

Megacities, Developing Cities and Sustainable Transportation

Keynote Presentation

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Developing world cities – a growing phenomenon...

- Urban population in developing world will *double* by 2030
 - 95% of net global population growth
 - 1.94 billion additional people
 - (developed world urban population doubled during 2nd half of 20th Century – adding ½ billion people)
- By 2015, 19 of 23 of the world's cities with >10 million people by 2015

What does this growth mean?

- A back of the envelope mind exercise; assume:
 - 3,000 private vehicle kms/capita in developing cities by 2030¹
 - 10 liters/km private vehicle average fuel consumption
- = ~6 trillion additional private vkms/year by 2030
- = ~600 billion additional liters of gasoline per year (53% greater than today)
- = ~1.9 billion annual tonnes of GHGs (lifecycle CO₂-equivalents)

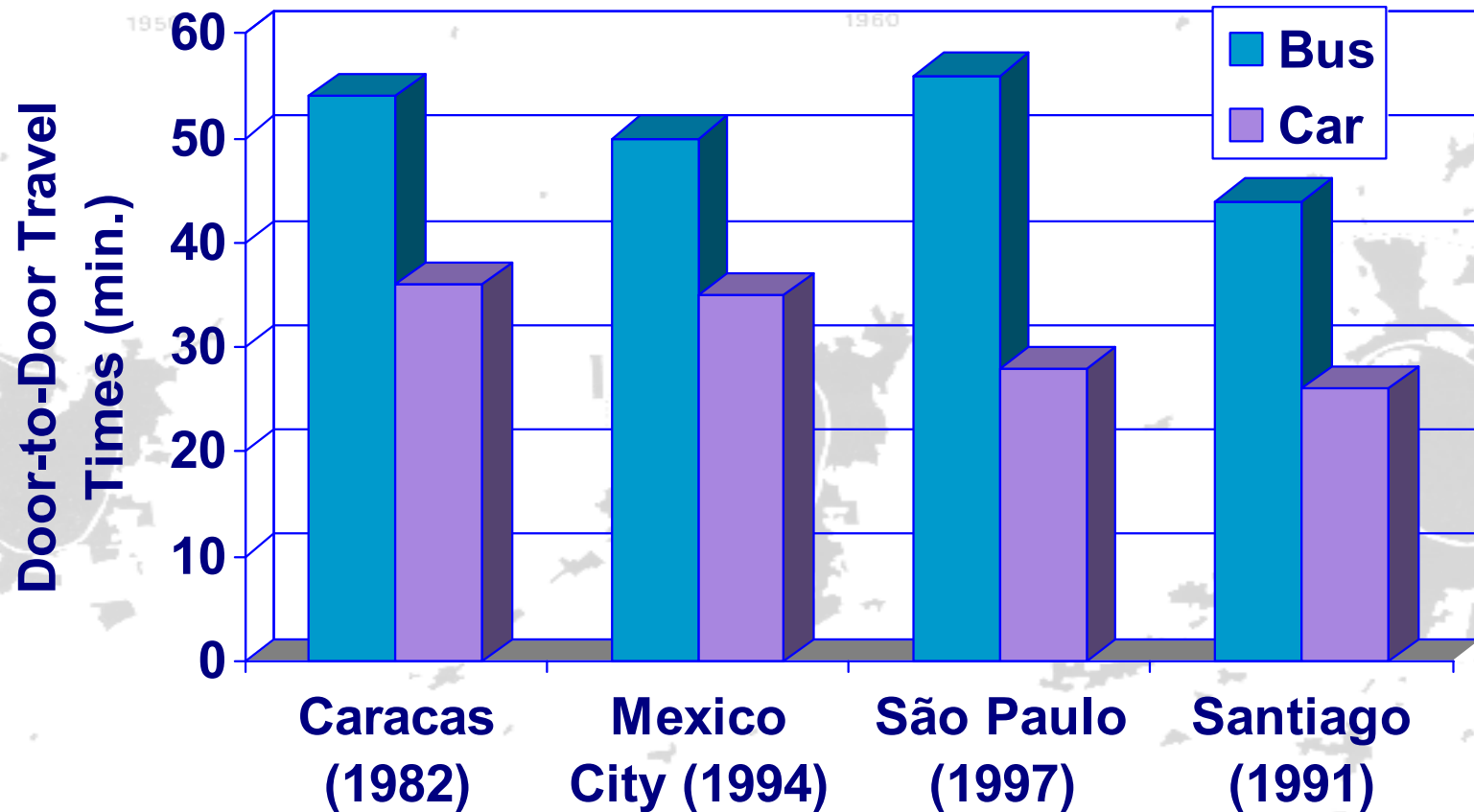
¹ Today: 1848 developing Asia; 4519 Europe; 11,155 US (Kenworthy & Laube, 1999).

Where does the developing world transportation situation stand today?

	Level	Direction
Measures to be increased		
Access to means of mobility	Red	+
Equity of access	Red	?
Appropriate mobility infrastructure	Red	-
Inexpensive freight transportation	Yellow	+
Measures to be reduced		
Congestion	Red	-
"Conventional" emissions	Red	-
Greenhouse gas emissions	Yellow	-
Transportation noise	Red	-
Other environmental impacts	Yellow	-
Disruption of communities	Yellow	-
Transportation-related accidents	Red	-
Transportations' demand for non-renewable energy	Red	=
Transportation-related solid waste	Yellow	?

Sustainability "Scorecard" from WBCSD *Mobility 2001*

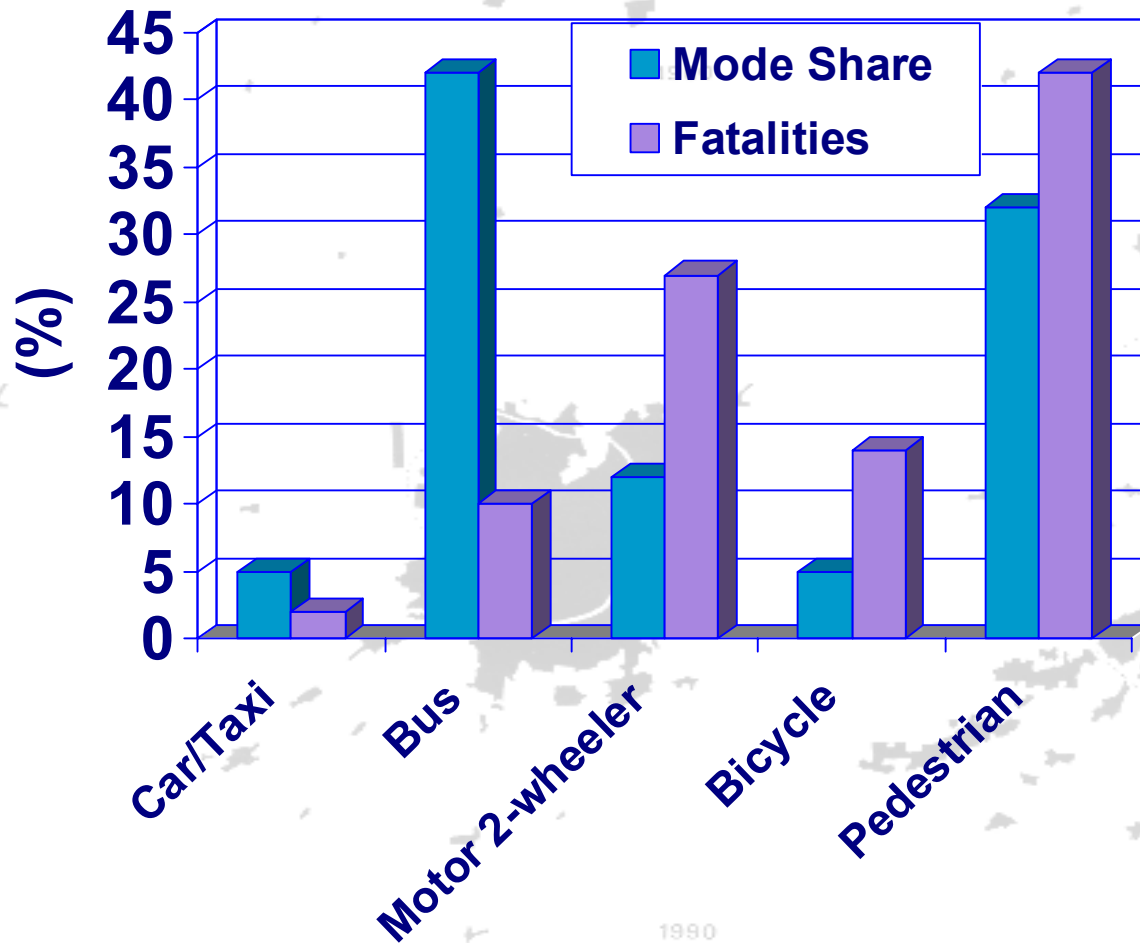
Equity in Access – Travel Times



Sources: SECTRA, 1991; Vasconcellos, 2001.

Equity and Access: Accidents

Delhi, 1994



Source: Mohan & Tiwari, 1999.

Air Pollution

City	Year	CO	HC	NO _x	SO _x	SPM
Beijing	2000	84	NA	73	NA	NA
Budapest	1987	81	75	57	12	NA
Cochin	1993	70	95	77	NA	NA
Delhi	1987	90	85	59	13	37
Lagos	1988	91	20	62	27	69
Mexico City	1996	99	33	77	21	26*
Santiago	1997	92	46†	71	15	86‡
São Paulo	1990	94	89	92	64	39

*PM10; † Does not include evaporative emissions ‡ PM10, including road dust.

Source: WBCSD, 2001.

What are the most influential drivers?

Urbanization
(Urban population growth)

+

Decentralization
(Urban outgrowth, “sprawl”)

+

Income Growth

=

More people making ***more*** trips over ***greater***
distances

Urban Decentralization

	pop/sq km (1960)	pop/sq km (1990)	% chg. (1960-1990)
Tokyo	8,565	7,097	-17%
New York	2,878	2,086	-28%
Paris	6,860	4,614	-33%
London	6,539	4,232	-35%
Detroit	1,970	1,275	-35%
San Francisco-Oakland	1,640	1,602	-2%
Washington	2,046	1,373	-33%
Melbourne	2,028	1,491	-26%
Hamburg	6,827	3,982	-42%
Vienna	9,141	6,830	-25%
Brisbane	2,095	978	-53%
Copenhagen	4,952	3,467	-30%
Amsterdam	9,973	5,591	-44%
Zurich	5,998	4,708	-22%
Frankfurt	8,722	4,661	-47%

Will the developing world follow suit?

Urban Decentralization

■ Shanghai

- 1990-2000: 2 mn people moved from center to periphery
- Center city density 32 times higher than new peripheral developments

■ Mumbai

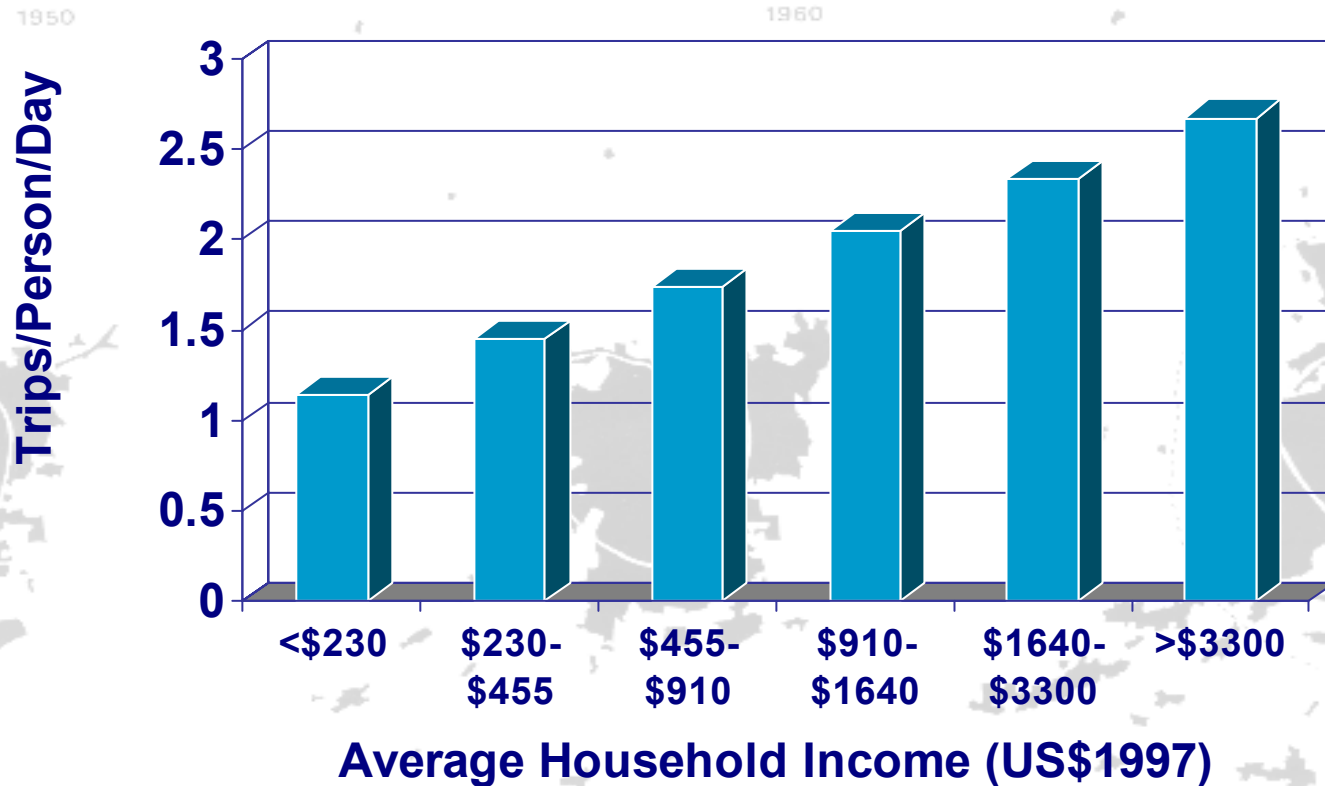
- 1981-2001: Suburbs accounted for 50% of population growth

■ Mexico City

- 1940-1995: the city expands at 1.5 times the population growth rate
- Grows from 13 political jurisdictions to 54

Income and Trip-making

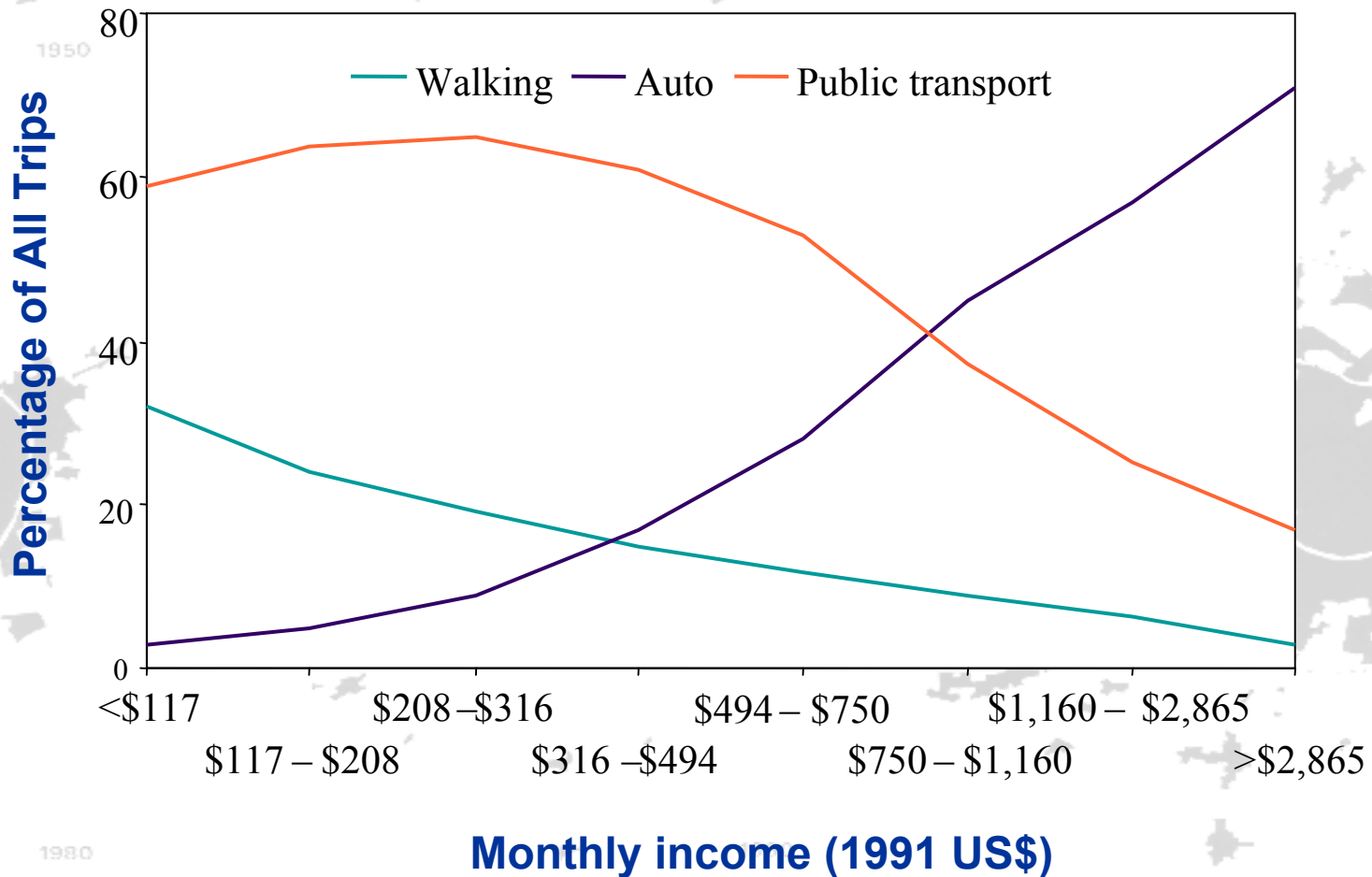
São Paulo, 1997



Source: Companhia do Metropolitano de São Paulo, 1999.

Income and Mode Choice

Santiago de Chile, 1991

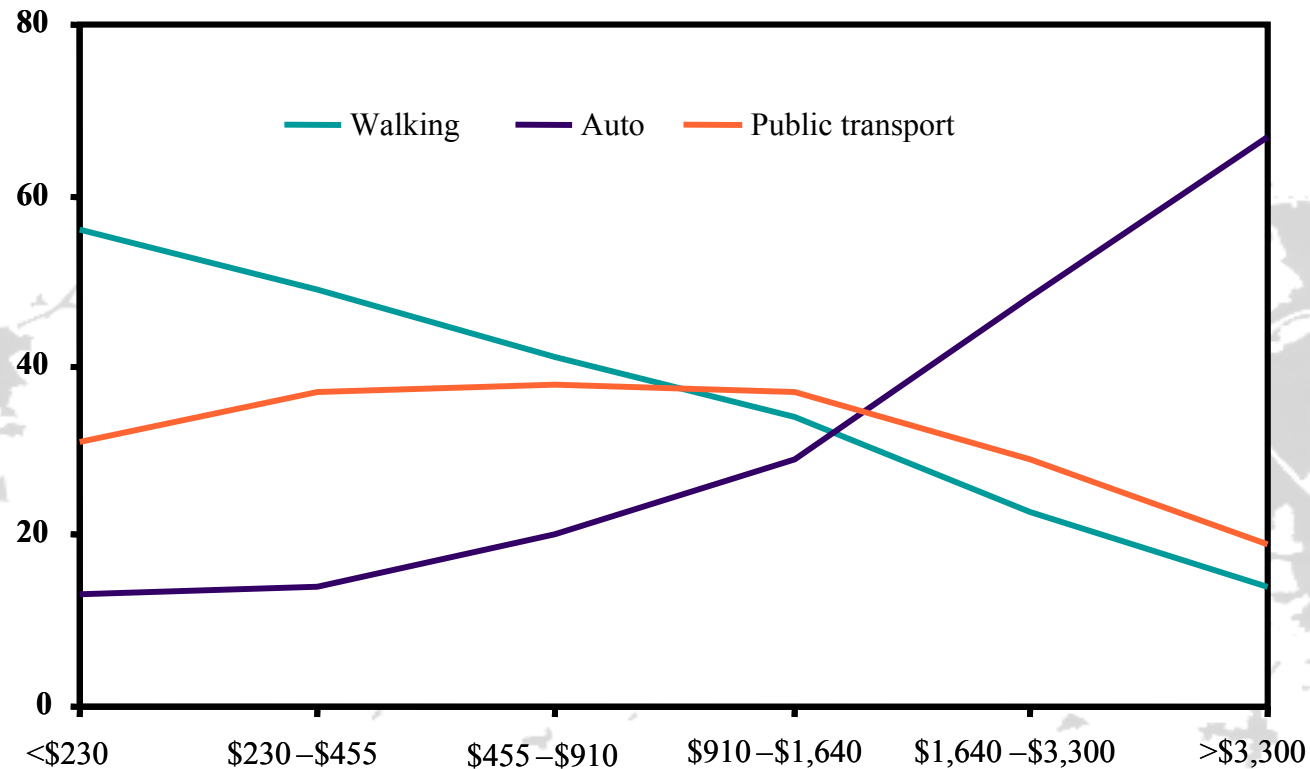


Source: Sectra, 1991

Income and Mode Choice

Sao Paulo, 1997

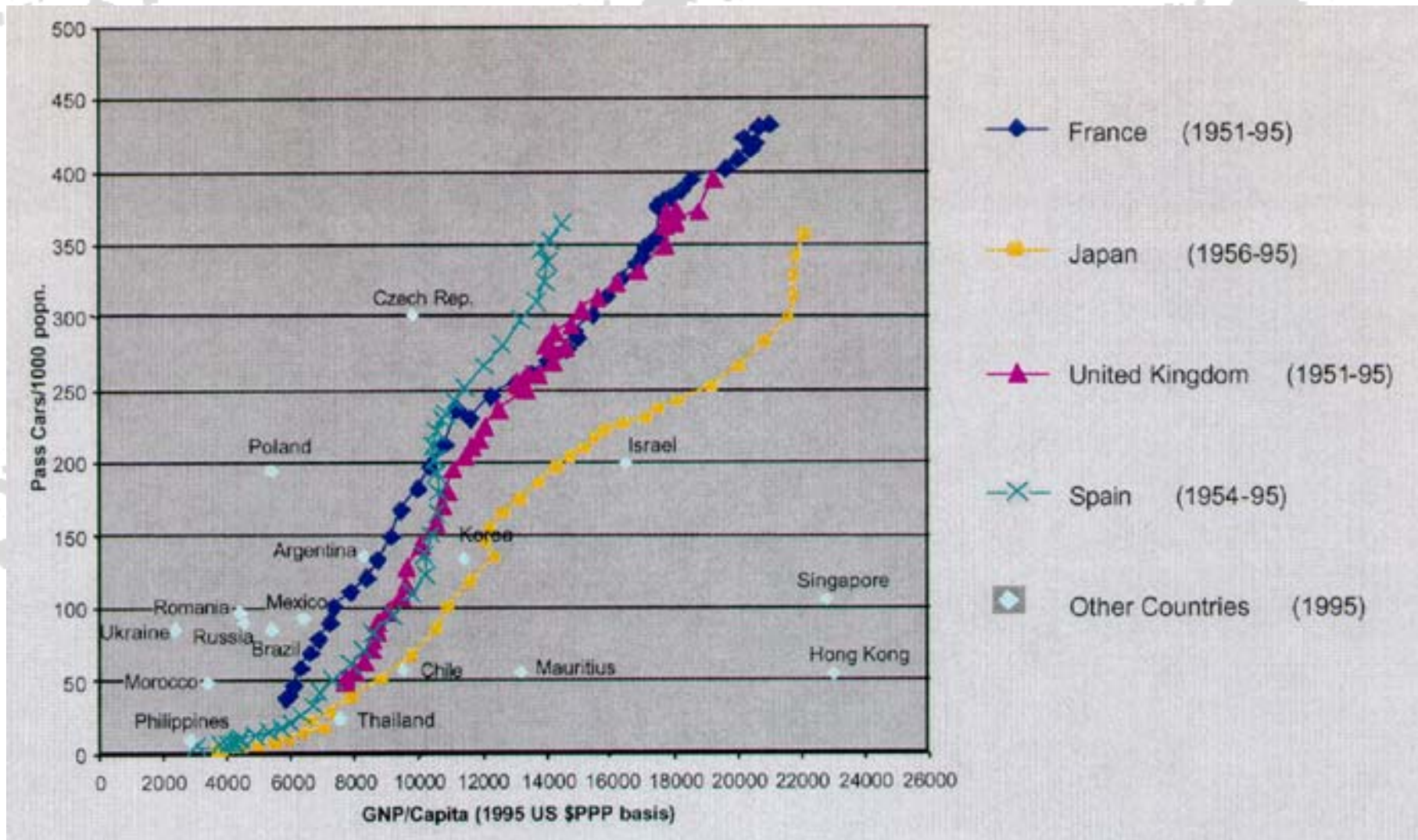
Percentage of all trips



Monthly income (1997 US\$)

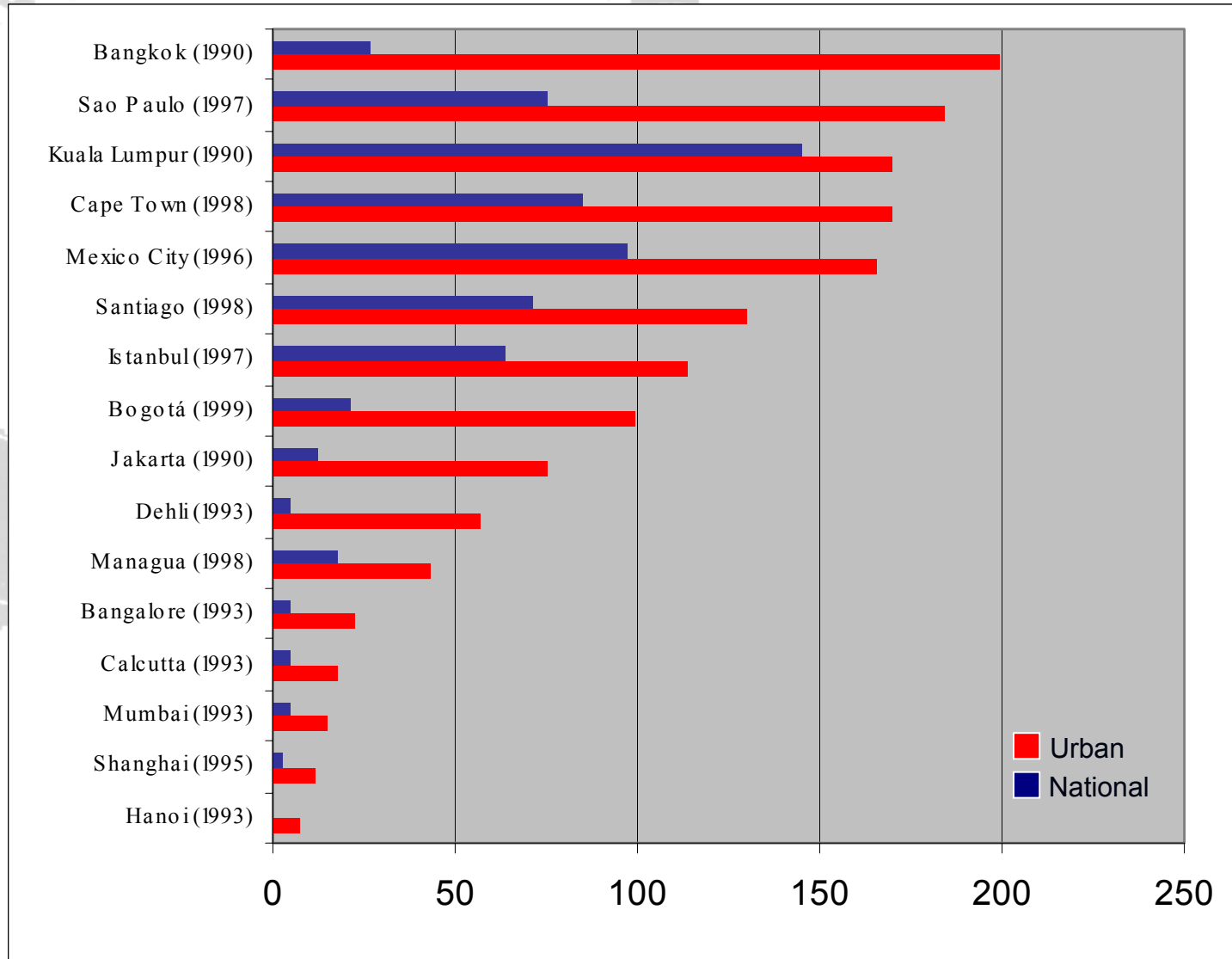
Source: Companhia do Metropolitano de São Paulo, 1999.

Income & Motorization



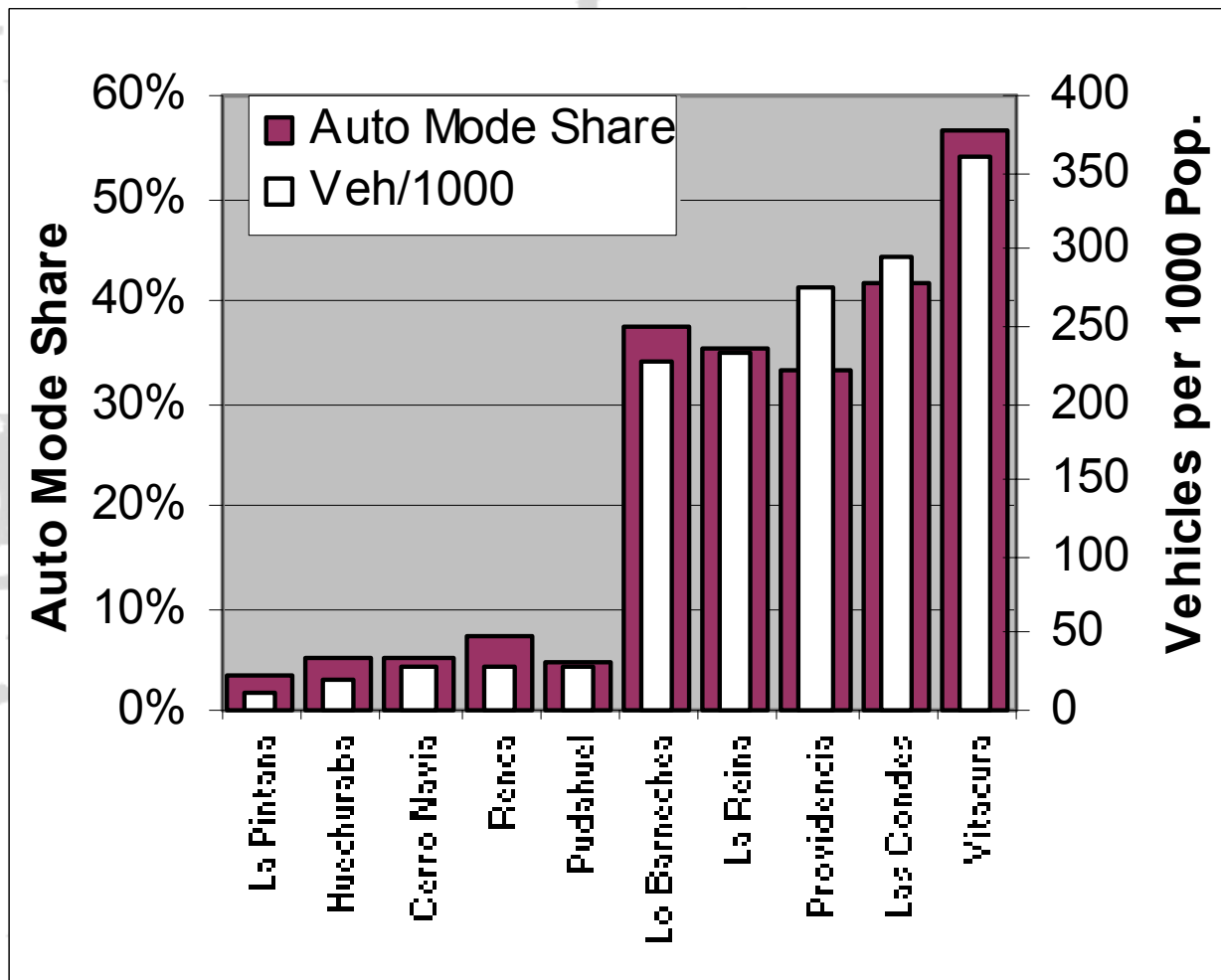
Source: Willoughby, 2000.

Urban v/s National Motorization Rates



Income > Motorization > Mode Share

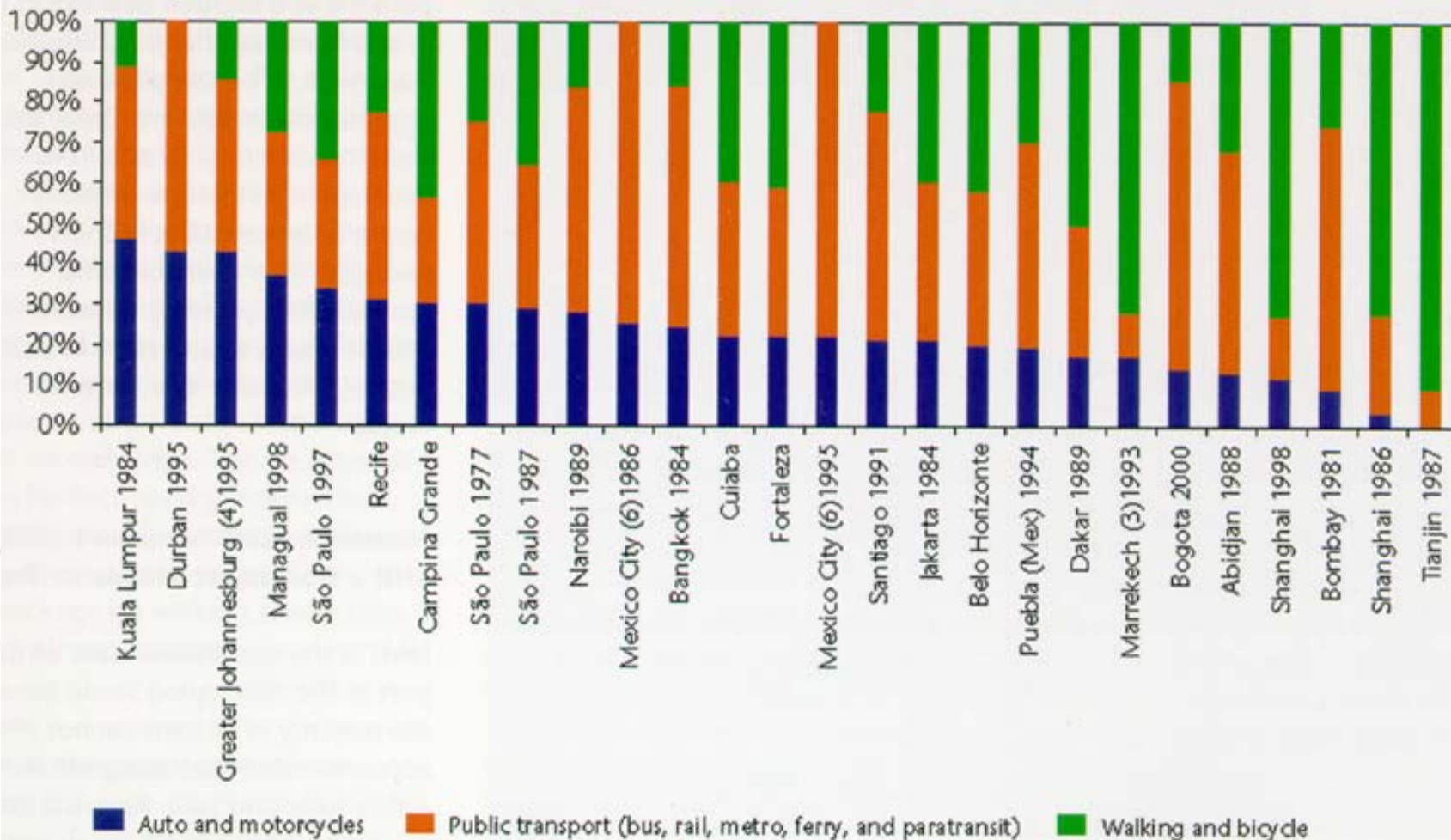
Santiago de Chile, 1991



Source: Sectra, 1991

Still, Non-Auto Travel Dominates

Share of trips



Source: WBCSD, 2001

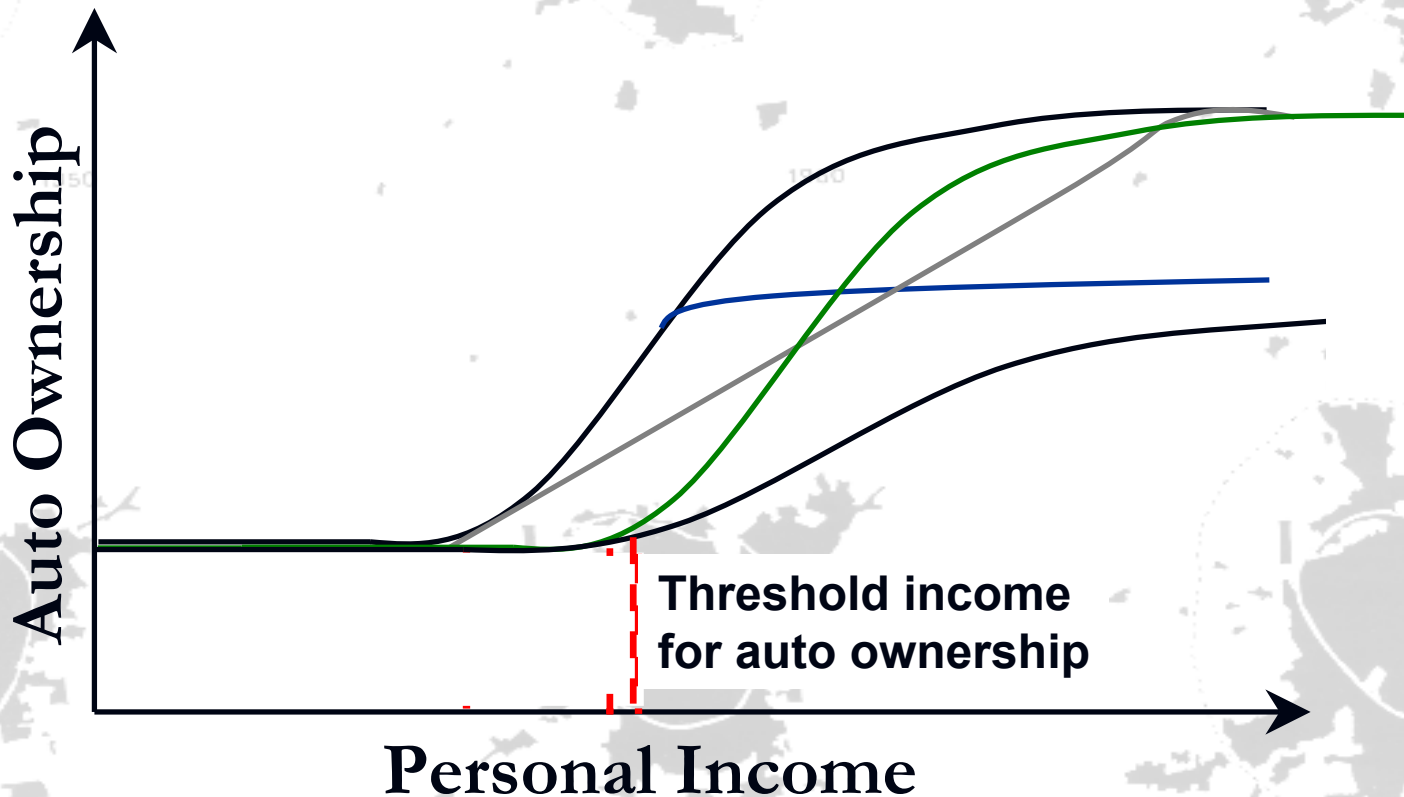
So, what are the main issues?

- Motorization
- Public Transport Performance
- Infrastructure Maintenance and Development
- Land Development
- Institutions

Motorization

- **Where is the saturation point?**
 - Absent gross disparities in income distribution or general economic stagnation, all developing countries are far from it.
- **Government industrial/trade policy plays important role**
 - Auto industry (Mexico, India, China, Brazil, Malaysia); trade liberalization and used car imports (Senegal)
- **Will any country lead the way with an “artificial ceiling”?**
 - i.e., become the “next” Singapore

Motorization – the stylized “S-curve”



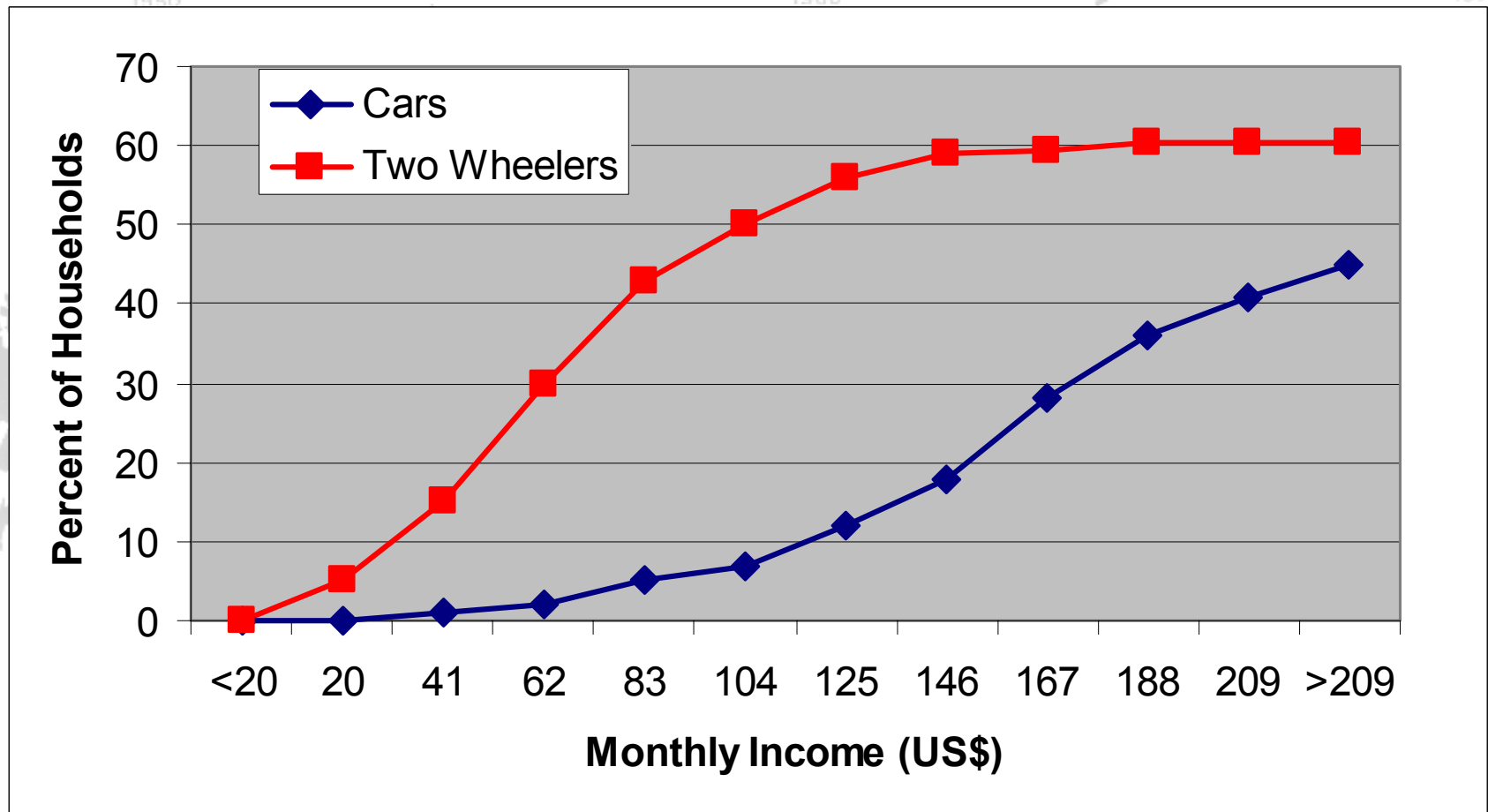
1. Can the S-curve be flattened?
2. Can it be made less steep?
3. Can it be pushed out?
4. Can we do all three?

Motorized Two-Wheelers: Some Key Questions

- Do 2-wheelers extend mobility in regions where they are prevalent?
- Do 2-wheelers accelerate the overall growth of motorization?
- Are 2-wheelers a step toward auto ownership?
- What accounts for the “Two Wheel Culture”?

Two-wheelers: Extending (and “equalizing”) mobility?

Autos and Motorized Two-Wheelers in Chennai, India (1993)



Source: RITES, 1995

What causes the 2-wheeler “culture”?

The “2-Wheel Region” of the world is well defined.

- Asia accounts for more than 75 percent of the world’s motorized two-wheelers.
- Of which, 50% are in China, 20% in India.
- *Examples:* 80% of private motor vehicles in Chennai, 64% in Shanghai, 80% in Wuhan, 38% in Kuala Lumpur, but only 10% in Belo Horizonte and few in Mexico City.

Public Transport Performance

The Greatest Obstacle to Mobility in Developing Cities

- Severe system overcrowding
- Heavy congestion on transit routes
- Deteriorated conditions of the vehicles
- High accident rates

Public Transport Downfall: Influencing Factors

- Since the 1980s, Dakar's SOTRAC passengers has declined since by over 20 percent, in spite of a rapidly growing population
 - Rise of the “*car rapide*” and “*Ndiaga Ndiayes*”
- Chennai's public transport mode share declined by 20 percent in the 25 years preceding 1995.
 - Rise of the 2-Wheelers
- Kuala Lumpur had a 20 percent transit mode share in 1997, decreasing from 35 percent in 1985.
 - Rise of the “National Car”
- In Mexico City, the publicly owned bus system collapsed
 - Rise of the “*Colectivo*”

Public Transport: The Power of “Informality”

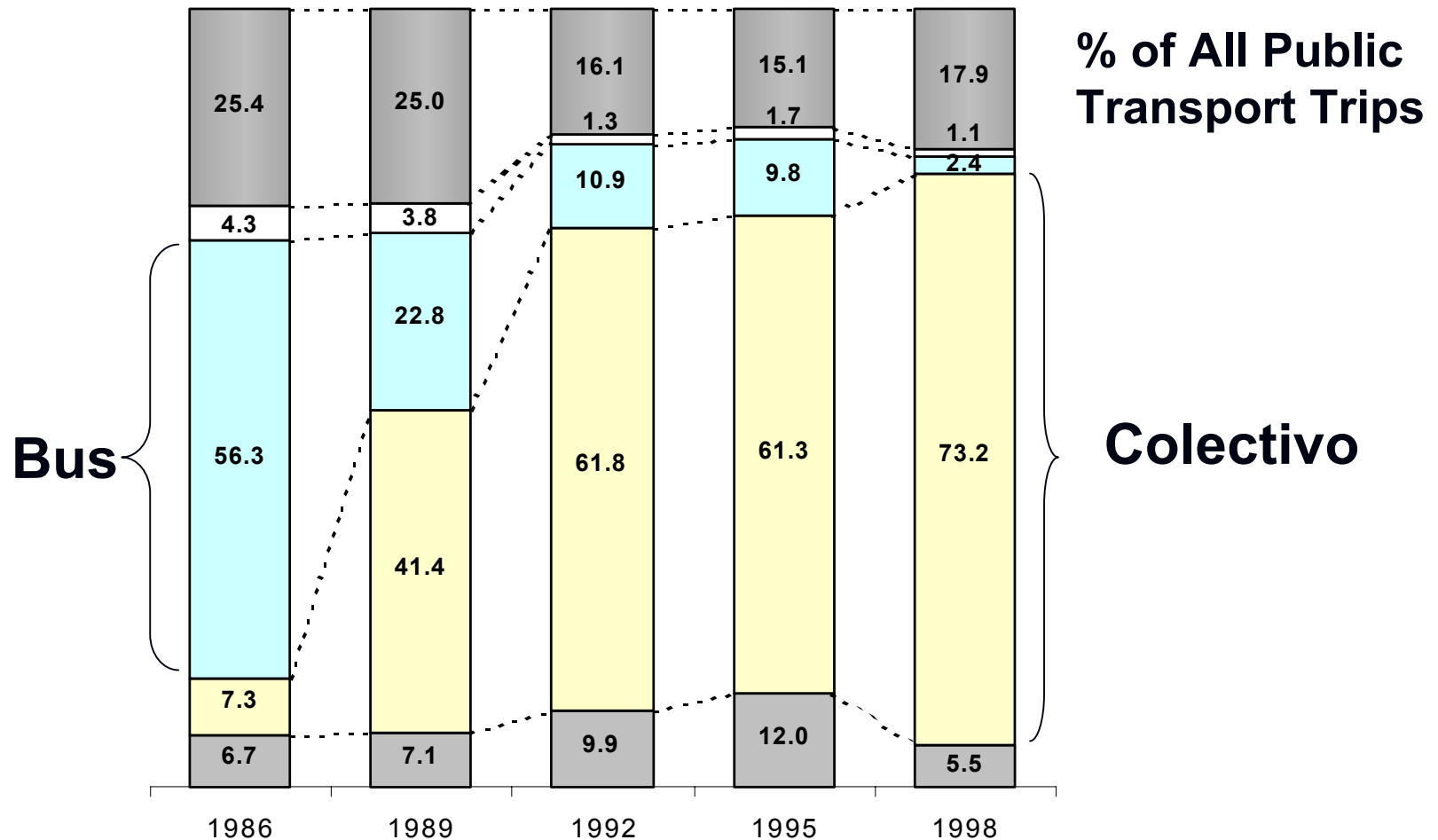
The *Matutu* minibus in Nairobi

	Bus	Matutu	Matutu Advantage
Average wait time (min)	24	14	44%
Average trip time (min)	65	38	42%
Average travel time (min)	90	52	42%
Average fare (\$/km)	0.03	0.02	28%
Average trip speed (km/hr)	13	18	42%
Average travel speed (km/hr)	9	13	41%

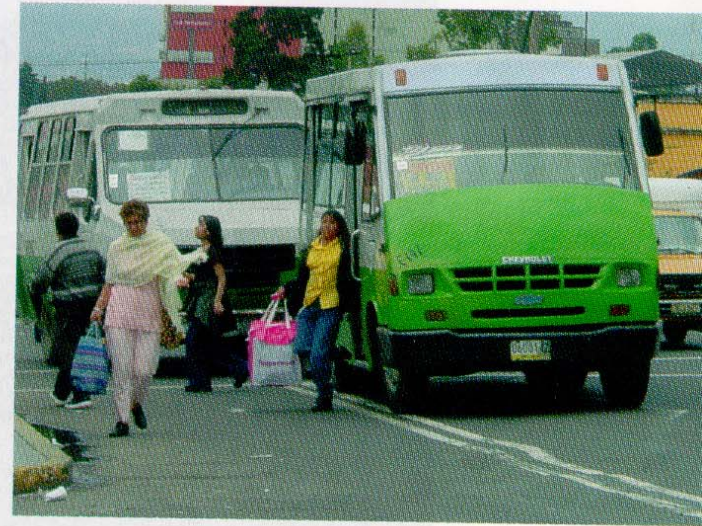
Source: Koster and Hop (2000).

Note: Overall average based on AM/PM Peak and Off Peak.

Rise of the Informal Sector: Mexico City



Mexico City's Colectivos



1970

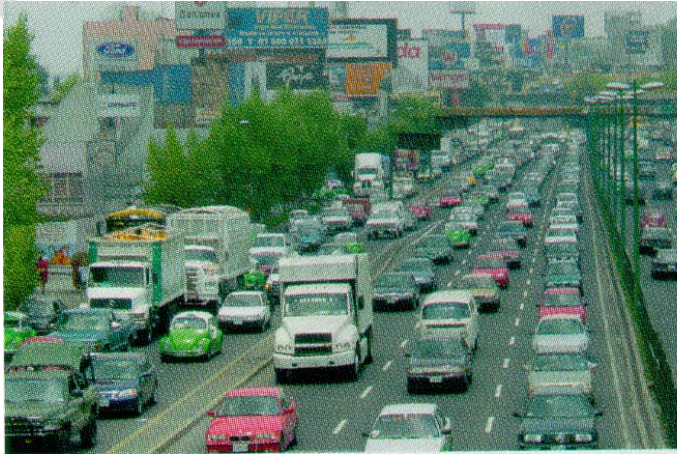


2010

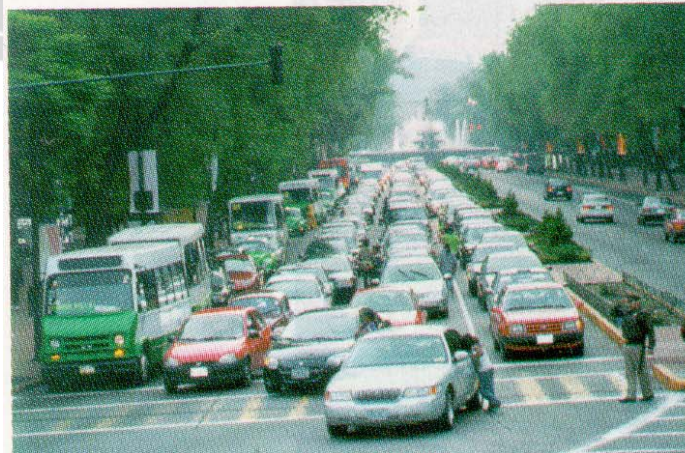
Public Transport: Key Questions

- Can viable, quality public transport service be maintained/enhanced?
(In the face of declining mode share, increasing congestion, deteriorating vehicle fleets, *low purchasing power* of users)
- What is to be done about the informal (“paratransit”) sector? What can be learned from these entrepreneurs?
- Will the bus rapid transit (BRT) “revolution” take hold?
- What is the future role of rail?
- How to achieve system integration?
(Service, fares, modes?)
- What is the influence of public security?
(the Federal District (Mexico City) is planning to require 28,000 minibuses in the city to have panic-buttons installed, with GPS locators by end of 2004)

Congestion



1970



2010

Infrastructure: A Role for the Private Sector?

Urban Road Projects with Private Sector Participation in Asia

	Open	Construction	Planning	Pre-Planning	Abandoned	Total
Bangladesh			1			1
Hong Kong	4	1				5
India			3			3
Indonesia	2	5	3	1		11
Malaysia	2	7	4	4		17
Philippines		2	7			9
Sri Lanka			1			1
Thailand	4	4	2		2	12
Total	12	19	21	5	2	59

Source: ADB, 2000.

As of 2000

- **at least** 25 urban transport infrastructure projects in operation; implying US\$ 8 billion in capital investments
- Another 25 Under Construction

Source: Menckhoff & Zegras, 1999.

Private Sector & Infrastructure Development: Major Challenges

- Externalities
(role of road pricing, traffic pollution)
- Competing facilities and network performance
- Political patronage (improved or exacerbated?)
- Local private sector development
- Public transport viability (bus rapid transit)
- Poverty (a system for the “haves”?)
- A financial sector capable of delivering
(risks and debt costs; lending horizons; equity requirements)

Land Development

Influencing Factors

■ Brownfields

- Industrial decline, increasing service-orientation of economies worldwide (e.g., Hall & Pfeiffer, 2000)

■ Socio-economic spatial segregation

■ Suburbanization

- Office parks, residences, industries

■ Transportation and telecoms systems

Land Development: Questions

- Can land use be used to influence transportation patterns?
 - Are effects certain?
 - Little theoretically sound empirical work to date in developing country cities
- Can effective management actually occur?
 - Institutional challenges, speed of change
 - Pudong (Shanghai) v/s Navi Mumbai

Institutional Implications

Challenges:

- Dynamics of the system
 - political decentralization, motorization, urban expansion, etc.
- Asymmetry of the players' strength
 - power of the private sector, real estate developers, etc.
- Shortages of human and financial capital
- Weak regulatory frameworks, enforcement mechanisms
- Institutional instability with changes in administrations
- Finance:
 - multiple supplying agents (expansion v/s maintenance, local v/s regional v/s national)
 - unclear budgeting processes, lack of direct user fees, no marginal cost pricing

Institutional Implications

Planning Capabilities

- Data collection, appropriate analytical techniques (including modeling land use-transport-environment), local capability to develop appropriate solutions (a la Curitiba) 1970
- What role for public participation?

Regulatory Capabilities

- Public transportation
 - increasingly in the hands of the private sector – strong and contentious
 - How to effectively capture the power of the entrepreneur (“informal” sector)?
- Infrastructure concessions
 - Establishing a clear legal framework, “rules of the game”
- Land development

Implementation Capabilities

- Pricing, user charges (including congestion pricing)
- Driver licensing and enforcement
- Vehicle Inspection and Maintenance

Role of development assistance?

- World Bank’s recent “Cities on the Move”, Global Environment Facility (GEF), any hope for Clean Development Mechanism (CDM)?