

Sustainable Mobility with Oil and Carbon Constraints: Will The Developing World Be Like Us?

Not if They Can Help It

Lee Schipper

Senior Research Engineer

Precourt Energy Efficiency Center, Stanford University
and

Project Scientist, Global Metropolitan Studies, UC Berkeley

A

Asilomar, 28 July 2009



Montezuma's Revenge in Mexico City?





**TECHNOLOGY LEAPFROGGING
In PANAMA?**

Mal-Asia?

(and Dozens of other Developing Cities)



Three Wheels in Lahore, Pakistan



Two Wheels in Kuala Lumpur



Formerly Two Wheels (with feet) in Shanghai



Four Feet in Pune, India

Is this Mode in Your Survey

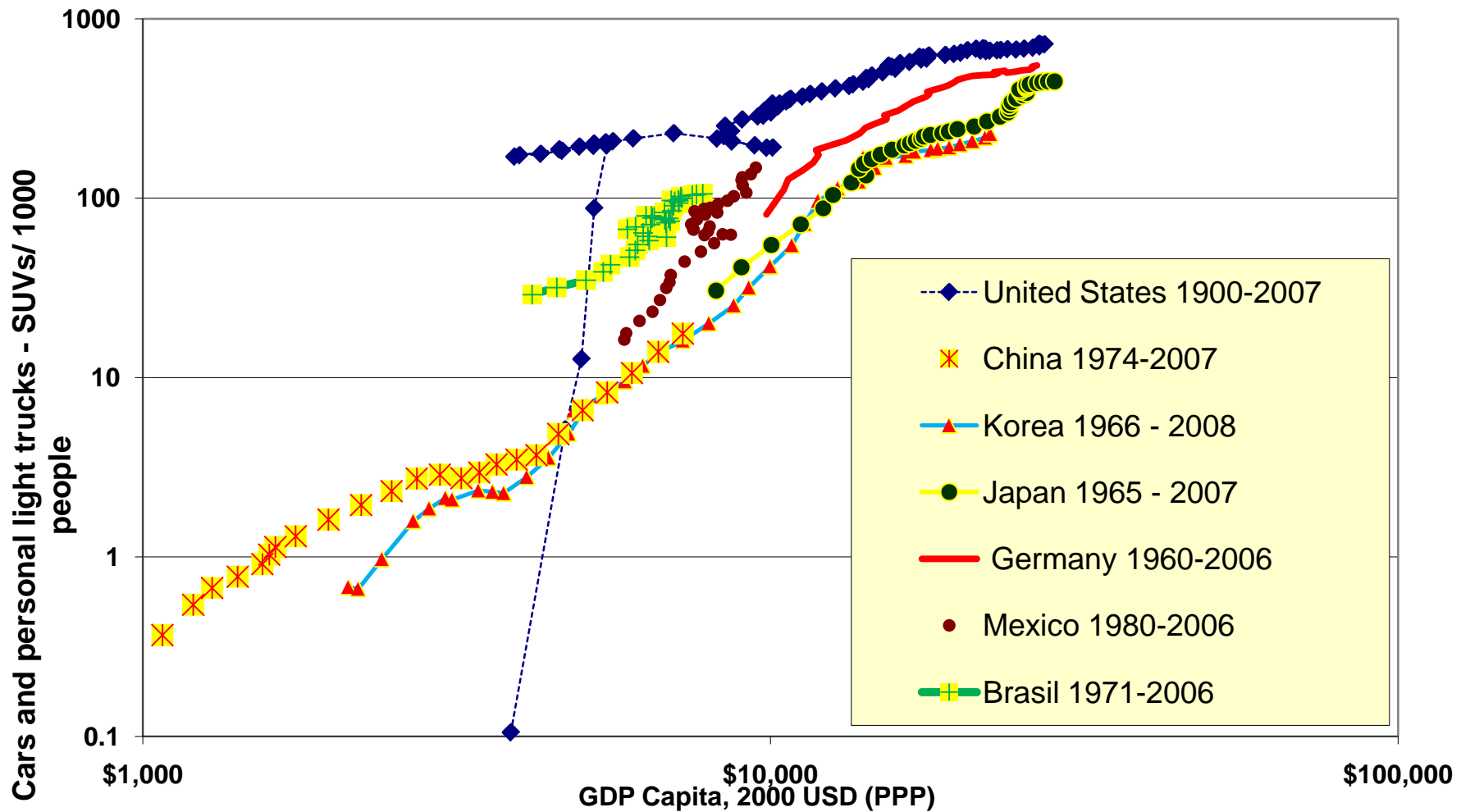


Outlook for Transport in Developing Countries

Breathing Room?

- Present Trends- Unsustainable Transport
 - Air pollution/exposure, safety, congestion mostly getting worse
 - In Asia 80% of trips “outdoors” *(feet, pedals, two wheels, bus stops)
 - Increased exclusion of the 80-90% not in cars
- Some Good News
 - Fuel economy standards in China (but car ownership rising >15%/year)
 - Much cleaner fuel, vehicles across Asia and Latin America
 - Sincere national support for urban transport (India, Colombia, Mex.
- This Leaves a Big Transport Problem
 - Urban transport snarled almost everywhere
 - Intercity roads usually torn up by overloaded trucks and buses
 - Rail strong in some countries (China, India),

Motorization and Economic Growth: Do 2 Billion Cars Make Us Better Off?



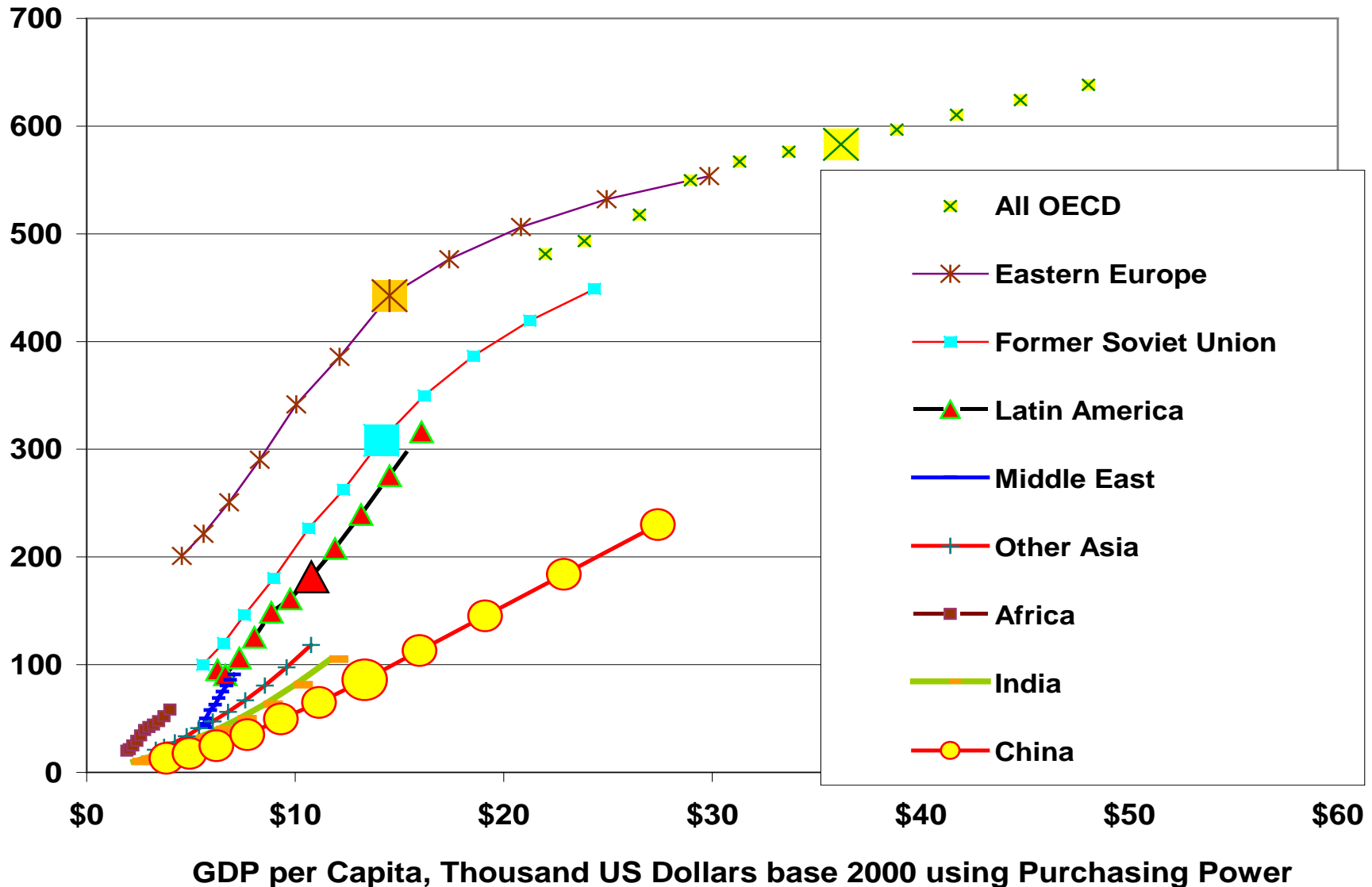
Key Question: Is this path of motorization good? Inevitable or avoidable?

Projections of GDP/Capita and Cars/Capita

LAC Remains Highly Motorized / GDP

Source WBCSD *Sustainable Mobility Project*

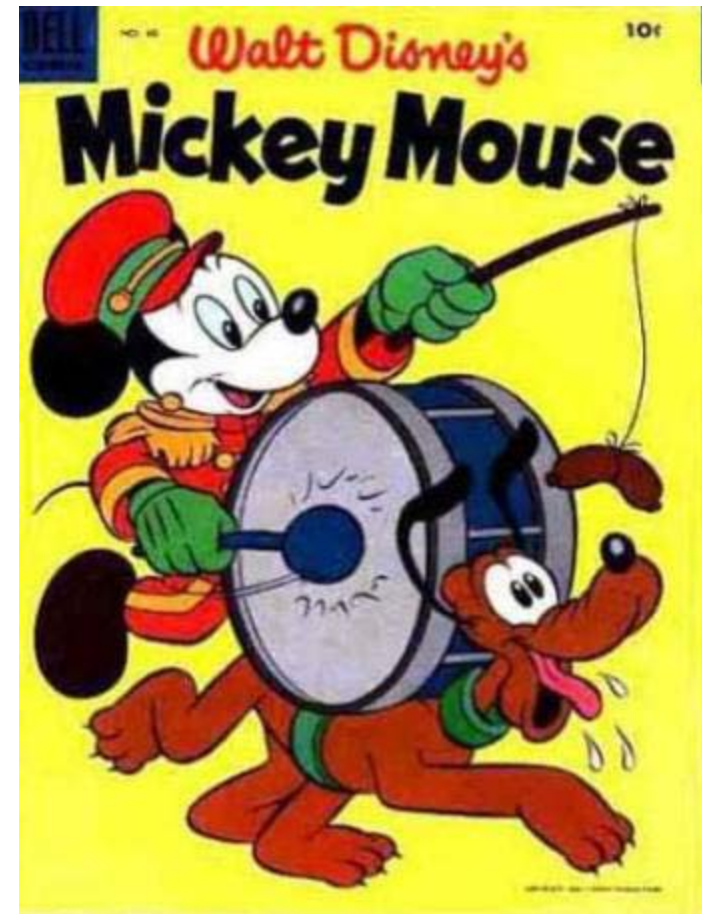
Cars, Light Trucks, SUVs per 1000 People



Today's Approach to Transport, Energy and Environment: A Ponzi Scheme?

- Little Transport or Urban Planning
 - Few land use controls
 - Rapid building of flyovers
 - Little effort to organize urban transit
- Default is Inefficient Cars, Poor Transit
 - Fail to charge for externalities, subsidized fuel
 - Reliance on car industry for development
 - Crowded cities waking up authorities
- Some Bright Spots
 - Curitiba, Singapore avoided the mess
 - Mexico, Bogota, other LA Cities turning around?
 - India, China coming to grips with cars—too late?

The Future Of the “Car”
Will Not Be Like Its Past



With thanks to Walt
Disney Productions





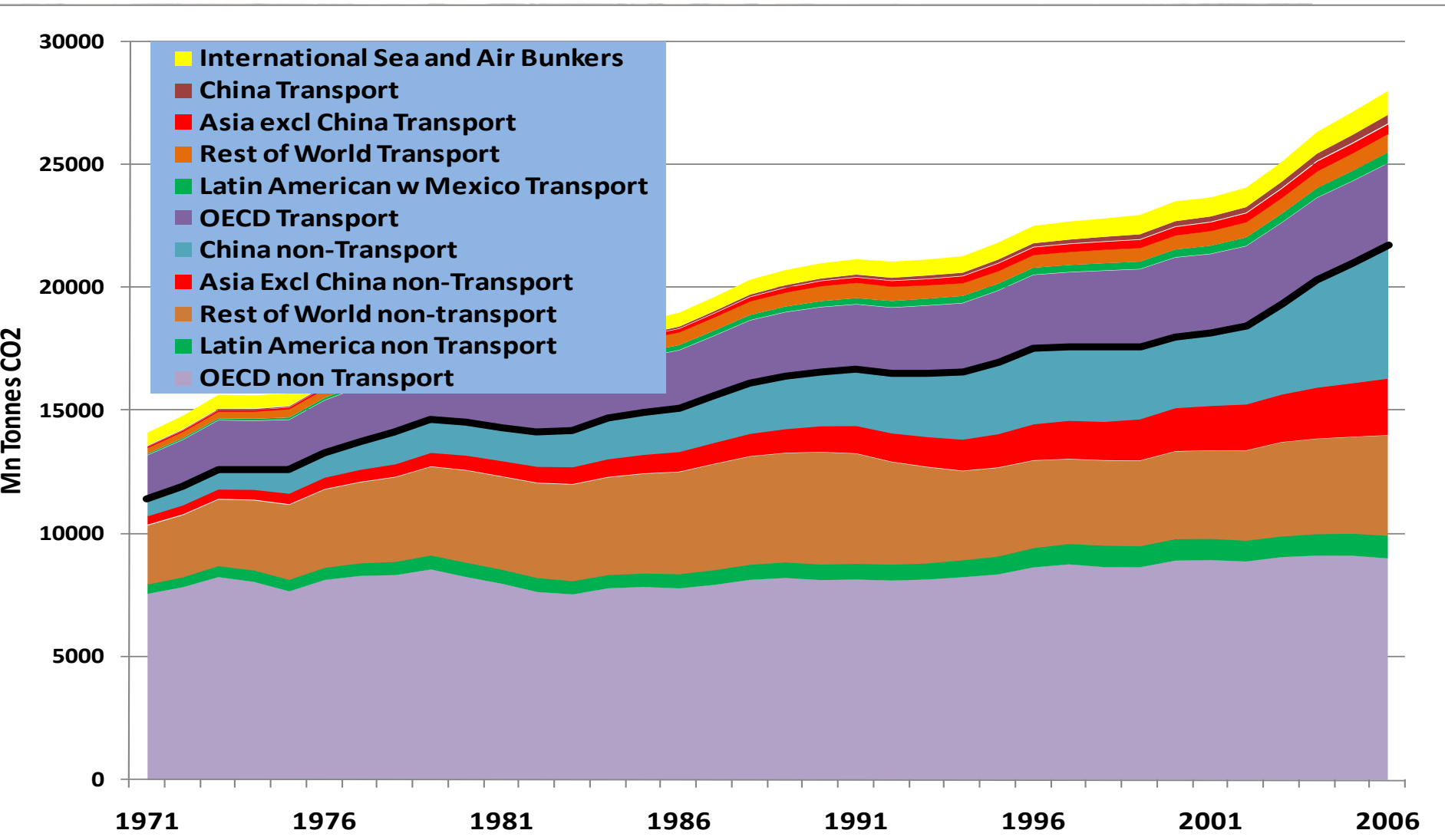
Dilemma for Developing World: Can Traditional Four Wheels Provide Real Mobility?

- **China**
 - Ring roads, freeways, and traffic fatalities
 - Cities suffering from car oriented development
 - Fuel economy standards but skyrocketing car ownership
- **Viet Nam (Hanoi): Bikes of Burden**
 - 1+ moped/household –works until cars overwhelm
 - Bus and rail development could provide backbone
 - A sustainable pattern for much of the world?
- **India – Motorization Exploding?**
 - Hectic, polluting mix of hooves, feet, and wheels
 - Few cities have organized public transport
 - Transport very contentious in big cities

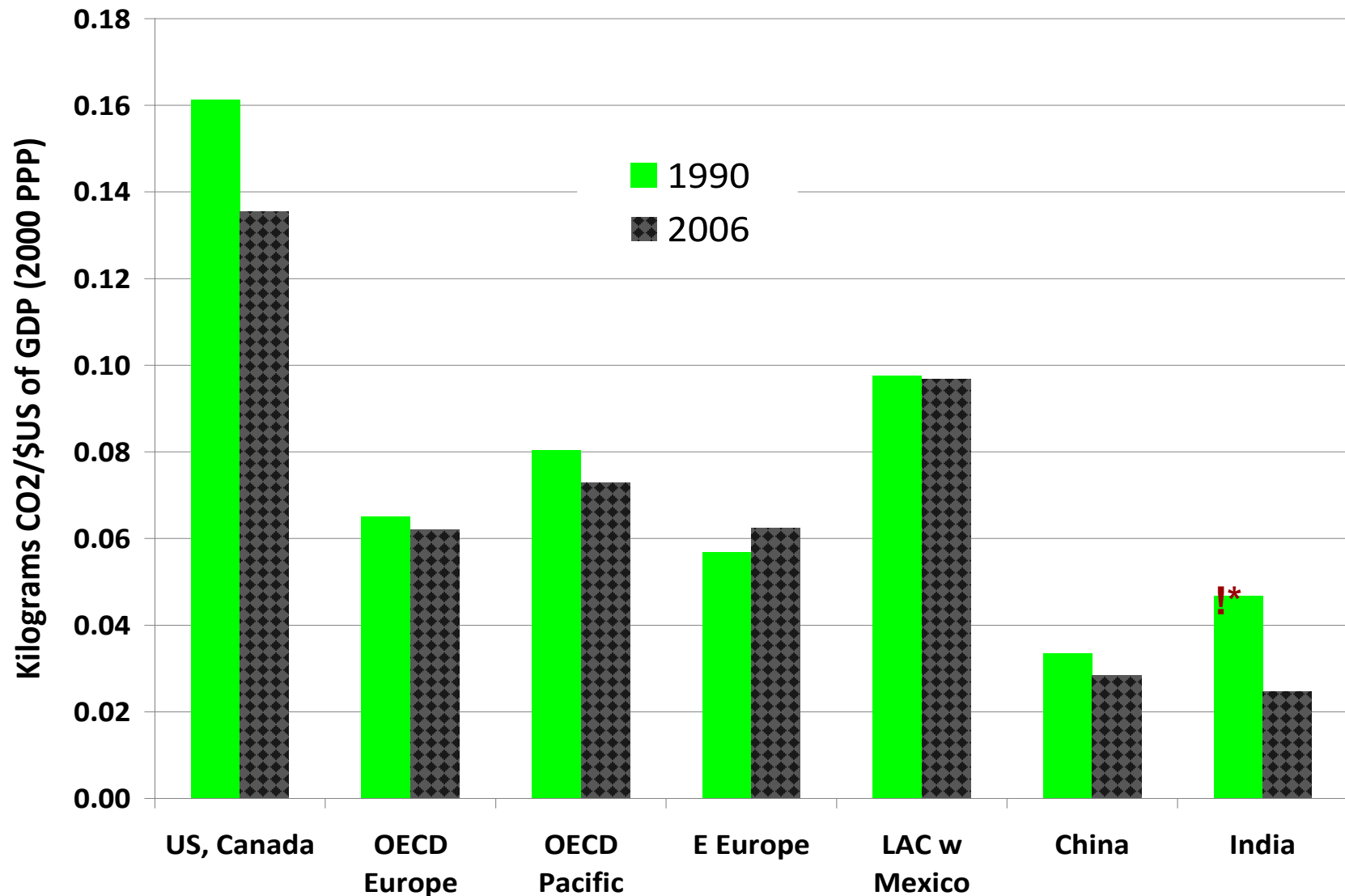


Transport Most Rapidly Rising CO2 Emission Source

Most of Increase in Developing World

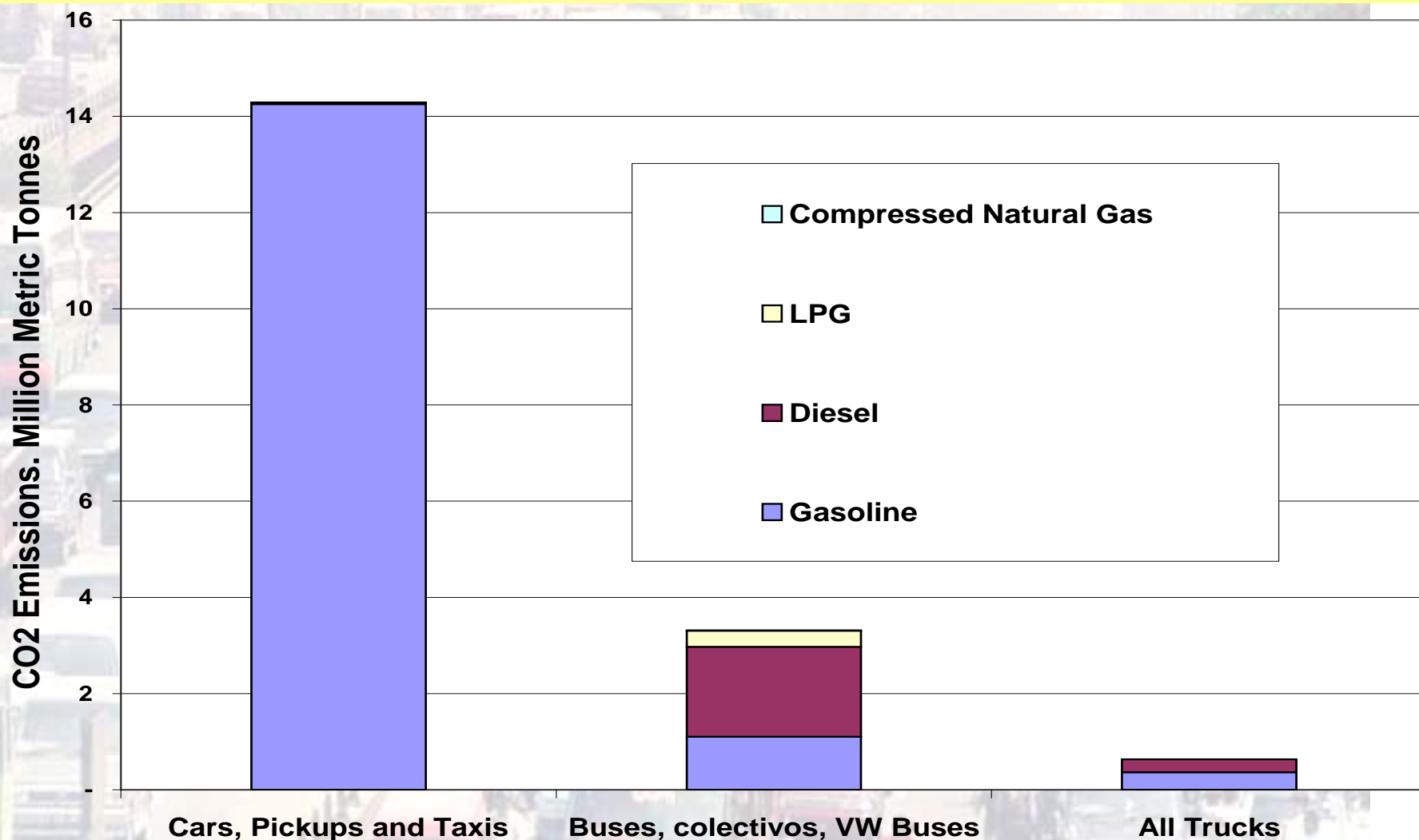


Road Transport CO2 Emissions Relative to GDP? Falling Only Very Slowly



* 1990 data include construction, agric., light industry

CO2 Emissions from Road Transport in MCMA – Similar Patterns for Bogota, Santiago, S Paulo*



***Source: MCMA Bottom-up Emissions Inventory**

S. Paulo has lower emissions from LDV because of alcohol, but still bad traffic

Transport and Emissions in 2030/2050 as LDV Dominance Grows

- WBCSD Projections: “Sustainable Mobility Project” (SMP)
 - First truly global mobility-CO2 study
 - Projected all major regions, all transport modes, all fuels
 - Signed by CEO of major oil and vehicle makers
- Developing World in Perspective by 2030 (SMP, MoMo)
 - Latin America keeps highest cars/GDP
 - All of Asia catching up but still lags
 - Other regions narrowing gap
- Dealing with CO2 in Transport Means Facing LDV and Trucks
 - “Good Urban Transport” (WBank) means fewer vkt, probably fewer cars
 - Transport measures (congestion pricing, vkt fees) and fuel economy
 - Improving existing transit, rail key, but losing so far to cars and trucks

**Needed: Strong Transport Actions Slowing Car VKT,
Strong National Actions on Fuel/CO2 Taxes, Fuel Economy**

Transport: What are the Externalities?

Compare w Fuel Costs 5 (US) to 5-15 (LDC) Cents/km

- Accidents, Congestion, Pollution (higher in developing world)
 - Accidents and death: 5-10 cents/km (not by the km), depends on life valuation
 - Congestion- 5-10 cents/km at certain times, seasons, places, ? In LDCs
 - Air Pollution – a few euro cents/km in developed countries, tens of cents in LDCs
- CO₂/Climate - \$7.50/tonne (Nordhaus) or \$85/Tonne (Stern)?
 - The lower value relevant only for fake-biofuels
 - Higher value = 18 ec/liter (Sweden 25 ec) – starts to show
 - Still not dominant in transport decisions
- Social Exclusion and Barriers – no Price
 - Few developing countries are ‘walkable’ except at own risk
 - 10-15 % of urban trips (cars) slow down the other 85% on surface
 - More cars probably lower, not raise aggregate welfare

***Virtually All Valuations put External Costs of CO₂
Much Smaller than Accidents, Congestion, Air Pollution
CO₂ and Fuel Saving a Co-benefit of Good Transport***

"ASIF" Decomposition: Road Map For Saving Road Map for Evaluation

Emissions from Transport

Air
pollution,
health
impacts
Global
CO₂

G

=

A

*

S_i

*

I_i

*

F_{i,j}

Total Transport
Activity

Veh-km and
pass-km by mode

Emissions per
unit of energy
or volume or km

Occupancy/
Load Factor

Modal Energy
Intensity

Technological energy
efficiency

Vehicle characteristics

Vehicle fuel
intensity

Real drive cycles and routing

Lesson: Attack all Problems of Transport
Not Just Technological Efficiency and Fuels

Transport- CO2 Mitigation: Avoid and Shift but also Improve/Mitigate



Avoid CO2-Intensive Development:
Singapore Land Use Planning,
Congestion Pricing



Shift and Strengthen:
Mexico City Metrobus



Improve and Mitigate:
Efficient Vehicles



Improve and Mitigate:
True Low Carbon Fuels

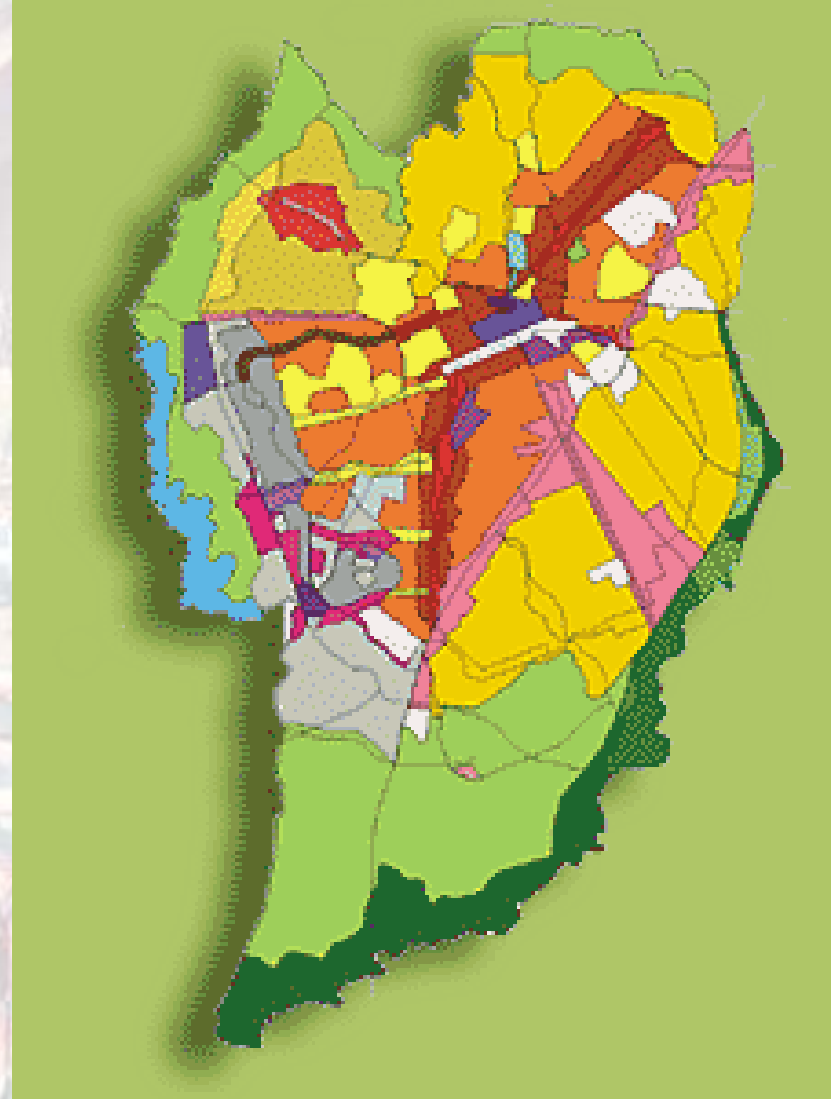
A Long Term Approach for the Developing World

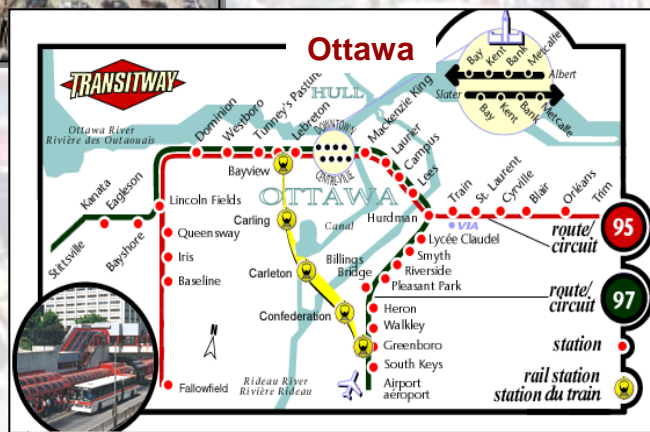
the New ASIF

- **Avoid – Saving Carbon Through Urban Development**
 - Land Use: Building a city or differently (Singapore, Curitiba, Seoul)
 - Internalizing costs at an early stage of development
 - Shifting the balance away from high-carbon transport
- **Switch: Co-benefits of Transport, Development**
 - Bus Rapid Transit and other improvements to transport system, LOS
 - Careful transition from smaller to larger, better managed transit vehicles
 - Congestion pricing and other strategies to reduce externalities
- **Improve by Operations, Technology: Carbon costs Count**
 - Lower fuel use/km with improved traffic flow
 - Higher vehicle occupancy
 - Efficient vehicles, low carbon fuels – Mostly national initiatives
- **Finance: Good Transport, not just CO2 Reductions**

*Saving Oil and CO2 Today Important (Sort of)
Creating Health Cities for Tomorrow Urgent*

Avoid High CO2 Emissions Through Development: Curitiba's street street and land use system





Dilemma for the Developing World?

Cheap Cars and Slow, Costly Transportation

**Cheap Two Wheelers,
but No Sidewalks in Pune**



**Nano or Nono?
The Peoples' Car**



*Nano is not Efficient, Just Small
Millions Could Clog India's Streets, Slow Economic Growth*

Key Messages: Saving CO2 in Transport

(from Schipper, Deakin, Mcandrews, Scholl and Frick 2009 for W Bank)*

- **Transport Matters A Lot for CO2; CO2 Matters Little for Transport***
 - ✓ Transport fastest rising CO2 emissions source (24% global 2006, “50% urban”)
 - ✓ Light duty vehicles at center of urban transport problems and rising emissions
 - ✓ Trucking a mess in most developing countries
 - ✓ High CO2 symptom of poor urban transport in most developing cities
 - ✓ **Attacking the Problem**
 - ✓ Frame problem as a transport problem, not a CO2 problem
 - ✓ Technology improvements to LDV important, but VKT growth the major problem
 - ✓ CO2 (even at \$85/tonne) not major determinant – take as cobenefit
 - ✓ Maximize welfare from transport for a given level of emissions
- **The Blind Leading the Blind – Can’t Master What You Can’t Meter**
 - ✓ Little useable information on passenger or tonne-km
 - ✓ Almost no information on # of vehicles, use /year or fuel and emissions/km
 - ✓ Important to bring in local and national public and private authorities

Thank You

Lee Schipper – mrmeter@stanford.edu



Car that absorbs its own carbon and needs no oil?

Doesn't solve our transport problems.

(with thanks to the late Barry McNutt, who gave me the picture

<http://peec.stanford.edu>