- Part of a total transport solution

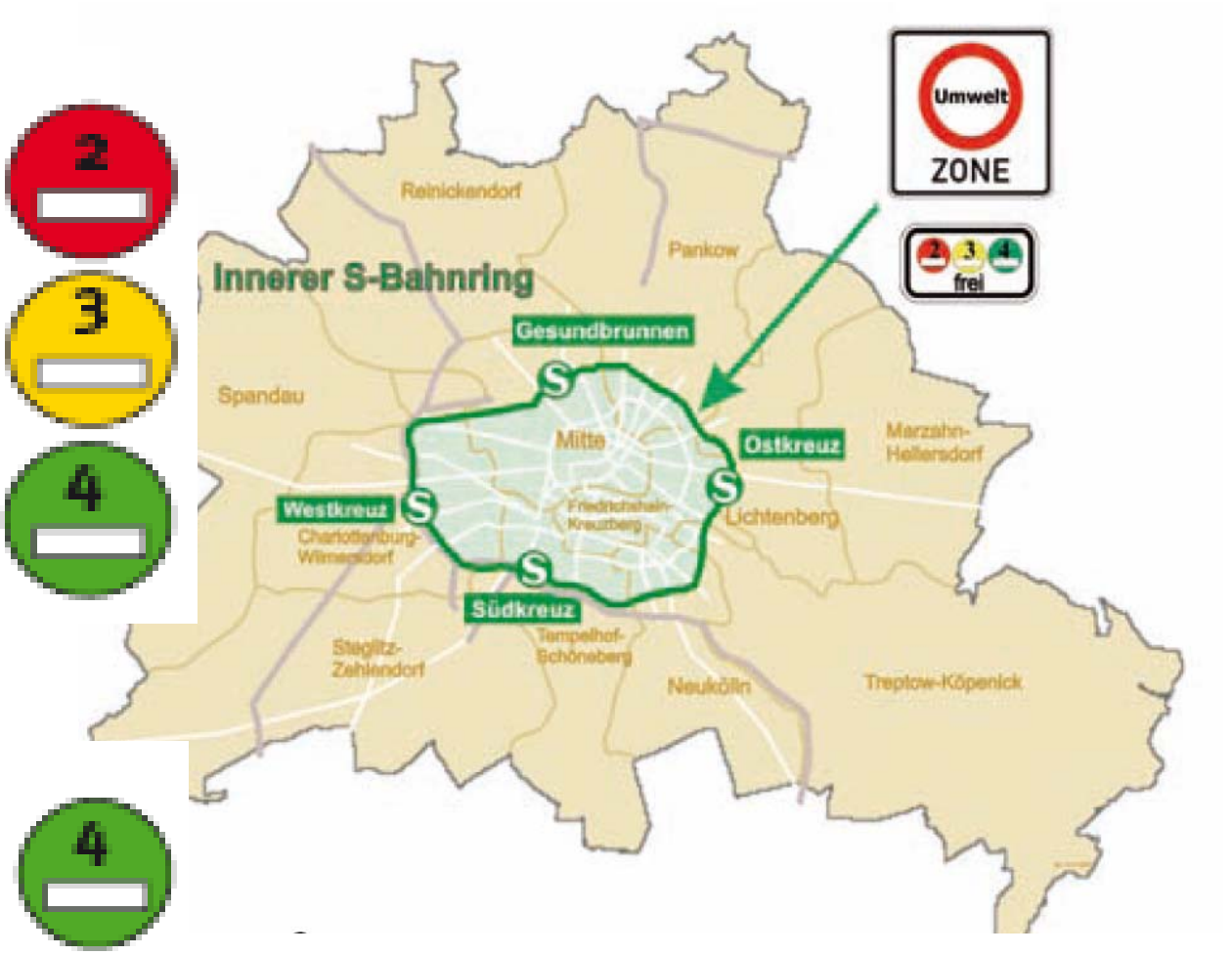


Source: S. Kodukula, GTZ, "Transport Demand Management" (Presented at the National EST Training Workshop-cum-Policy Dialogue, Dhaka, Bangladesh, 26-28 April 2009). (Unpublished)

Case Study 4: Berlin's Low Emission Zone - Who is allowed to drive in Berlin's environmental zone?

Stage 1 from 1.1. 2008: Vehicles (lorries and passenger cars) must at least meet the requirements of Pollutant Class 2 of the recently adopted national vehicle marking scheme Therefore, vehicles with red, yellow and green stickers are allowed.

Stage 2 from 1.1.2010: Only vehicles in Pollutant Class 4—thus, only vehicles with green stickers—can drive in the zone.



The environmental zone covers Berlin's inner city within the urban railway ring. It is an area of approximately 88 km2, which is especially densely developed. Approximately one million of Berlin's 3.4 million inhabitants live here.

Source: Axel Friedrich

Berlin 'Umweltzone' Program

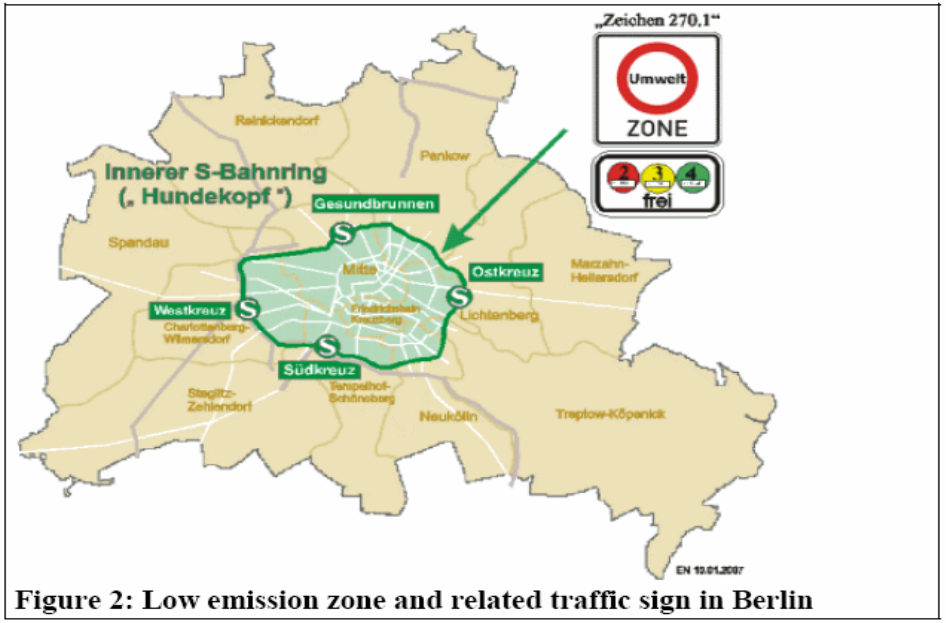


Figure 2: Low emission zone and related traffic sign in Berlin

sticker:	2 S-UM43	3 S-UM43	4 S-UM43
minumum criteria for Diesel vehicles	Euro 2, or Euro1 plus particle filter	Euro 3, or Euro 2 plus particle filter	Euro 4, Euro 3 plus particle filter
ban for Diesel veh. older than …	1992	1996	2000
minimum citeria for petrol cars			Euro 1 plus catalytic converter

Figure 1: German vehicle labelling scheme

Main features:

- a special 88 km^2 environmental zone has been created to decrease the excessively high levels of PM_{10} and NO_2
- only vehicles meeting certain exhaust gas standards are allowed into the zone.
- vehicles are categorized into four groups
- all registered vehicles receive a sticker certifying their emission level

Source: Martin Lutz, "The LEZ in Berlin – Results of a first Impact Assessment" (Presented at the Workshop on "NOx: Time for Compliance", Birmingham, Nov 2009). (Unpublished)

Berlin 'Umweltzone' Program

Impacts:

• Net reduction of 24% of exhaust particulate emissions and 14% lower NOx emissions from Berlin's motor traffic

•impact on annual PM10 (fine particulates) pollution is about a 3% reduction

•SO2-concentrations have fallen to 5% of the levels 20 years ago

•Decrease of traffic by 4% inside the zone and 6% in surrounding areas

•70% of high polluting passenger cars and more than 50% of old commercial vehicles have disappeared from the city center

•Reduction of 73% of "no sticker" (class 1) passenger cars and 53% of commercial vehicles when comparing 2006-2008. (Lutz, 2009; City of Berlin 2010).

Learning Objectives:

•LEZ must be properly planned and progressively implemented

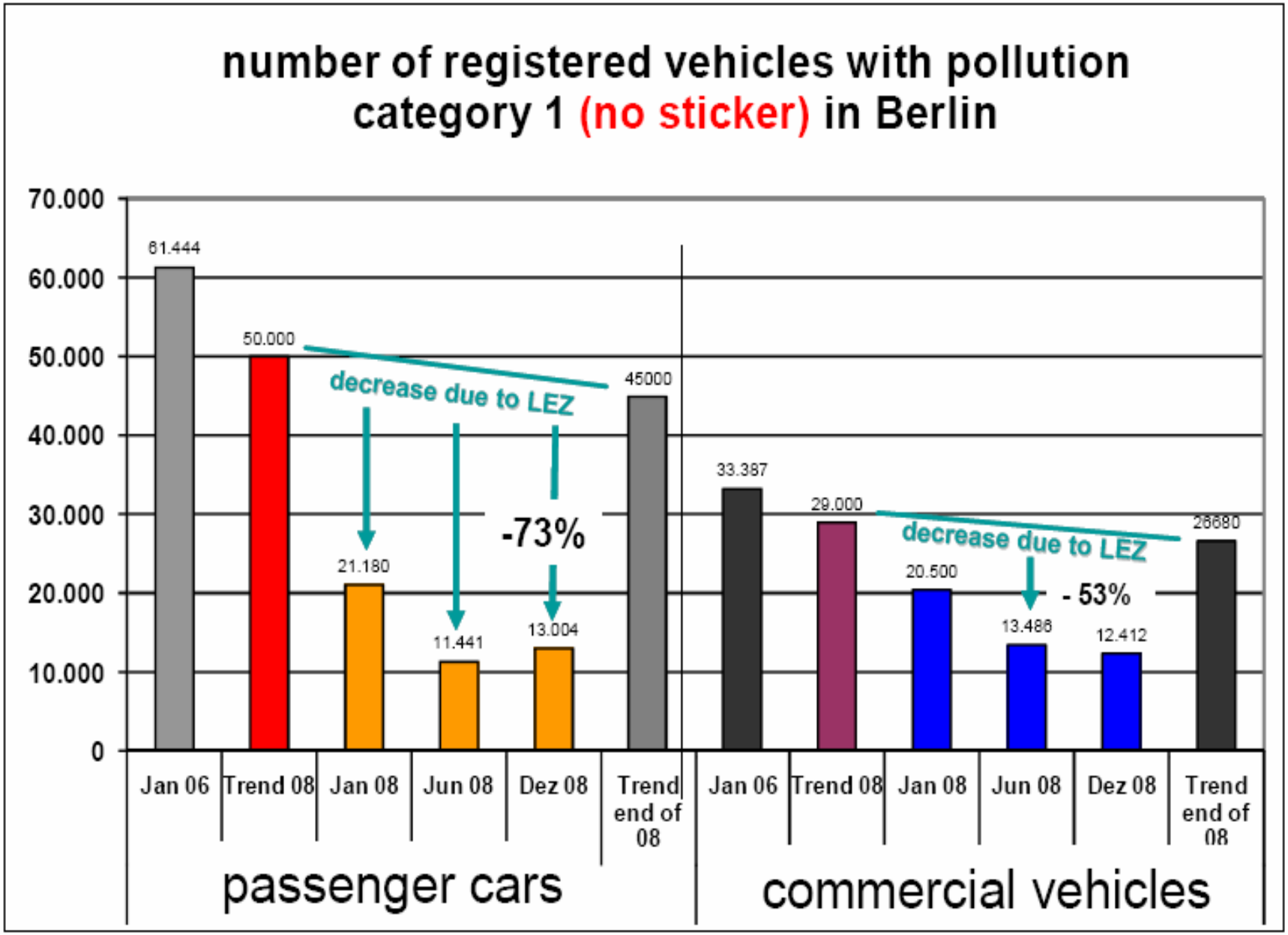
•LEZ can have specific and immediate benefits - air pollution, GHG emissions, traffic congestion, health

Support from higher levels of government can be crucial

•Various components - Emission classes, issuance of stickers, Enforcement, LEZ area

•Users perspective - may be willing to take part in the LEZ; need support from the government in retrofitting/acquiring vehicles

Source: Martin Lutz, "The LEZ in Berlin – Results of a first Impact Assessment" (Presented at the Workshop on "NOx: Time for Compliance", Birmingham, Nov 2009). (Unpublished)



Source: Martin Lutz, "The LEZ in Berlin – Results of a first Impact Assessment" (Presented at the Workshop on "NOx: Time for Compliance", Birmingham, Nov 2009). (Unpublished)

Acknowledgement

Many of the materials/slides used in this PowerPoint presentation were contributed by the Expert Group Members of the Regional EST Forum in Asia (1st ~ 5th), international transports experts who participated in the National EST Training Workshop-cum-Policy Dial ogues, and Asian Mayor's Policy Dialogues. For details about the Forum and each individual expert member, please see: http://www.uncrd.or.jp/env