



# Redefining Public Transport - Recent Achievements and way forward for Developing Cities

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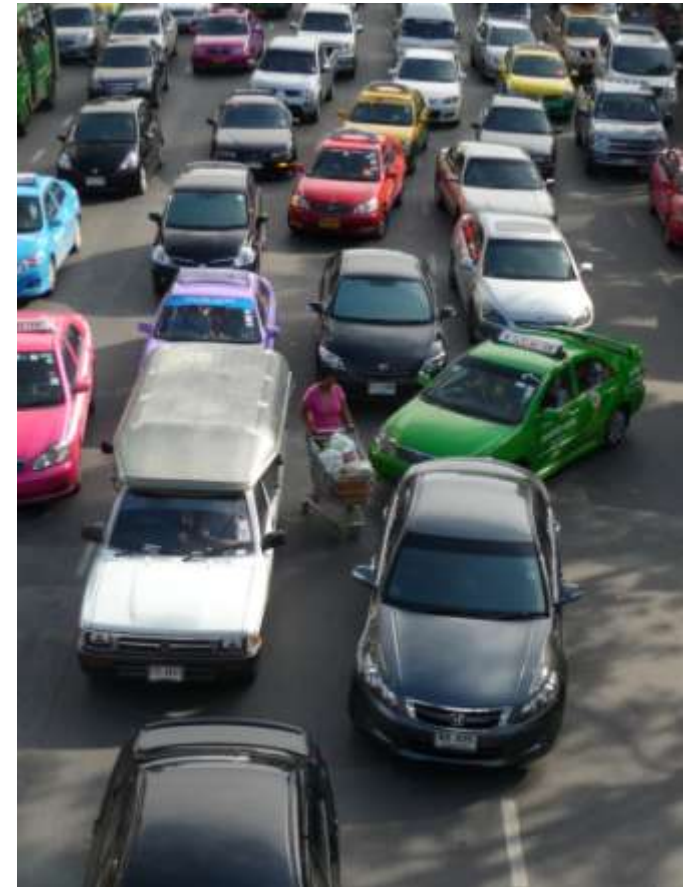
**Manfred Breithaupt**  
**GTZ – Water, Energy, Transport**





# Outline

- Challenges in Urban Transport
- Redefining Public Transport, Why?
- Recent Achievements
- Way Forward for Developing Cities



Source: Wagner/GTZ 2008, Bangkok



## Some current trends in cities

### Trends

- Rapidly increasing car ownership and use
- Declining mode share of public transport, walking, and cycling
- Declining city centres; rapid decentralisation into car-oriented suburban sprawl

### Some effects

- Worsening air pollution & noise (more than 2 million deaths p.a.)
- Poor and deteriorating road safety (over 1 million deaths p.a.)
- Increased congestion
- Deteriorating operating conditions for public transport
- Pedestrians and cyclist increasingly marginalised by private motor vehicles

**> Less liveable cities**



## The transport paradox

“Transport is unique as the only development sector that worsens as incomes rise. While sanitation, health, education and employment tend to improve through economic development, traffic congestion tends to worsen.”



Lloyd Wright

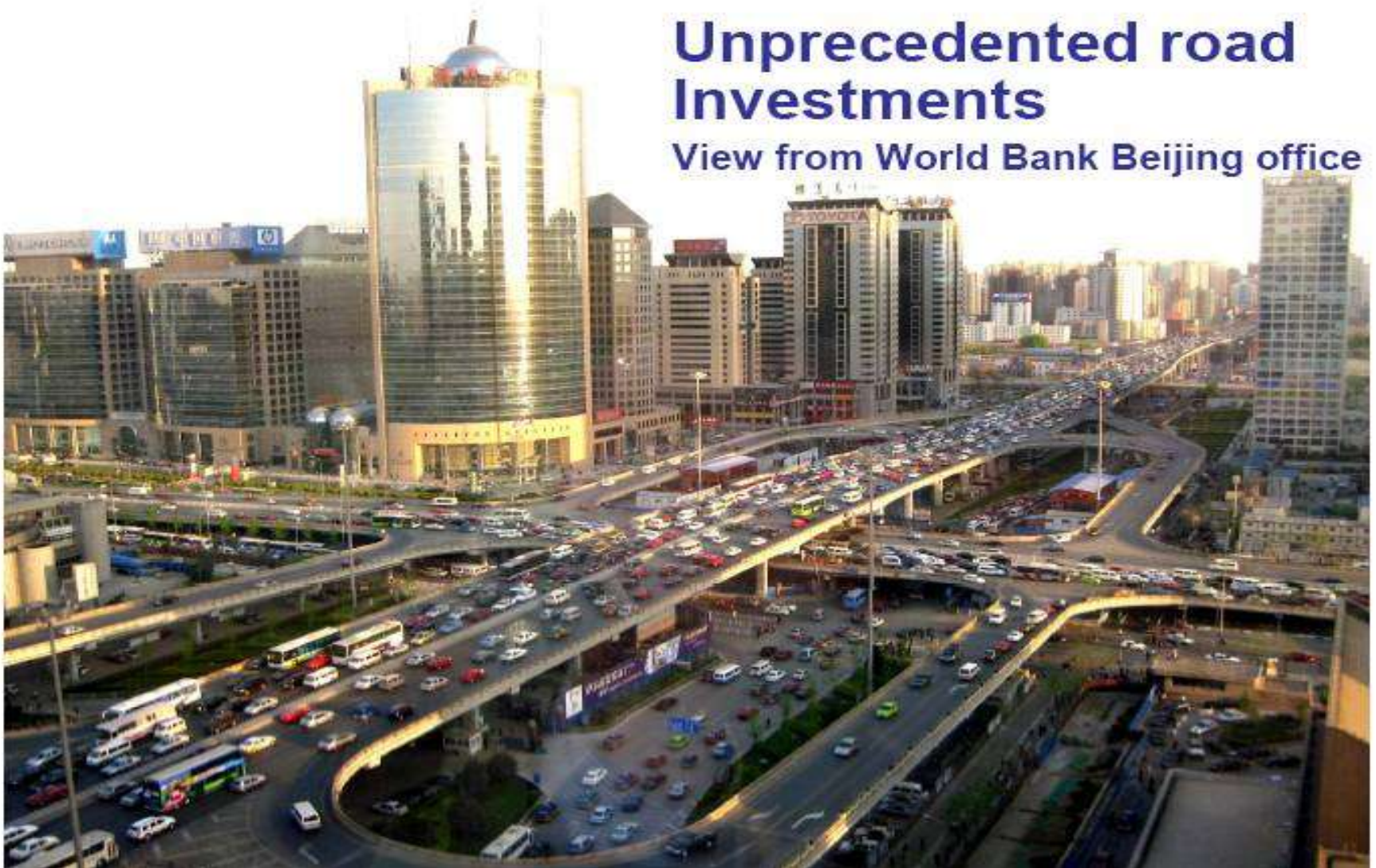
## ■ Challenges in Urban Transport



Will this solve congestion problems?

### Unprecedented road Investments

View from World Bank Beijing office



**Bangkok developed an extensive roadway network, but road construction could not keep up with demand. Road building is an expensive way of dealing with travel demand.**



## ■ Challenges in Urban Transport

Often transport prices do not reflect internal and external costs. Fuel prices are often too low and do not include appropriate fuel taxation.

The same applies to vehicle registration fees, parking charges, etc.



E.g. Yogyakarta

Source: Breithaupt/GTZ 2008

## ■ Challenges in Urban Transport



Low attraction and bad image of public transport



**Guangzhou,  
China (before  
the new BRT)**

Source: ITDP



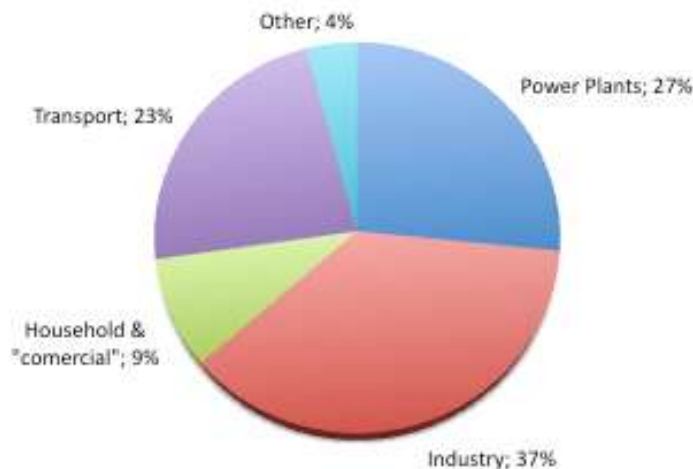


## ■ Challenges in Urban Transport

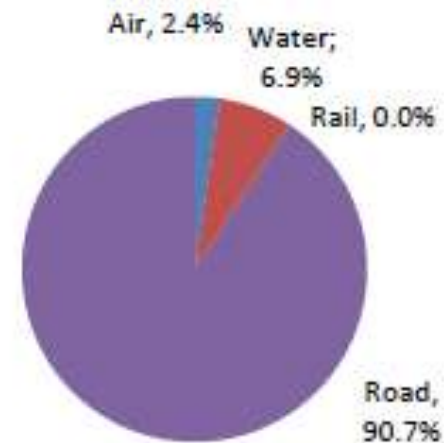
Transport accounts for 13% of global GHG emissions, in developing countries energy consumption and CO<sub>2</sub> emissions from transport are increasing rapidly

E.g. in **Indonesia**, 2005, Transport contributed 23% of the total CO<sub>2</sub> emissions from the energy sector or 20.7% percent of the country's overall CO<sub>2</sub> emissions. Many dev countries experience the same situation

CO<sub>2</sub> Emissions from the Energy Sector 2005  
[million ton]



Modal Mix in terms of Energy Consumption 2005



Source: ICCSR 2010

## ■ Redefining Public Transport, Why?



Total external costs of transport / year

Cost of  
congestion, air  
pollution and  
traffic accidents  
(EU 25)

€ 560 Billion

Total turnover  
including capital  
investments in  
public transport in  
Europe

€ 120 Billion

Per capita GDP  
wasted due to  
congestions, air  
pollution and  
accidents

€ 1240

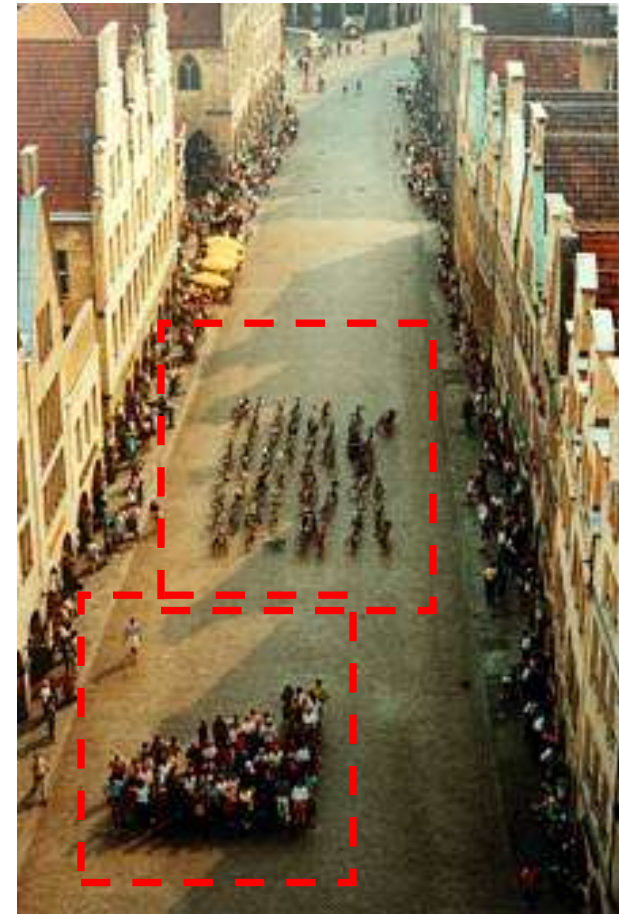
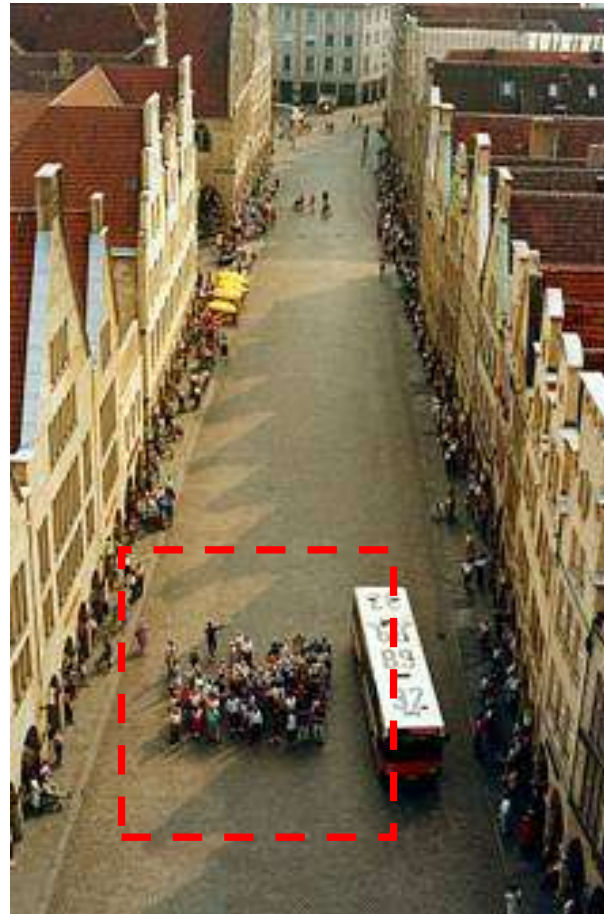
Congestion alone costs a minimum of 2% of the national GDP and between 2 and 8% in the European Union (+/\_200b €)

Source: UITP

## ■ Redefining Public Transport, Why?



Traditional focus was given to road design: More infrastructure for cars, more space for motorized vehicles---Unsustainable focus

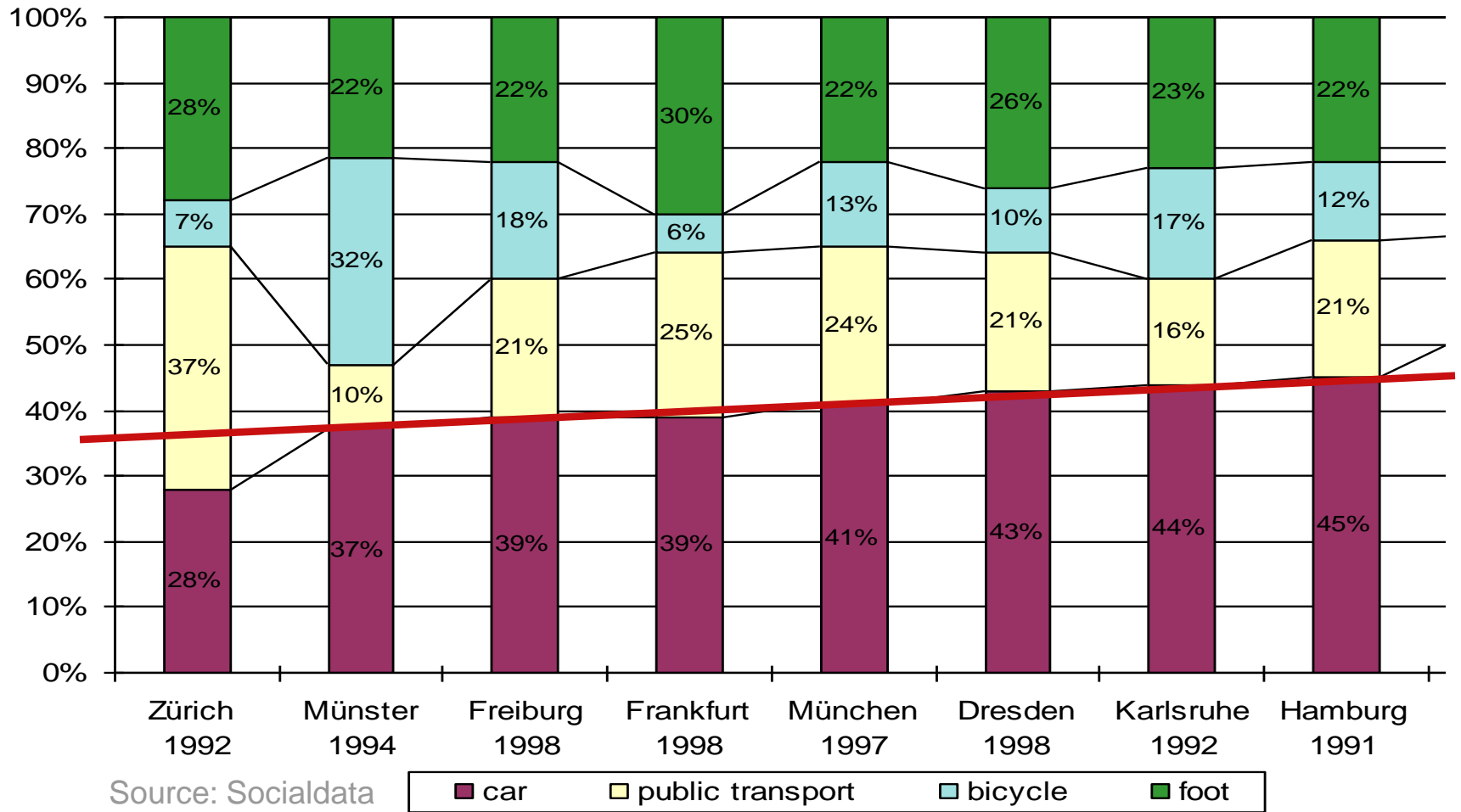


Source: City of Münster

# ■ Redefining Public Transport, Why?



## Getting the perspective right



...the majority of trips is still made by walking, cycling and public transport!

# ■ Redefining Public Transport, Why?



## Alternatives?

### Alternative 1: Capital intensive solutions

- Give greater capacity to the road network in the hope to relieve congestion
- Build massive rail transport systems (light rail- metro)

### Alternative 2: Change paradigms

- Give priority to non motorized transport and public transport
- Restrict automobile use

Shanghai  
Photo: E.Penelosa



Amsterdam, The Netherlands  
Photo: FPPQQ

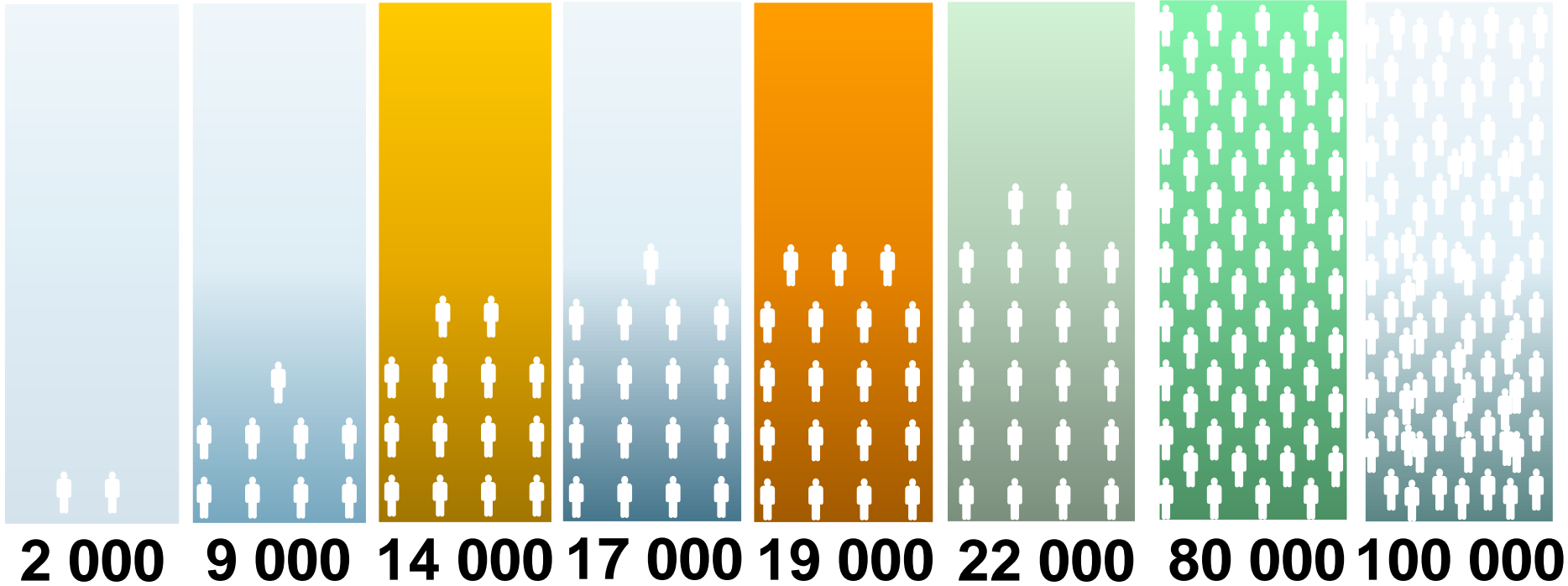




# ■ Redefining Public Transport, Why?

## Corridor Capacity

(people per hour on 3.5 m wide lane in the city)



Source: Botma & Papendrecht, TU Delft 1991 and own figures

## ■ Redefining Public Transport, Why?



CO<sub>2</sub> emissions from passenger transport vs. modal split: Selected cities

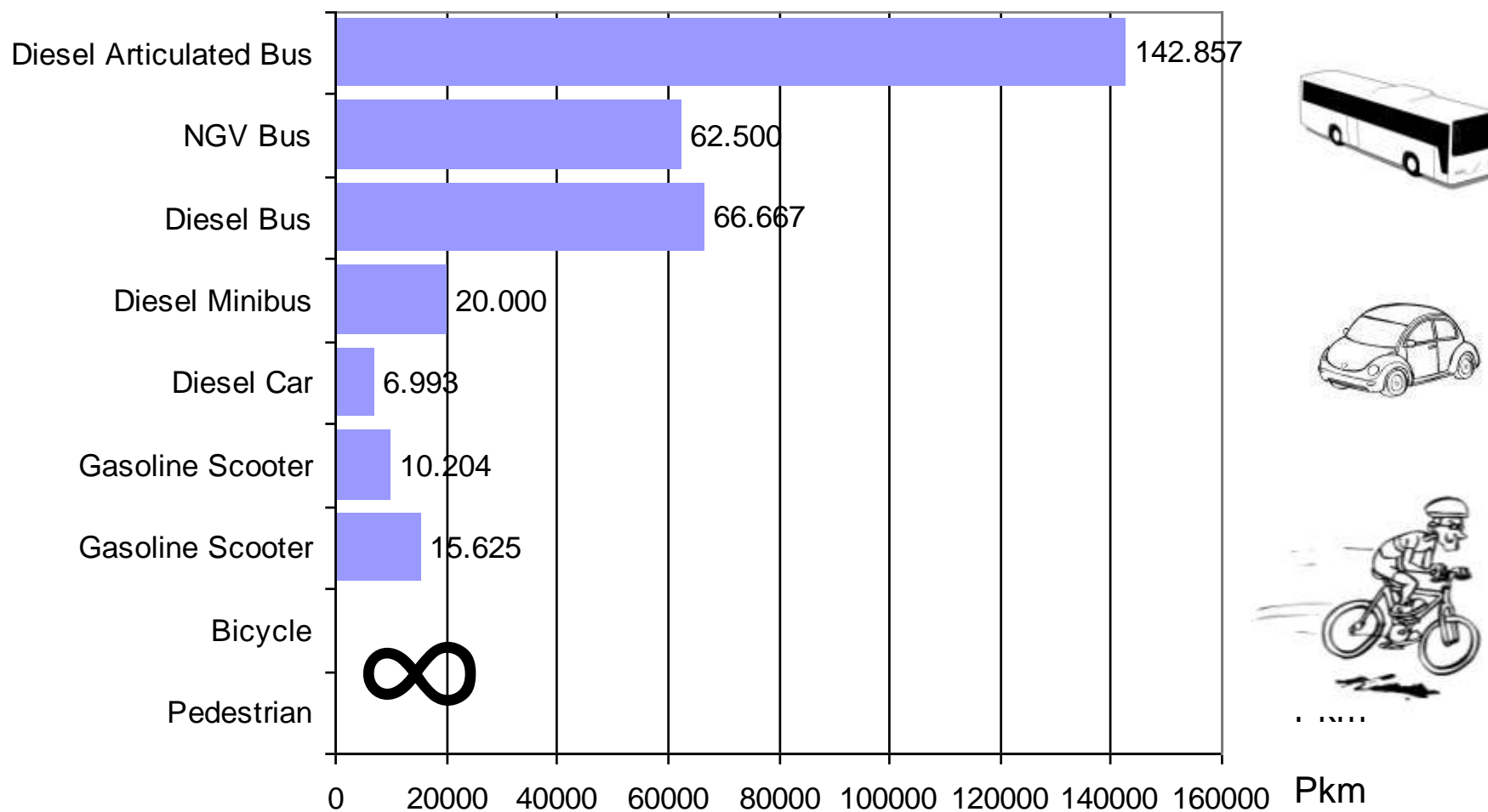
	<b>% public transport, walking and cycling</b>	<b>CO2 emissions (kg per capita per year)</b>
Houston	5%	5690 kg
Montreal	26%	1930 kg
Madrid	49%	1050 kg
London	50%	1050 kg
Paris	54%	950 kg
Berlin	61%	774 kg
Tokyo	68%	818 kg
Hongkong	89%	378 kg

Source: UITP

# ■ Redefining Public Transport, Why?



How far can I travel on 1 ton CO<sub>2</sub>?



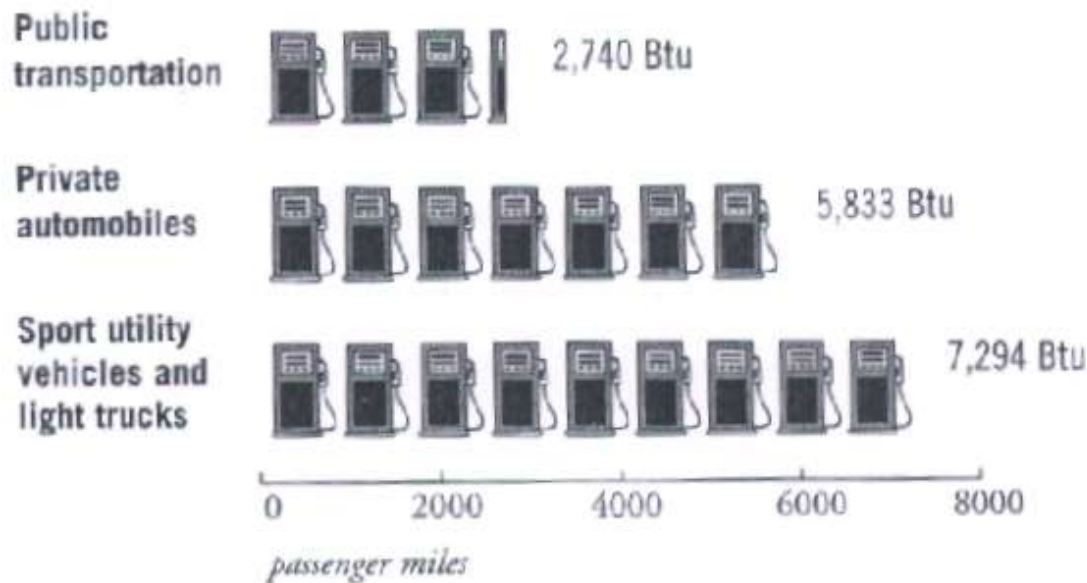
Source: GTZ Sourcebook Module "Transport and Climate Change", 2007, based on Hook / Wright, 2002



# ■ Redefining Public Transport, Why?



## Public Transportation Uses Less Fuel



Energy savings between cities with a high modal share of public transport and cities where most trips are made by private car represent around **500 to 600 litres of petrol per inhabitant per year.**

Source: UITP



## Energy consumption and transport

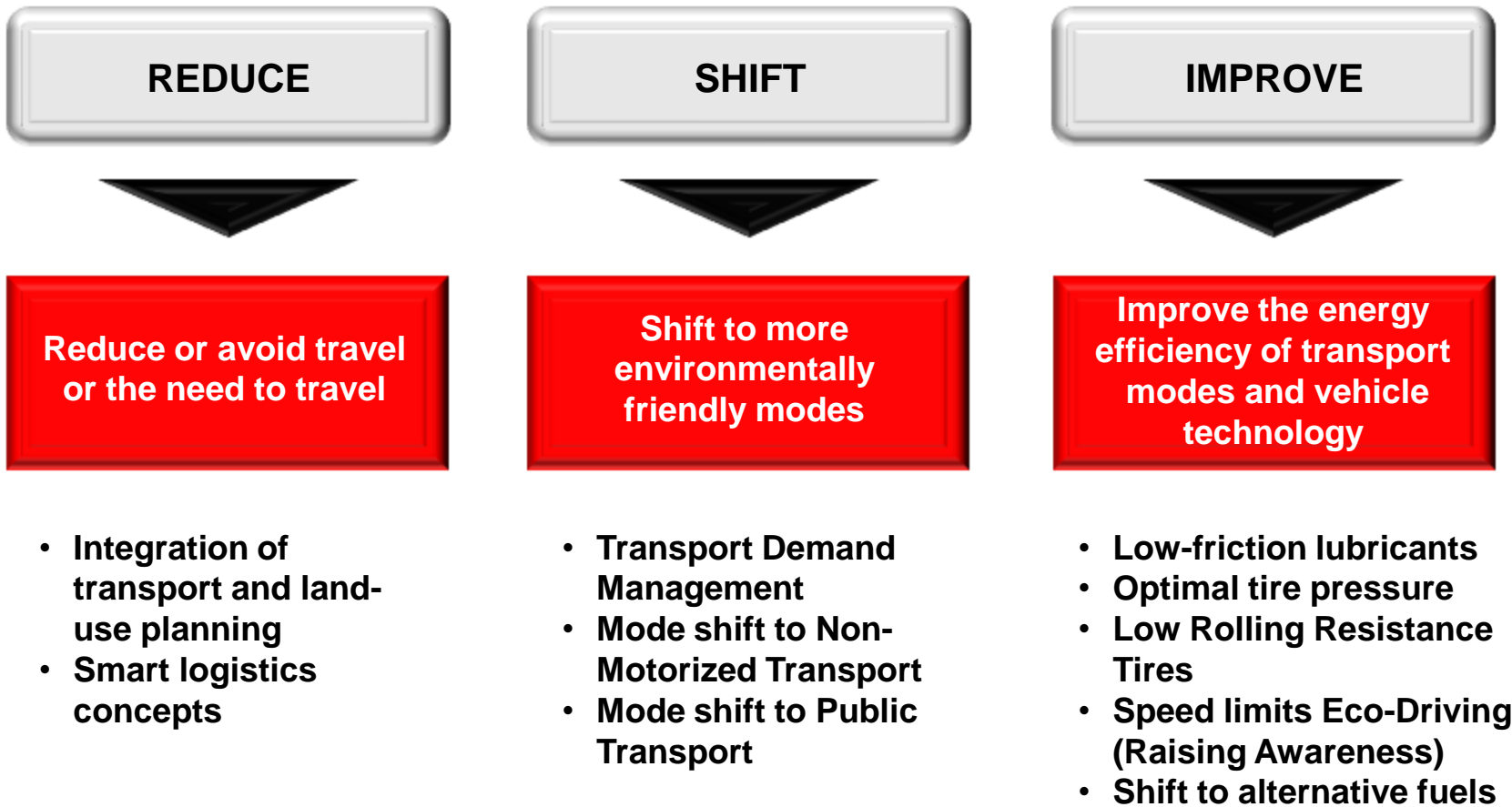
	Modal share of walking, cycling and public transport		Average energy consumption per person (MJ)	
	1995	2001	1995	2001
<b>Athens</b>	34,1	40,9	12.900	12.600
<b>Geneva</b>	44,8	48,8	23.600	19.200
<b>Rome</b>	43,2	43,8	18.200	17.100
<b>Vienna</b>	62	64	10.700	9.050

Cities which increased the modal share of walking, cycling and PT saw a decrease in the consumption of energy for passenger transport per capita.

Source: UITP



## The Approach of GTZ





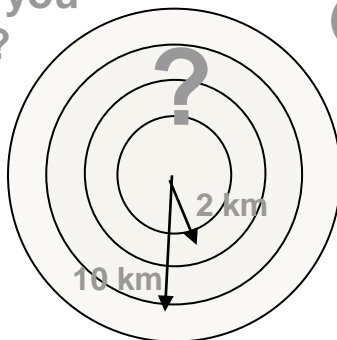
# Recent Achievements

Traffic generation & Carbon emissions:  
What aspects should we concentrate on?

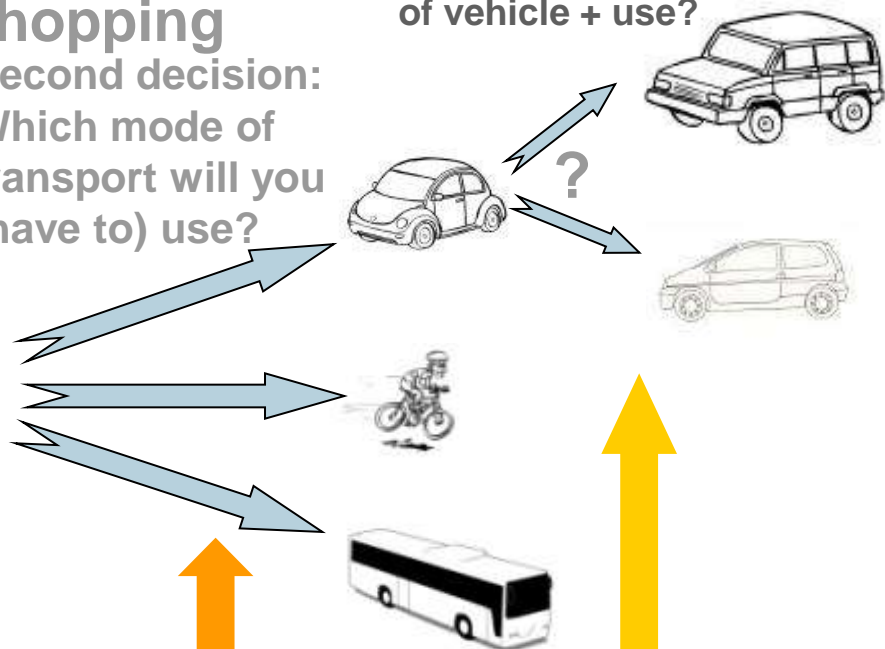


## Example: Shopping

First decision:  
How far do you have to go?



Second decision:  
Which mode of transport will you (have to) use?



Third decision:  
Which type of vehicle + use?



Starting point:  
A household requires a wide range of goods, with varying frequency.

**Smart infrastructure planning: Reduces need for travelling!**

**AVOID**

**Encourage use of non-motorized and public transport!**

**SHIFT**

**Reduce car size and consider using alternative fuels!**  
**IMPROVE**

## Recent Achievements



### Car use and fuel prices

The price changes 2004-2006 brought the US and Canada up to Germany's cost per year, and to Japan's cost per trip

	LDV stock average economy, L/100km	Average travel, vkt / year	Avg. fuel use per year, litres	Taxed gasoline Price / litre, Aug 2006	Avg. fuel cost per year	Avg. fuel cost for a 10km trip
<b>USA</b>	<b>12.0</b>	<b>17,000</b>	<b>2,040</b>	<b>\$0.79</b>	<b>\$1,614</b>	<b>\$0.95</b>
<b>Canada</b>	<b>10.5</b>	<b>16,000</b>	<b>1,680</b>	<b>\$0.98</b>	<b>\$1,642</b>	<b>\$1.03</b>
<b>Germany</b>	<b>8.0</b>	<b>12,000</b>	<b>960</b>	<b>\$1.70</b>	<b>\$1,634</b>	<b>\$1.36</b>
<b>Japan</b>	<b>7.8</b>	<b>10,000</b>	<b>780</b>	<b>\$1.24</b>	<b>\$969</b>	<b>\$0.97</b>

Note: this chart does not reflect likely changes to average fuel economy or travel. It holds these at 2004 levels for comparative purposes.

## ■ Recent Achievements



City form and dominant mode of transport is strongly linked to energy use



- Energy consumption for transport per inhabitant is **four times higher** in cities such as **Houston** or **Chicago**, where the majority of trips are made by private cars compared with cities such as **Warsaw** or **Hong Kong**, where public transport, walking and cycling are highly used
- Source: UITP Mobility in cities database



## 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.

## ■ Recent Achievements



- ✓ Bogotá
- ✓ Curitiba
- ✓ Copenhagen
- ✓ Zurich
- ✓ Freiburg
- ✓ Vienna
- ✓ Seoul
- ✓ Singapore
- ✓ Hongkong



**All of these successes featured an integrated and packaged approach:**

- 1. High-quality public transport**
- 2. Improved conditions for walking and bicycling**
- 3. Effective integration of modes**
- 4. Supportive land-use policies**
- 5. Car-restriction measures**



## ■ Recent Achievements



## ■ Redefining Public Transport, Why?



What do citizens want?

- ✓ Rapid journey
- ✓ Convenience
- ✓ Comfort
- ✓ Frequent Service
- ✓ Safety
- ✓ Security
- ✓ Customer Service
- ✓ Low cost
- ✓ Have a network



**Public Transport  
should be  
designed around  
the customer and  
not around a  
technology**



## Bus Rapid Transport (BRT)



Source: Enrique Penalosa, Bogota 2008

### Key features of BRT

- Segregated busways
- Pre-board fare collection and fare verification
- Restricted operator access (closed system)
- Free transfers between corridors
- Competitively bid concessions
- High frequency service and low station dwell times
- Clean bus technologies
- **Modal integration** (including timetables / fares)



## ■ Recent Achievements

### Providing an integrated BRT system

Functional model: System by hierarchy of routes



#### Trunk lines

- Structural axis, long distances, high demand
- Articulated buses (160 passengers) and **biarticulated** (250 passengers)
- Fare payment: At station. Exclusive lane with or without passing lane



#### Auxiliary

- Support trunk routes. Corridors of medium demand. Transport and distribution of demand.
- Padron bus (80 passengers), Bus (50 passengers), Buseta (40), minibuses (19). Fare payment : in the bus. Mixed traffic operation.



#### Feeders and complementary

- Feeders to trunk lines, at terminal stations, simple stations
- Padrones (80 passengers) and Buses (50 passengers)



#### Special routes (urban and rural)

**Attention to areas of difficult access (mountains) or very low demand**

Vehicles: Special buses or minibuses . Internal fare payment

## Recent Achievements

### Bogota SITP (Sistema Integrado de Transporte Público)

- By 2015, the system will serve 5 million passengers per day over 388 kilometers of busways;
- Up to 40 000 pass/hr/direction on trunk
- 5 bus operators are selected by hierarchy of routes.



Source: Transmilenio, Bogota 2008





## Guangzhou, China

### Approach

Very recent system, highest capacity Bus Corridor in Asia, 800 000 pass a day.

Minimizes transfer penalty and optimizes directness of route

Stations with sufficient capacity to accommodate huge numbers of passengers and high bus frequencies

Minimal changes in existing bus routes (merely selecting which ones are 'inside' the BRT and which are outside)



### Initial Situation: Guangzhou, China

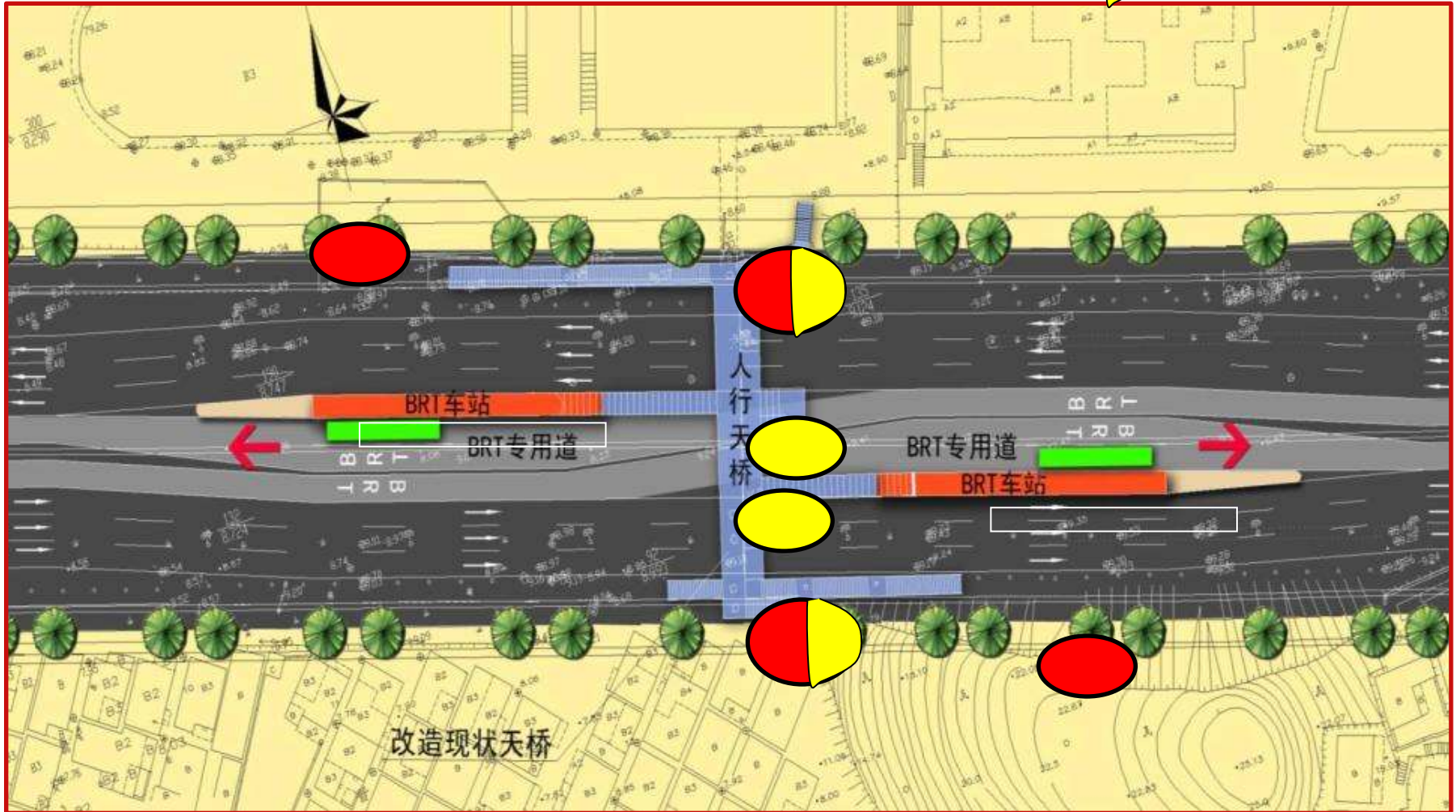


Source: NLP 2009

# Recent Achievements

## Guangzhou, China – Modal Integration

-  Bike parking
-  Bike sharing



Source: ITDP 2009

■ Recent Achievements



# Guangzhou, China

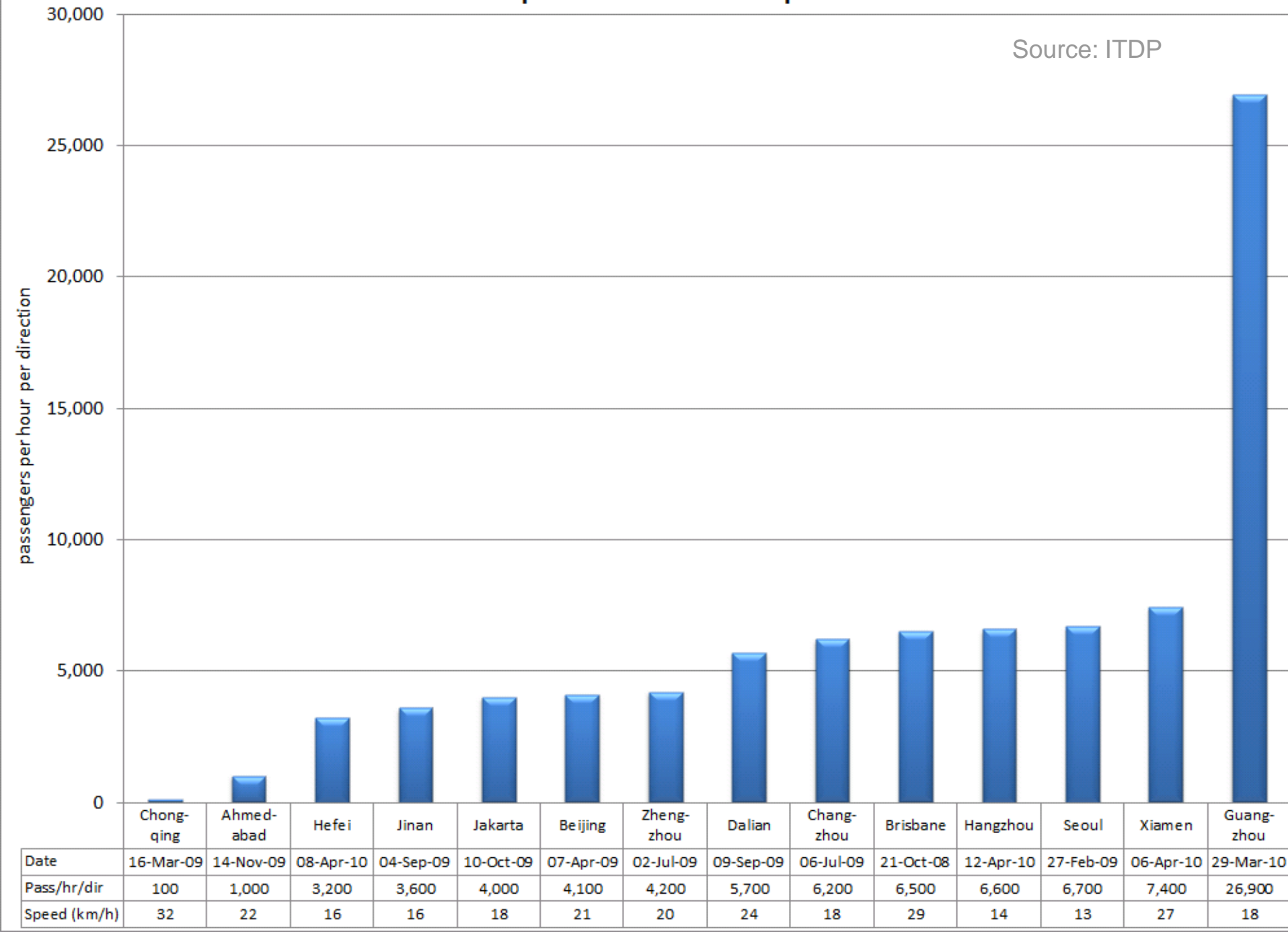


Source:  
ITDP 2009



## Asia BRT speed and demand comparison

Source: ITDP





## South Africa : BRT Planning Johannesburg

### Objective

- Provide a high quality and affordable transport system, which is fast and safe
- Strengthening of the capacity of decision makers and bus operators

### Client

- City of Johannesburg

### Measures

- Implementation of a high-capacity Bus Rapid Transit (BRT) system
- Active assistance in planning and design
- Advice on financial issues, on measuring and maximising the environmental benefits of the BRT and registering the project for Clean Development Mechanism (CDM) credits

- BMZ provided a grant (2 million Euro) to assist the City of Johannesburg in the BRT planning process.
- The grant (F+E) was channeled through KfW.
- GTZ has been commissioned to execute the project.

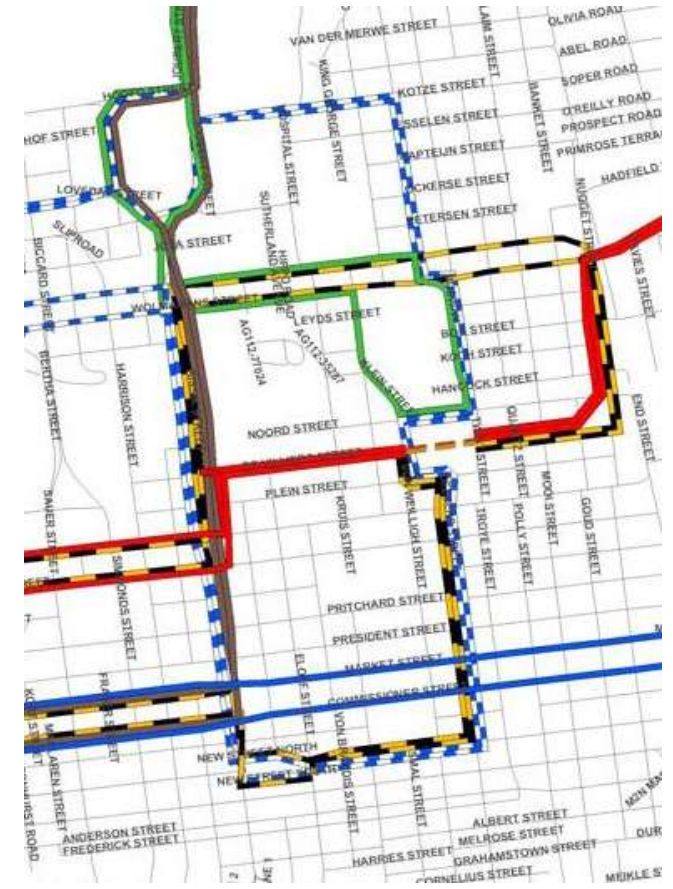




## World Cup 2010: Bus Rapid Transit System Johannesburg

Implementation of defined work packages including :

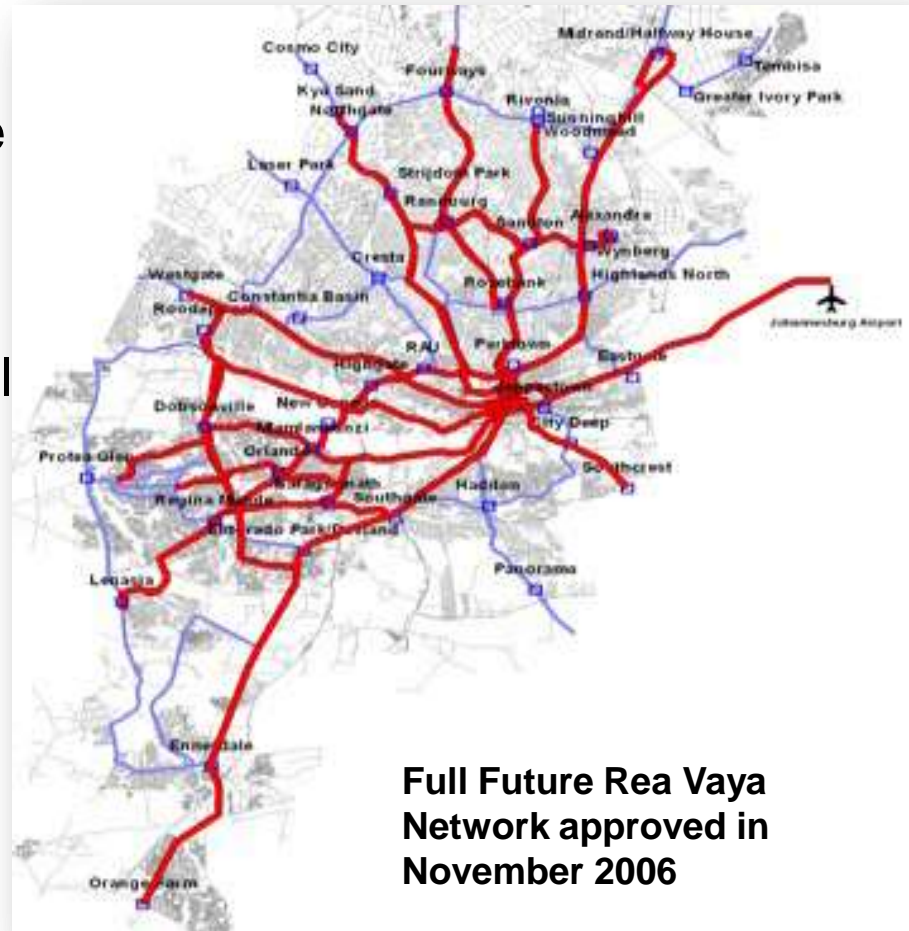
- Financial Modelling,
- Operation Design,
- Operators Business Plan,
- Fleet specification,
- Infrastructure Planning,
- Transport Operators liaison,
- Marketing and Communication and
- Negotiation frame with taxi industry





## BRT “Rea-Vaya”

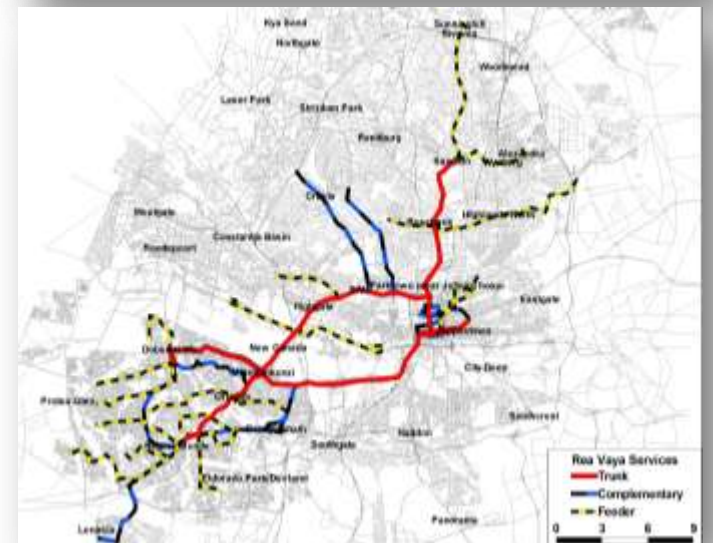
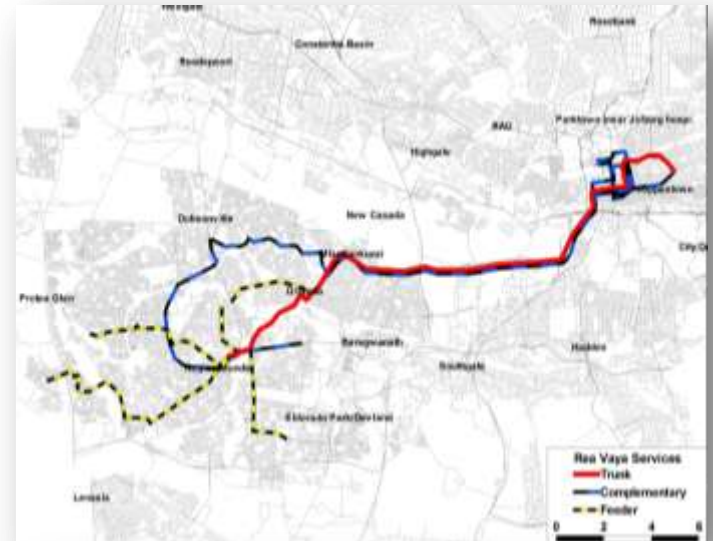
- Nov. 2006: Johannesburg decided to adopt BRT in principle as its long-term mass transit option
- Planning went partially in parallel with construction
- Aug. 2009: the first 40 Rea Vaya buses began operating; Full project: 122 km of exclusive busways





## Developments to date

- Starter service on “Phase 1A” in operation since August, 2009
- On 3 May 2010 full Pase 1A with 143 buses and feeder lines
- First corridor: 25,5 km
- 23 stations
- 50 000 passengers a day
- “Phase 1B” under construction, to be operational in 2011





## Achievements

- Rapid implementation
- High quality infrastructure and fleet
- Credible public transport alternative
- Well-supported and liked by passengers
- Displaced taxi drivers being employed.





## ■ Recent Achievements

### **Sustainable Urban Transport Improvement Project (SUTIP) Indonesia-** Towards the Implementation of Sustainable Urban Transport in selected Indonesian Cities:

- **Component I: Support for the Ministry of Transportation**
  - Development of National Urban Transport Policies, Standards and Regulatory Framework
  
- **Component II: Direct support to selected City Government**
  - Strengthening Institutional Capacities in Transportation Planning and Transport-related Governance
  - Support in Implementing measures which contribute to more sustainable urban transport systems



## Component II (Direct Support to Cities)

Assist (at present 4) Cities directly in implementing sustainable urban transport improvements:

- Non-motorized Transport
- Transportation Impact Control
- Bus industry restructuring
- TDM measures





## Recent Achievements



### Public Transport Integration

#### The reality in most cities:

- Public transport is underdeveloped, not attractive enough for customers (often 2-4 tickets are required to get to work per direction)
- There often exist stand alone systems (Bangkok, Manila, Kuala Lumpur....) without proper physical, time table- and fare-integration
- Fares are collected at vehicles (causing slower services)
- Urban transport responsibilities are often fragmented between various ministries, provincial and municipal level



#### Outlook:

**Public transport integration is the challenge during coming years to considerably increase attractiveness of PT!**

# Recent Achievements

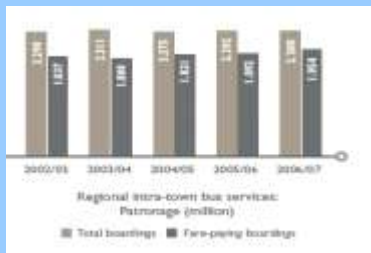
## What to do: 2 main issues

### Public Transport – Integration (physical, fare, institutions, timetables)



Station	Line	Direction	Time
Hamburg	1	to	08:00
Hamburg	1	to	08:15
Hamburg	1	to	08:30
Hamburg	1	to	08:45
Hamburg	1	to	09:00
Hamburg	1	to	09:15
Hamburg	1	to	09:30
Hamburg	1	to	09:45
Hamburg	1	to	10:00
Hamburg	1	to	10:15
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Hamburg	1	to	23:15
Hamburg	1	to	23:30
Hamburg	1	to	23:45
Hamburg	1	to	00:00

### Public Transport – Quality Control





## ■ Recent Achievements

4 steps regarding policy framework for public transport:

### **1. Clearly define the role of the national government in urban transport:**

- providing policy directions
- rewarding good practices financially
- adopting performance benchmarking
- guiding municipal financial reform

### **2. Develop accountability procedures and promote public participation**

### **3. Strengthen institutional and technical capacity for strategic planning**

### **4. Integrate urban transport planning and operation for the entire metropolitan area**



## ■ Recent Achievements

The standard model of public transport executives (PTE) in Germany:

### **Level 1**

Regional administrative body as political supervisory body

### **Level 2**

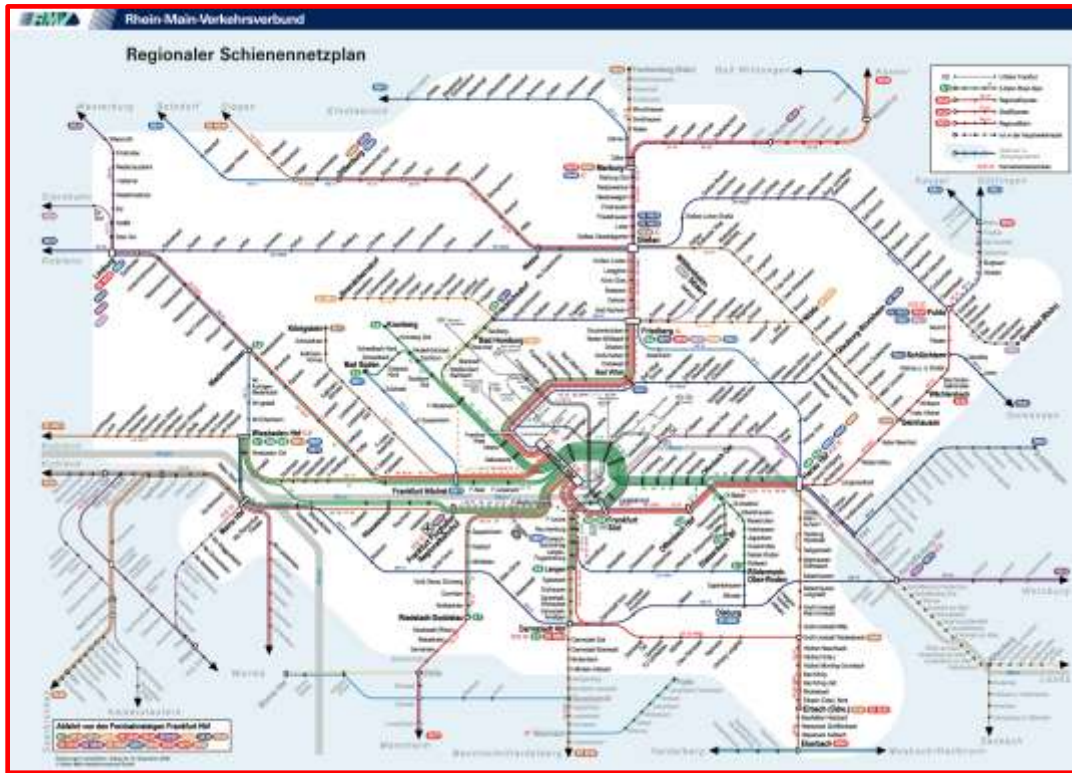
Management level: non-commercial limited company with procurement function for local public passenger transport services (kind of a regulator)

### **Level 3**

Transport operator(s) offering transport services to customers

■ Recent Achievements

# RMV - Rhein-Main-Verkehrsverbund \*



Covers southern part of the Federal State of Hesse (Frankfurt), established in 1995

Municipal association: Cooperation of **25** local responsible authorities ; over 70 operators

\* Adapted from TraffiQ

- Recent Achievements



# Transport modes in Frankfurt and the Rhein-Main-Region



All modes are integrated and part of the RMV network !

Recent Achievements



# Tender Areas for Buses in Frankfurt

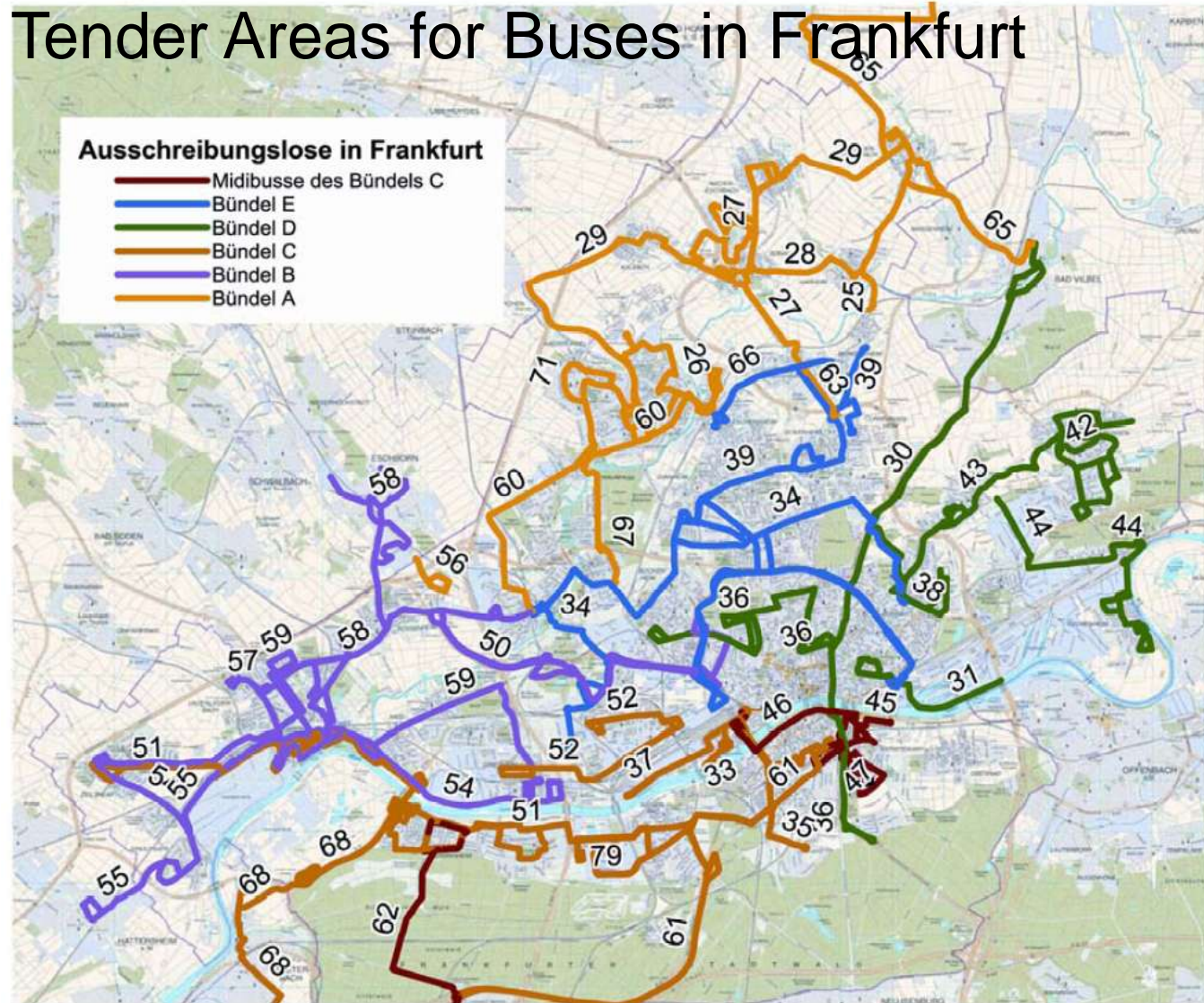


Abb. 5: Bündelaufteilung Frankfurt am Main

## FRANKFURT

(600 000 inh.)

**The 6 Bus Sectors to be tendered separately** (different colours).

**Bus types used:**

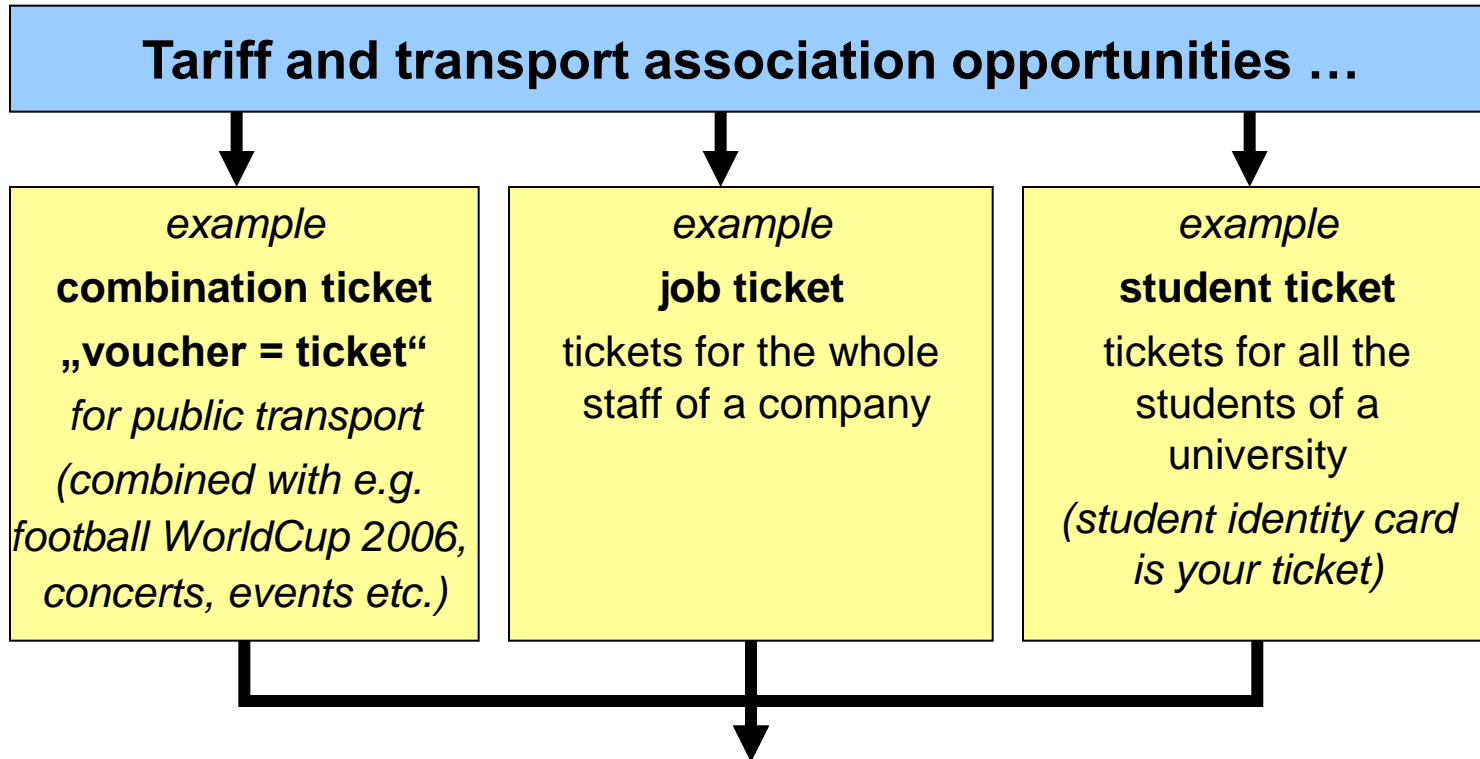
- ◆ Minibuses (line no. 25)
- ◆ Midi-Buses (line 61 in the south)
- ◆ Articulated buses (line 30,37,55,79)
- ◆ Standard buses (all other lines)

**Volume of individual tender:**

c. 50 buses and 3 million buskm for 6 years.



## Fare Integration



### Advantages

- ▶ low costs for distribution
- ▶ assurance of fare income (because tickets sold as a package)
- ▶ political objectives in transportation are easier to reach
- ▶ increase of the usage of public transport in relation to other means of transportation





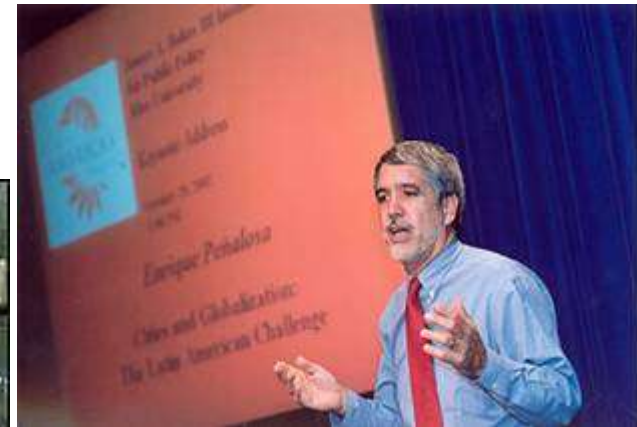
## Leadership

World's best systems were developed with high levels of political support

With strong political will, anything is possible



**Lee Myung-bak**  
Mayor of Seoul



**Enrique Penalosa**  
Former mayor of Bogota



**Jaime Lerner**  
Former mayor of Curitiba



## What do many cities lack?

1. Cities lack the capacity i.e. less information on developments in other cities
2. Officials have not sufficient time to gather information
3. Have funds but are in a dilemma on which investment is correct
4. Less exposure and interaction with other experts around the world

Therefore GTZ has implemented its **SUTP**-Project

# Way Forward for Developing Cities



## Sustainable Urban Transport: Knowledge base

The key features of the Sourcebook include:

- A practical orientation, focusing on best practices in planning and regulation and, where possible, successful experiences in developing cities.
- Contributors are leading experts in their fields.
- An attractive and easy-to-read, colour layout.
- Non-technical language (to the extent possible), with technical terms explained.
- Updates via the Internet.



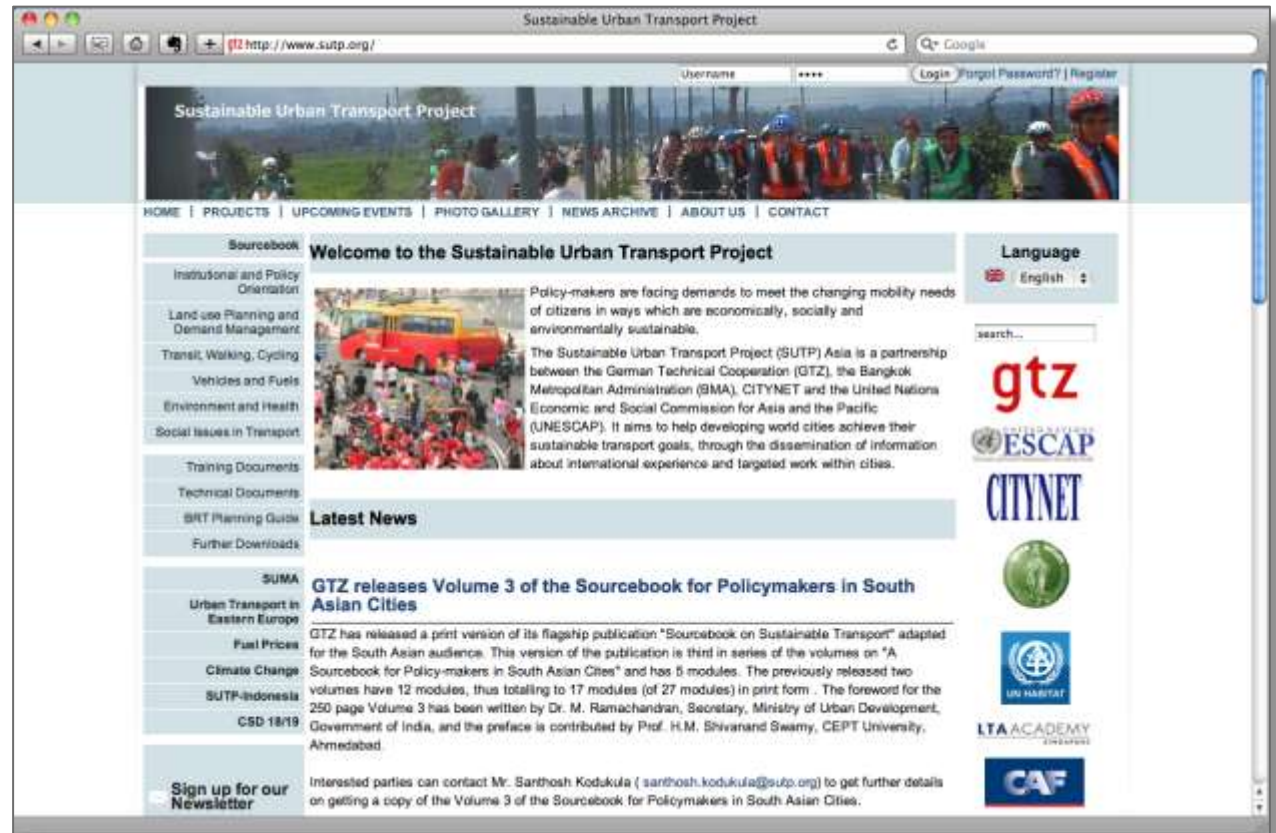
1. [Institutional and Policy Orientation](#)
2. [Land Use Planning and Demand Management](#)
3. [Transit, Walking, Cycling](#)
4. [Vehicles and Fuels](#)
5. [Environment and Health](#)
6. [Social Issues in Transport](#)

# Way Forward for Developing Cities



**Sustainable Urban  
Transport:**

**International  
Networking &  
Dissemination**



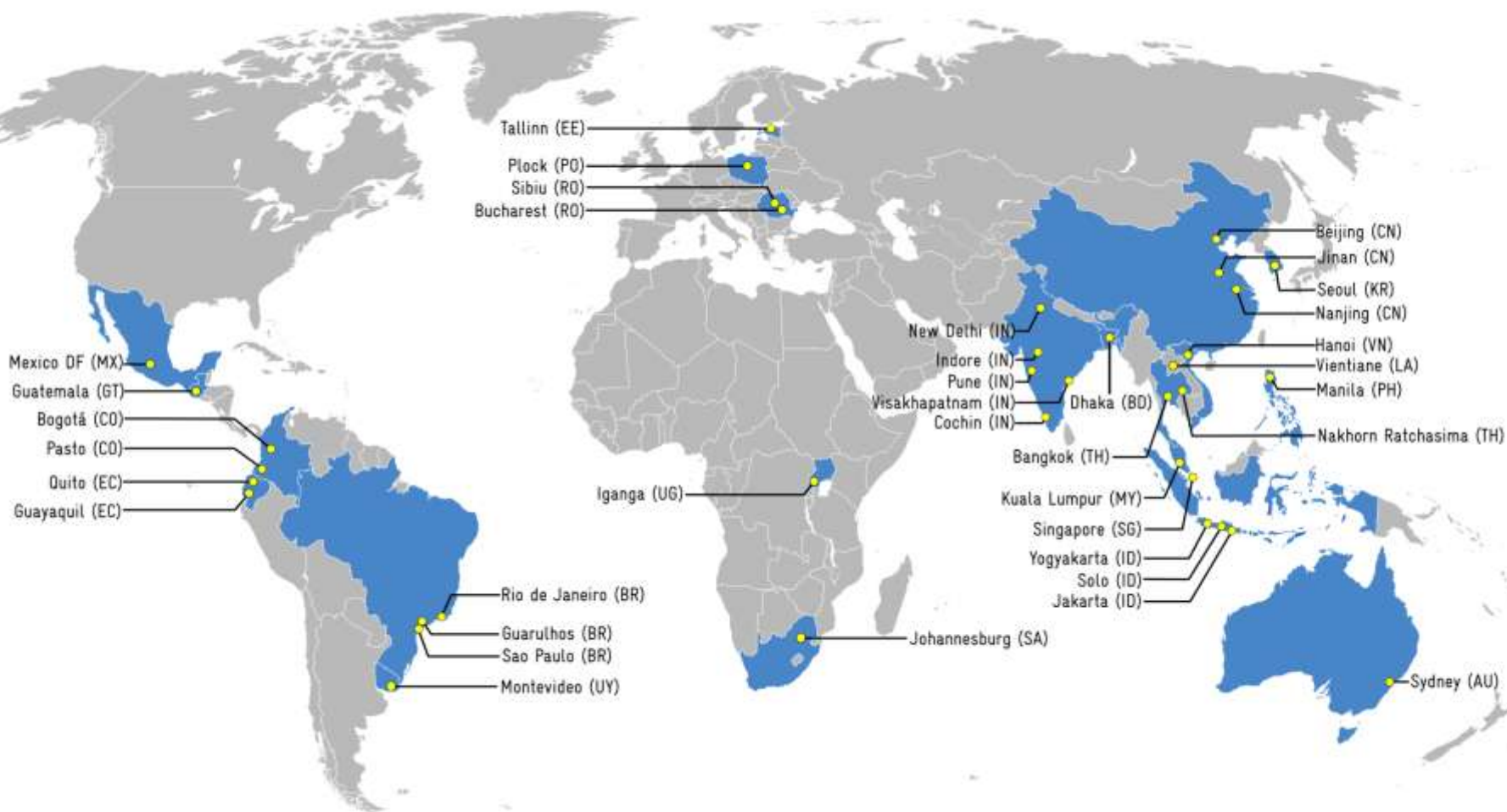
The Sustainable Urban Transport webpage ([www.sutp.org](http://www.sutp.org)) is an internationally recognized source for information and networking on sustainable transport.

→ Monthly, over 15,000 users

→ Bi-monthly newsletter



## Sustainable Urban Transport: Urban Transport Training Courses



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Thank you for your attention

GTZ SUTP project

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