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THE WRI CENTER FOR TRANSPORT AND THE ENVIRONMENT



Sustainable Transport and GHG emissions in Developing Countries: Which is the Cart, Which is the Horse?



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Asilomar, August 25, 2005



Sustainable Transport and GHG emissions in Developing Countries

- Introduction: *EMBARQ*
- The Horse – the Urban Transport Problem
- The Cart – GHG and Transport
- Challenges in Asia
 - Transport in Medium Sized Cities
 - Rapid Motorization in China
- Challenges in Latin America
 - Cleaner Vehicles in Mexico
 - BRT Bus Rapid Transit
- The Way Forward with the Horse Before the Cart
 - Sustainable Transport means GHG Restraint
 - Help is on the way..or is it?



EMBARQ

- A catalyst for socially, financially, and environmentally sound solutions to the problems of urban mobility
- Created in 2002, by the Shell Foundation, at the World Resources Institute, Washington DC
- Work with politically and financially empowered authorities, forming public private partnership and direct engagement with cities.



EMBARQ Project Locations



- Mexico City, Mexico
- Queretaro, Mexico
- Leon de Guanajuato, Mexico
- Lima, Peru
- Sao Paulo, Brazil
- Porto Alegre, Brazil
- Shanghai, China
- Xi'an, China
- Pune, India
- Hanoi, Vietnam
- Istanbul, Turkey



Which Ones MIGHT Be Sustainable?



Sustainable Transport: Three Pillars and a Roof



Governance Sustainability

Clear Laws Clearly Enforced
 Maintain Progress During Political Change
 Stability of Financial Support

Environmental sustainability/safety – health of future citizens

- No environmental problems left for future generations
- Externalities internalized
- Low accident rates, low pollution, low sickness from air pollution
- Low CO2 Emissions

Social sustainability – equity

- Access for the poor, both genders, etc.
- Heavy vehicles don't crowd out lighter (or non motorized)
- Reasonable travel times and speeds, low congestion

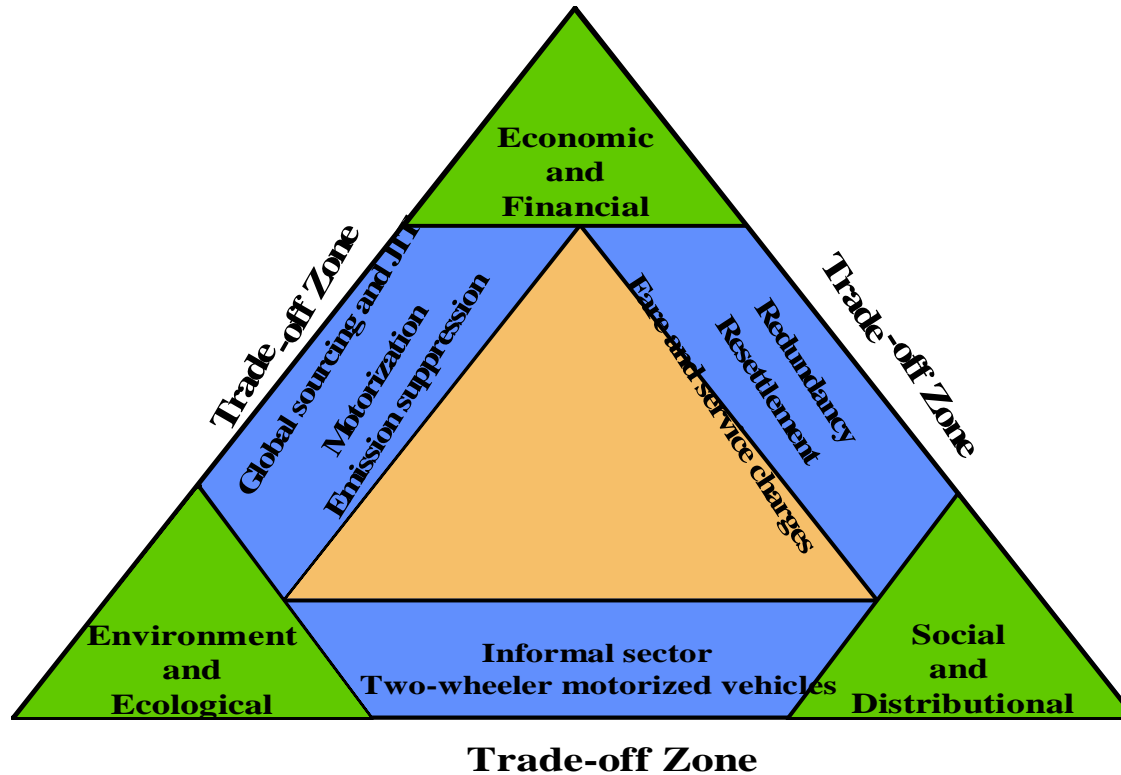
Economic sustainability –innovation and efficiency

- Signals to transport suppliers, level-playing field market opportunities in cities
- Private and public operators financially sustainable

**FEW OF THE ABOVE APPLY
 TO CITIES IN THE DEVELOPING WORLD**

The Horse: Sustainable Transport is multi-dimensional....

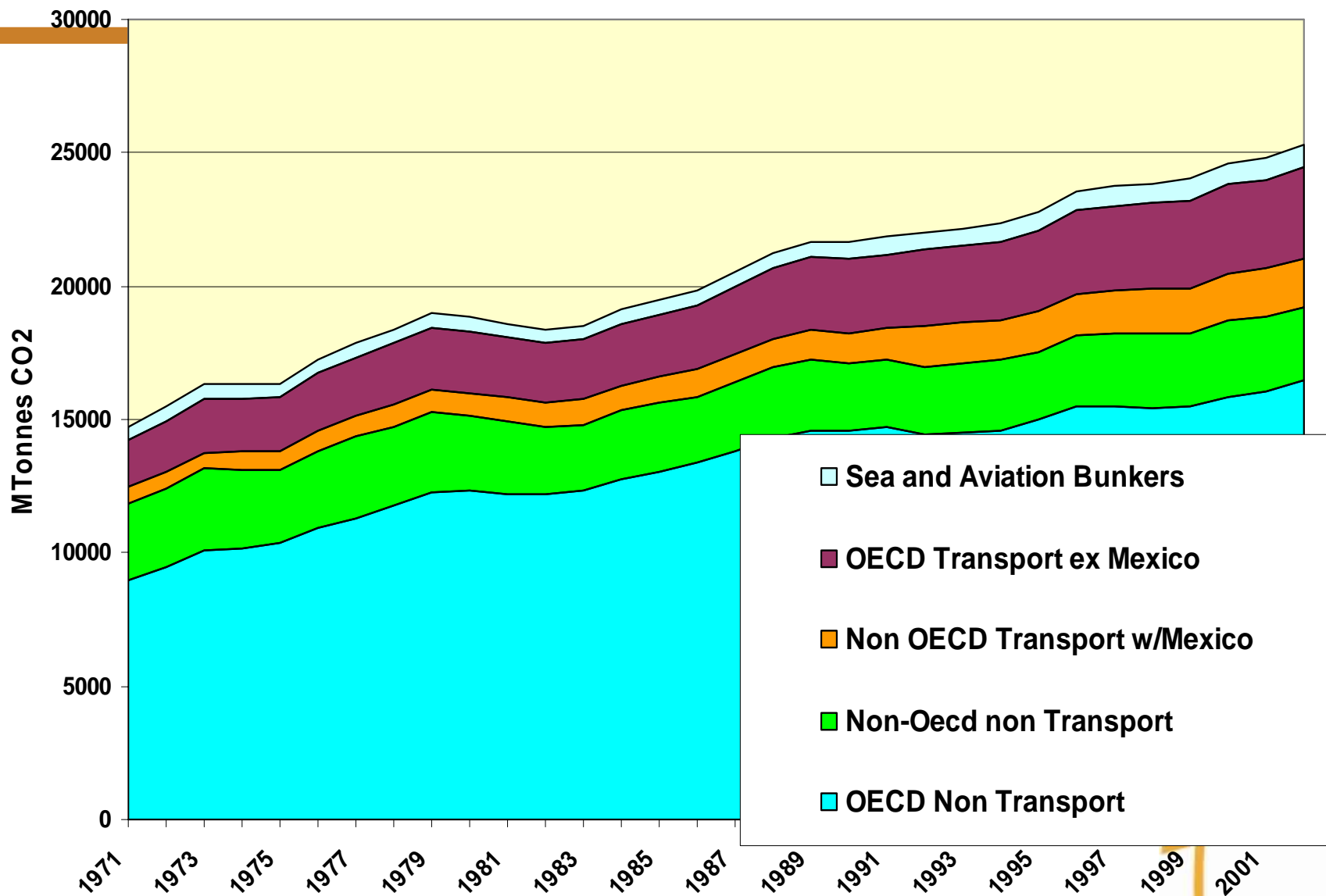
Sustainability, Synergies and Trade-offs



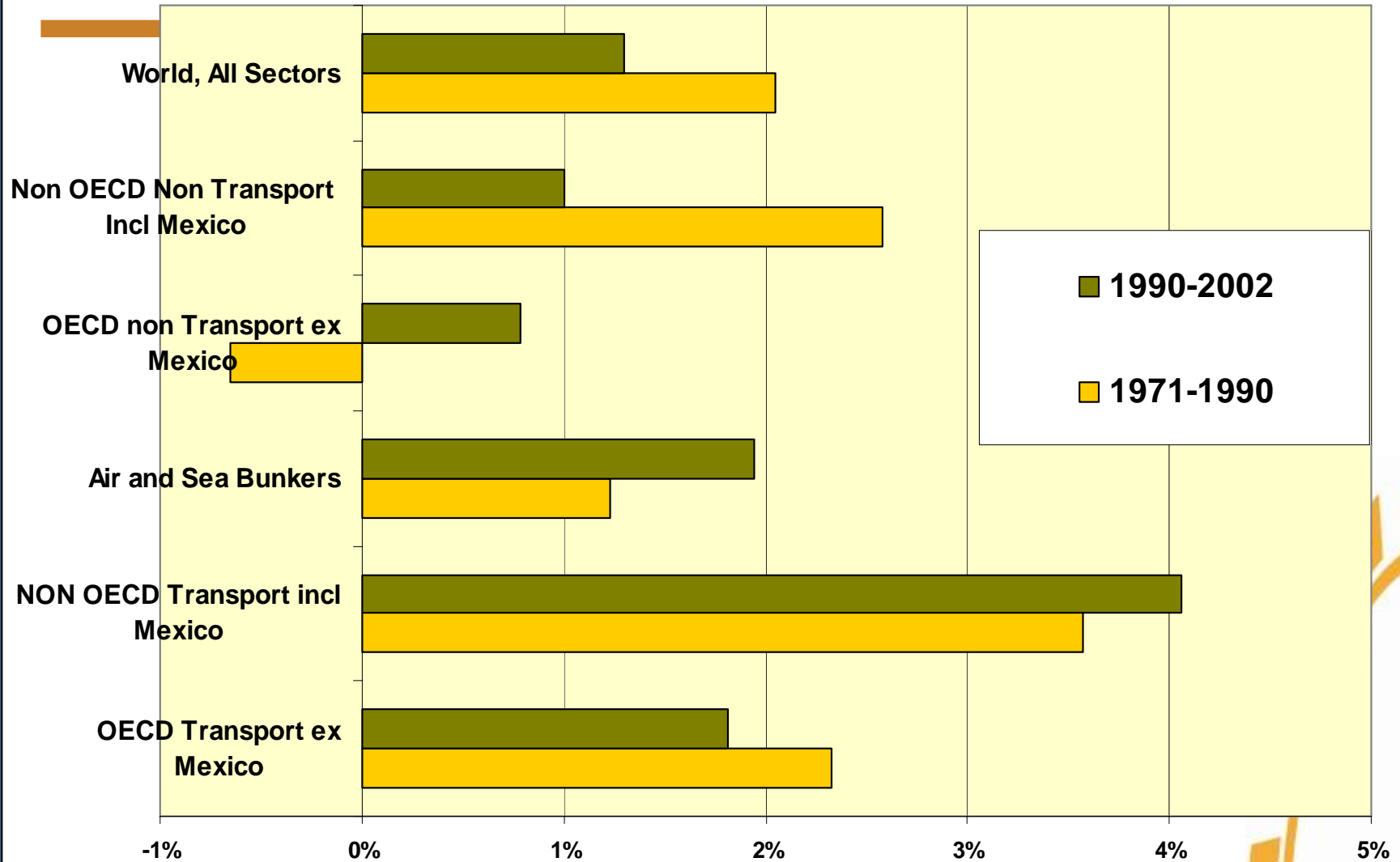
The World Bank

Source. Sustainable Transport, World Bank, 1996 and R. Scurfield

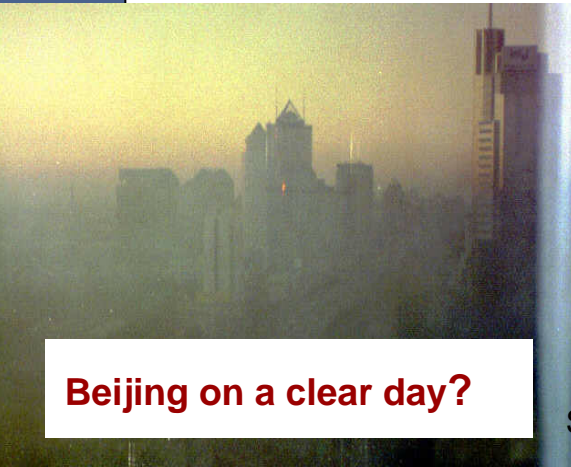
THE CART: WORLD CARBON EMISSIONS PULLED BY TRANSPORT



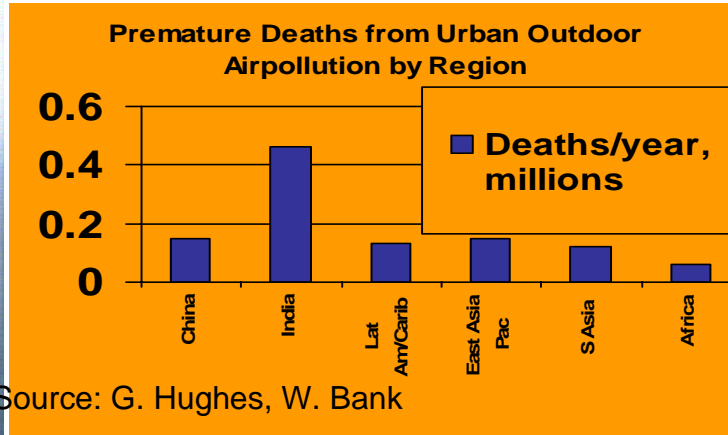
GROWTH IN CARBON EMISSIONS TRANSPORT AND OTHER GROWTH RATES



Air Pollution: A Real Killer



Beijing on a clear day?



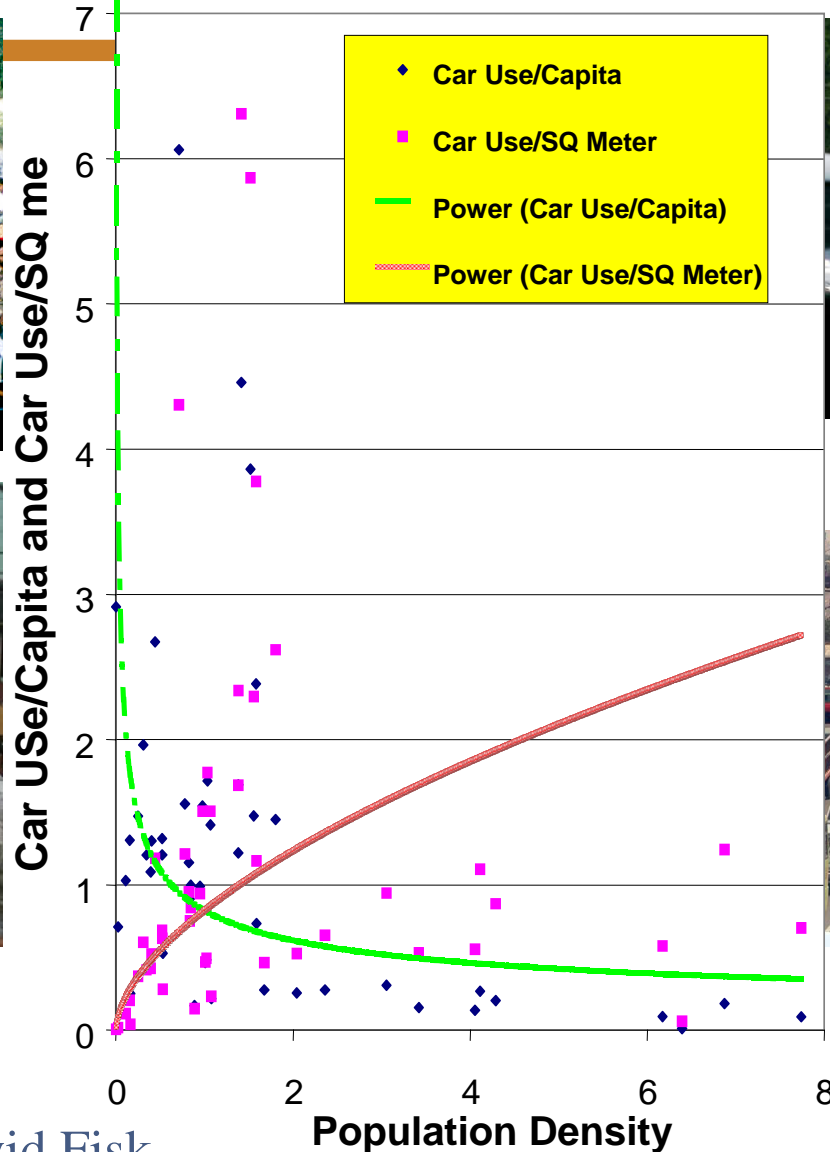
Mexico City, on a clear day?

“Congestion means exposure: being too close to hold your breath”



ENVIRONMENT, CONGESTION, DENSITY

How to Design Large, Dense Cities?



Challenge for Asian Cities: Reduce Air Pollution from Motor Vehicles and Improve Transport Before It Is Too Late!

- Rapid growth in 2-wheeler and other traffic in built-up areas choking everyone
- Tottering bus systems slowed down by cars
- Governments have been woefully negligent
 - No controls on swelling megacities
 - No one protecting walkers/cyclers
 - Some issues settled by Supreme Court, others by adulterated fuels

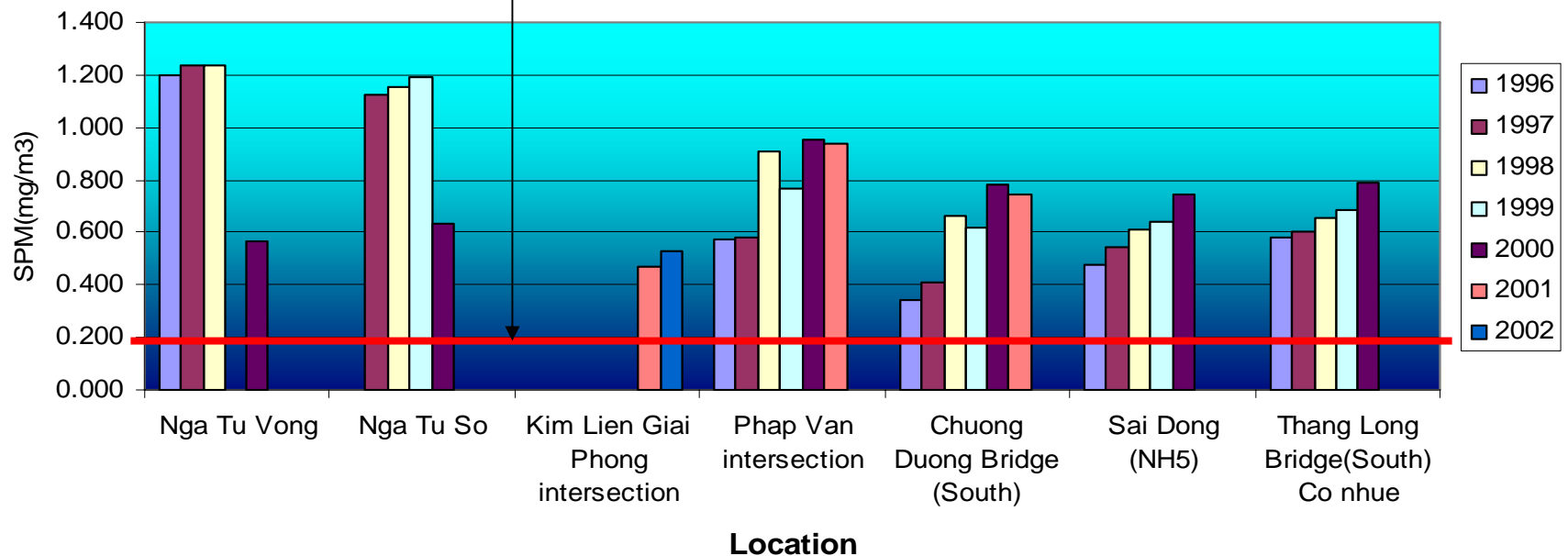
***Partnership for Sustainable Urban Transport In Asia:
Confront these Problems in Three Cities***

HANOI – HEALTH and ENVIRONMENT

Air Quality

Standard SPM=0.2 mg/m³

SPM



Source : - State of the Environment in Hanoi City 2003 –DONRE of Hanoi

- Controlling pollution and giving out environmental protection mitigations in activities of vehicle- VR- 7/2002.

Cars and Urban Transport in China: Concern before Conflicts?

- **Congestion: Cars and Other Traffic**
 - Buses and people stuck in traffic
 - Building more roads makes problem worse
 - Tough policies called for – by whom?
- **Air Pollution: Too Many Vehicles**
 - Enough old smokers to ruin air
 - New fuels, vehicles improving
 - Emissions from cars could offset improvements
- **Economics: End of Metro Mania?**
- **Traffic Safety: People First**
 - Walkers, cyclists main victims
 - Too many kinds of traffic in same place
 - More cars and speed will kill more people



Rapid Motorization in China

[http://Inweb18.worldbank.org/eap/eap.nsf/Attachments/background+2/\\$File/China_Motorization.pdf](http://Inweb18.worldbank.org/eap/eap.nsf/Attachments/background+2/$File/China_Motorization.pdf)

• The growth of the automobile industry

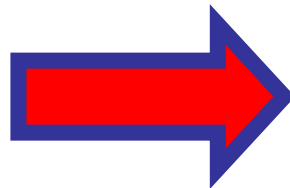
- Pillar of national economy
- Popularity – increase in demand and foreign investment
- Low cost and high cost models, imports

• Historic trends and future projections

- Automobile production from 509,000 in 1990 to 4.4 million in 2004
- Beijing from less than a million in 1990 to 2 million cars in 2003
- China's vehicle stock from 1 million in 1992 to 24 million in 2003
- By 2020, China could have a projected number of 131 million motor vehicles



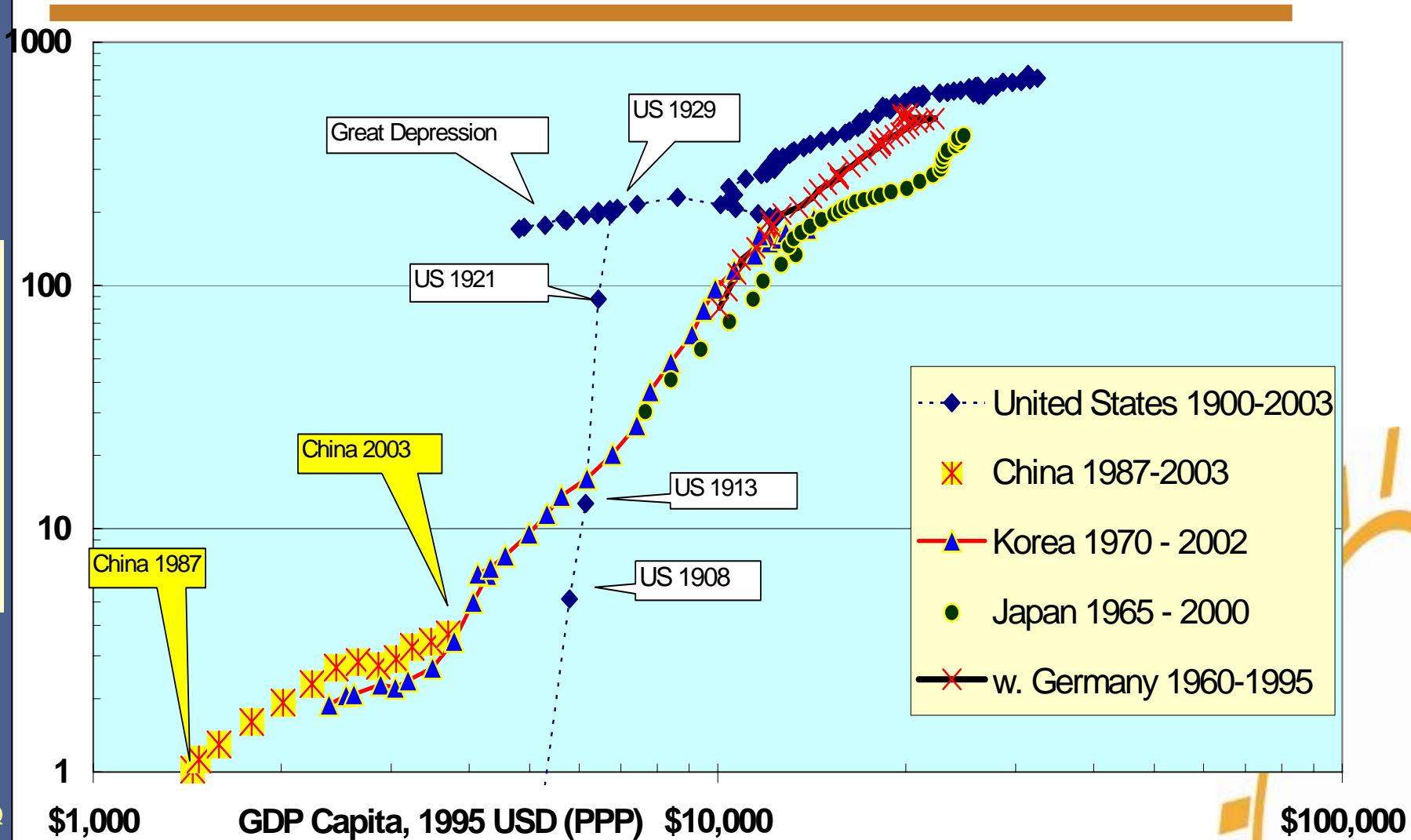
1970s rural vehicle



2002 Buick Van

China's Car Ownership per person today = USA in 1913: Is China On a Collision Course with Itself?

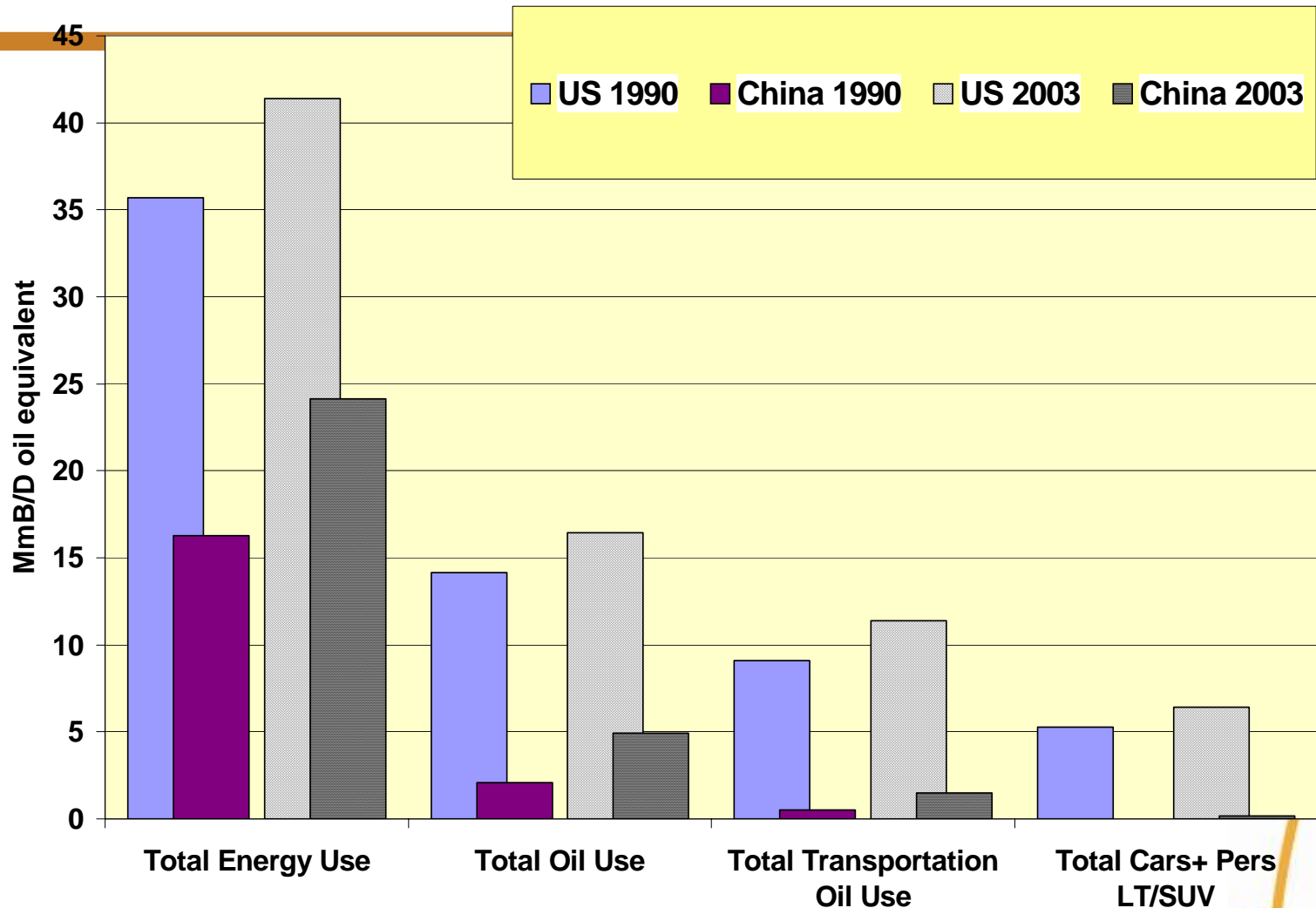
Cars, SUVs/ 1000 people



Source: *EMBARQ*

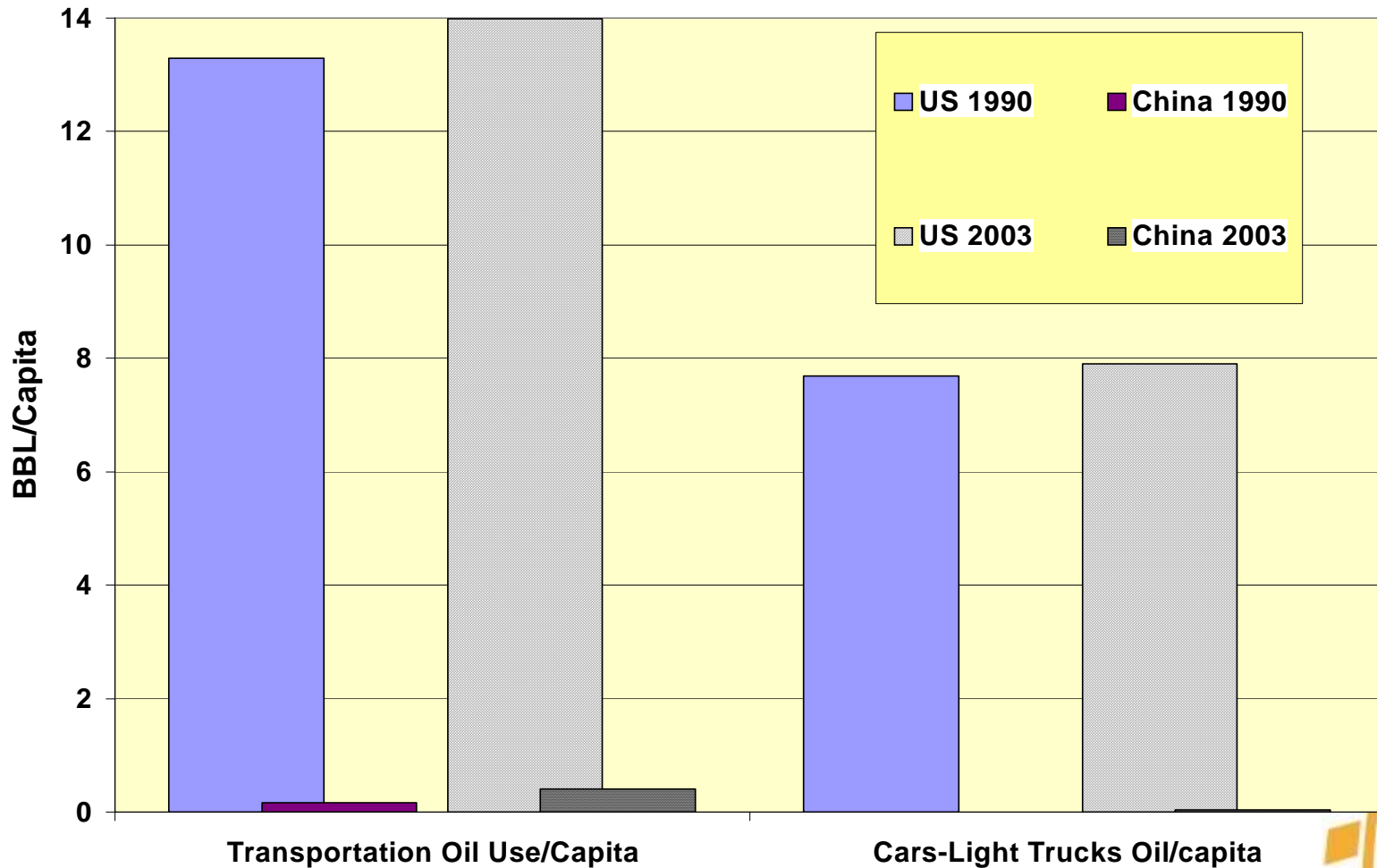
FOR ALL THE CARS IN CHINA?

Growth in Car Use in China is Forcing up Oil Prices?

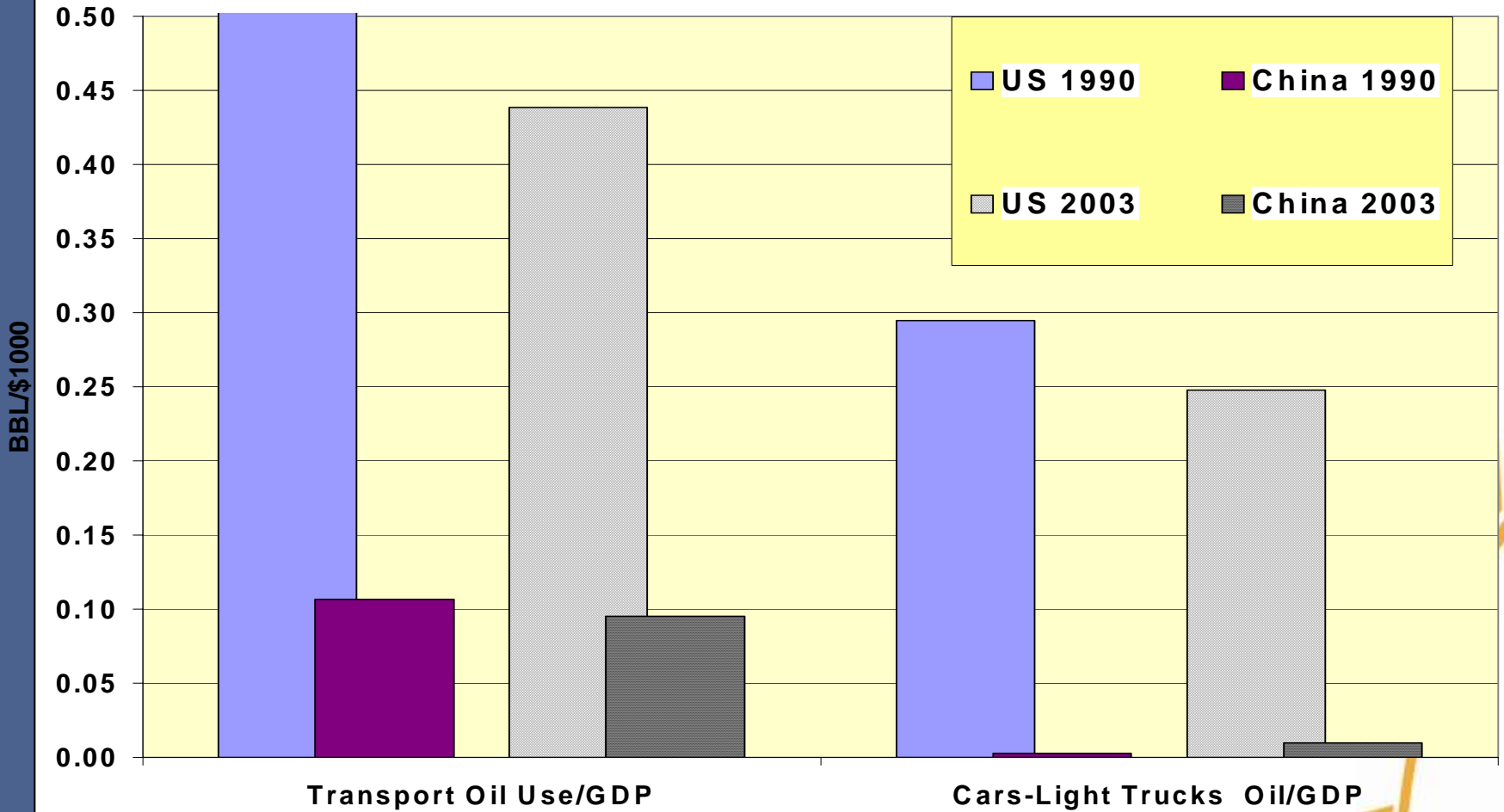


***The Approx U.S. Increment 2002-2003 was half
Of the TOTAL China Use 2003***

PER CAPITA OIL USE FOR TRANSPORT, CARS/PERS LIGHT TRUCKS



OIL USE PER UNIT OF GDP FOR TRANSPORT, CARS/PERS LIGHT TRUCKS



Energy and Transport: “For all the Cars in China”

Original Paper and LS Scenarios “China Car”

- 160 mn cars by 2020, 8000-10 000 km/car
- 7-8.5 l/100km (too low)
- “Only” 2 mn barrels/day new oil demand

More Recent Thoughts

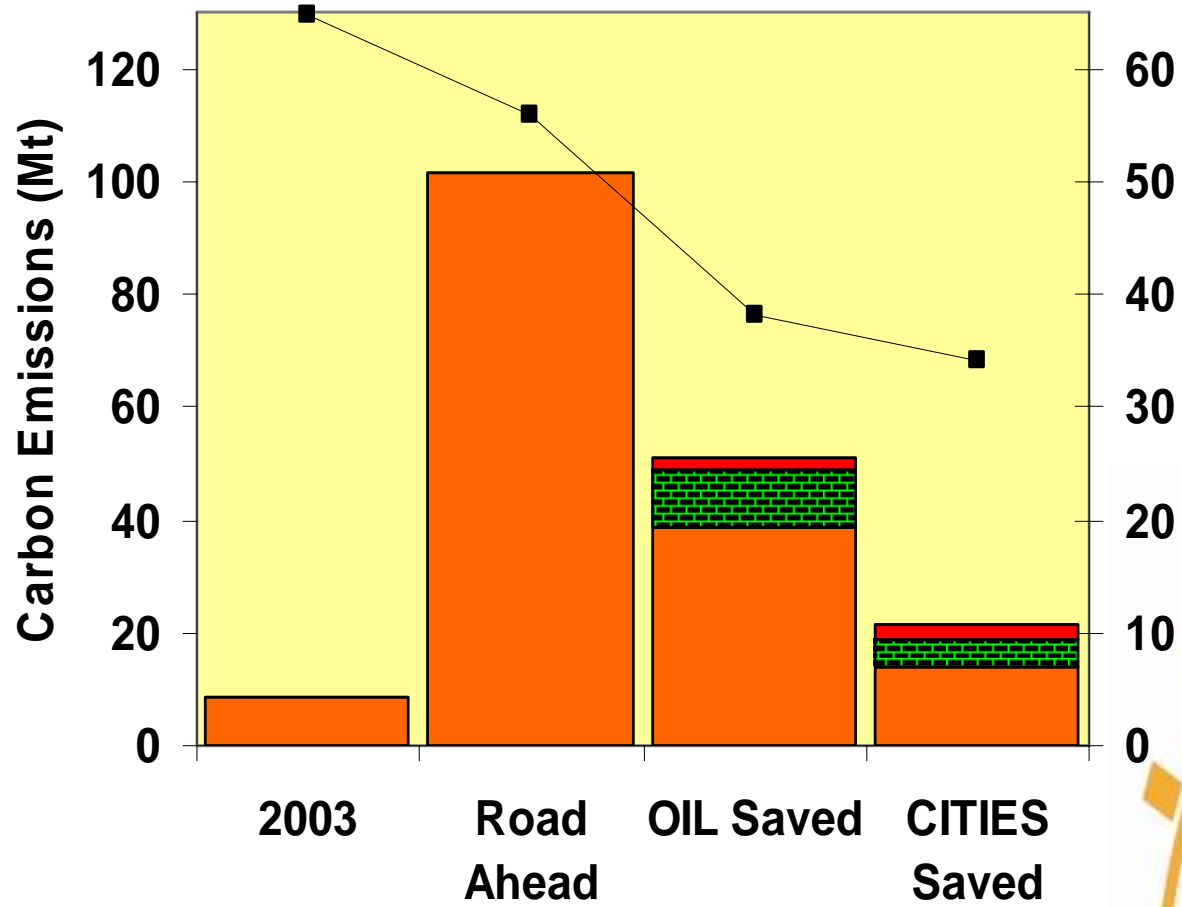
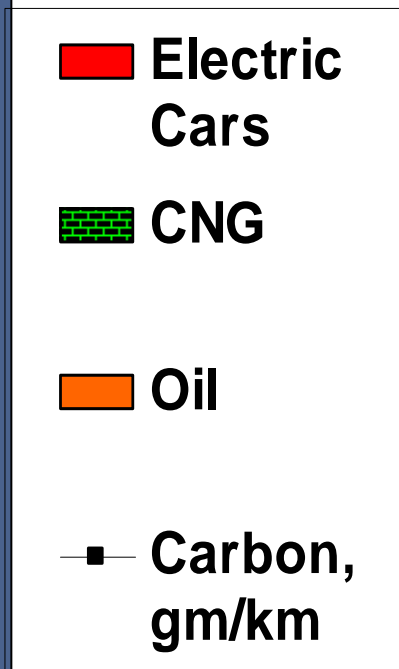
- 120-160 mn cars, 10 000-12 000 km/car
- 8-8.5 l/100 km if no new measures (avg. new car 1500 kg!)
- Closer to 3 mn bbl/day oil in 2020

Variations on the Theme – Saving Cities the Key

- Much lower car use – avoiding the plague
- Very small cars (incl. slow electrics, hybrids) to avoid the space and car collapse in cities
- More efficiency, hybrids, CNG, to avoid oil import risks



The Sustainability Challenge: Cars and CO₂ Emissions in 2020



***“Cities Saved” Has only 25% the Cars of Base line,
50% the VKT/car as well***

Challenge for Latin American Cities: Reduce Air Pollution from Motor Vehicles and Improve Transport Because it Too Late!

- Slow but Steady Growth in Automobile Use
- Walkers, cyclists Decimated
- Bus Systems Undermined by Mini-Buses
- Governments Woefully Negligent
 - Freeways built while collective transport handed to bandidos
 - “Rusticos” (SUV) everywhere ala Americana
 - Dysfunctional transport, metromania, and foul air for the poor



Clean Vehicles in Mexico City: Human Health Before GHG

- **Conventional Technology at Minimal Cost**
 - Clean diesel hauling up to 240 passengers in double articulated
 - Conventional size clean diesel or CNG, even LPG
 - Very low emissions available today (*EMBARQ* Tests in Mexico->)
- **Clean up Existing Vehicles (13 Buses Mexico City)**
 - Exhaust retrofit of existing heavy vehicles; 90% less PM, 20% less NOx
 - Used cleanest diesel available (<15 PPM)
 - Careful testing to pick best and most cost effective solutions
- **Advanced Systems – Maybe Now, Maybe Later**
 - Hybrid from Allison showed lowest emissions, fuel use, but \$\$\$\$
 - Fuel cells? Feedstock and infrastructure main uncertainties
 - Real issue: Learn without starving other options



Mexico City: Features of Traffic

Playing chicken with the bus in the counter flow lane



Bovine Rapid Transit



Challenge: Improve Traffic and Reduce Pollution in one of the World's most Polluted and Congested Cities

Centerpiece: NewBRT System in Mexico City

ROUTES (> 800 000 p/day)

Insurgentes – June 19!!!

Proposed/discussed:

Eje 8 sur Eje Central

**Equipment for first line
(Insurgentes)**

60 large buses on clean fuels
20 Feeder buses and routes
New look in stations
Signal Synch for intersections



What Is Bus Rapid Transit (BRT)

More Than Just Lines On A Map

- **Systematic Reorganization of Surface Transport**
 - Rapid implementation, stable finances,
 - Reliable (mostly private) operators, transparent regulations,
 - Good integration with other modes (smart cards for fares)
- **Backbone of Regional Development**
 - Friendly to other modes
 - Clearly branded and popular
 - Tied to local and regional development and land use
- **Priority to the Client**
 - Speed through protected lanes, traffic signal synch.
 - Greater comfort and security on board, smoother ride
 - Reliability and high frequency, with pre-paid fares

***BRT IS ABOUT CHANGES TO THE TRANSPORT MIND SET:
FUEL AND GHG ARE A MINOR CONSIDERATION***

METROBUS LAUNCH, JUNE 19, 2005

Transformation of Mexico City



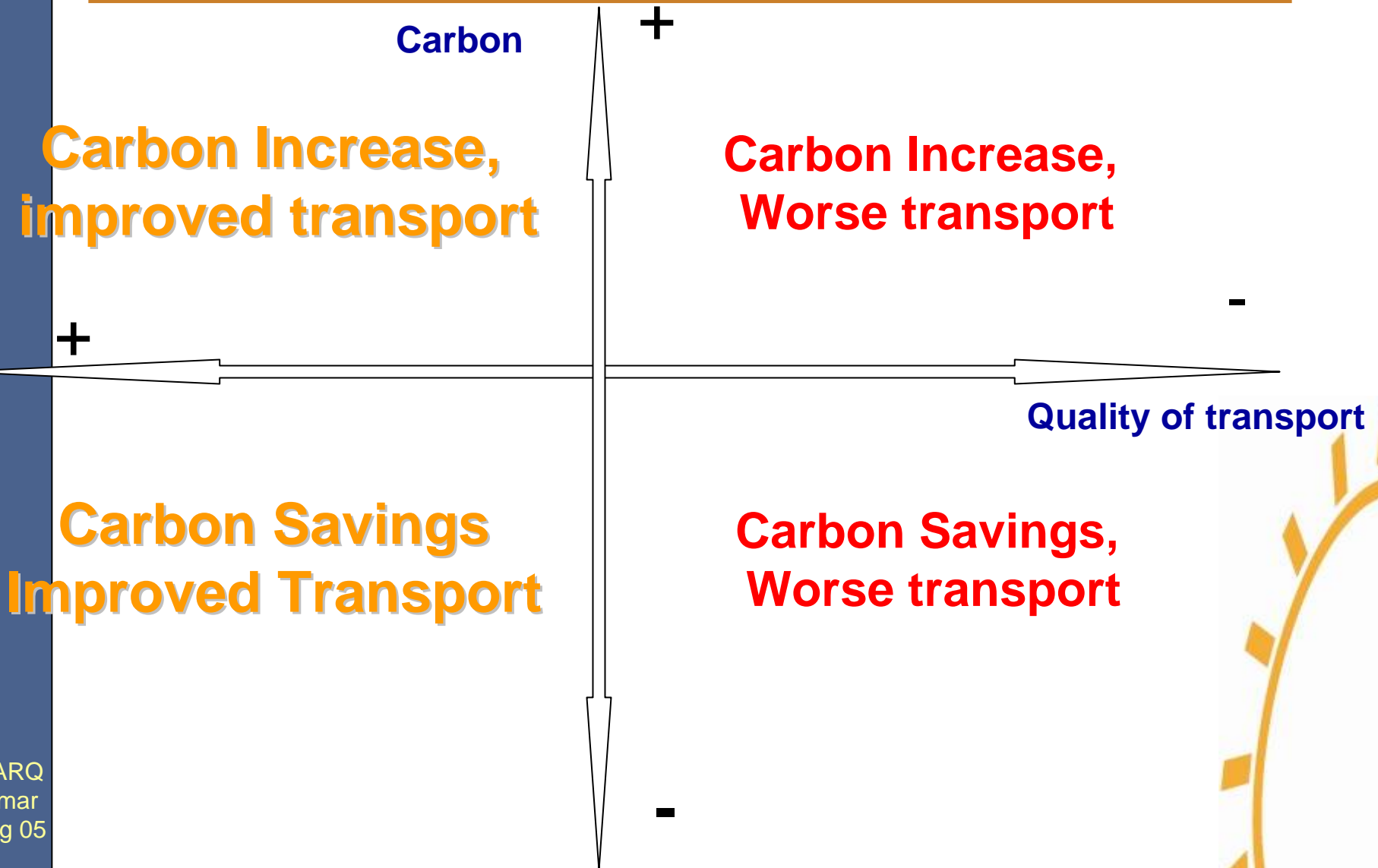
Pollution, GHG Reduction from Bus Rapid Transit System Changes as Important as Emissions Controls

- **BRT Effect**
 - Vehicles run more smoothly, polluting less than in stop and go traffic.
 - Vehicles earn more revenue, so better, cleaner vehicles are affordable
 - Bottom line is less pollution/veh-km compared with no BRT
- **Raise Share of Transport in High Capacity Vehicles**
 - BRT attracts riders from cars and low capacity modes (colectivos)
 - BRT rebuild confidence in the bus system
 - Bottom line is less pollution/pass-km compared with cars, maxi-taxis or empty large buses
- **Use Newer, Cleaner Vehicles and Stations**
 - New clean vehicles pollute less than old ones
 - Passengers wait less in better stations, exposed to less local emissions

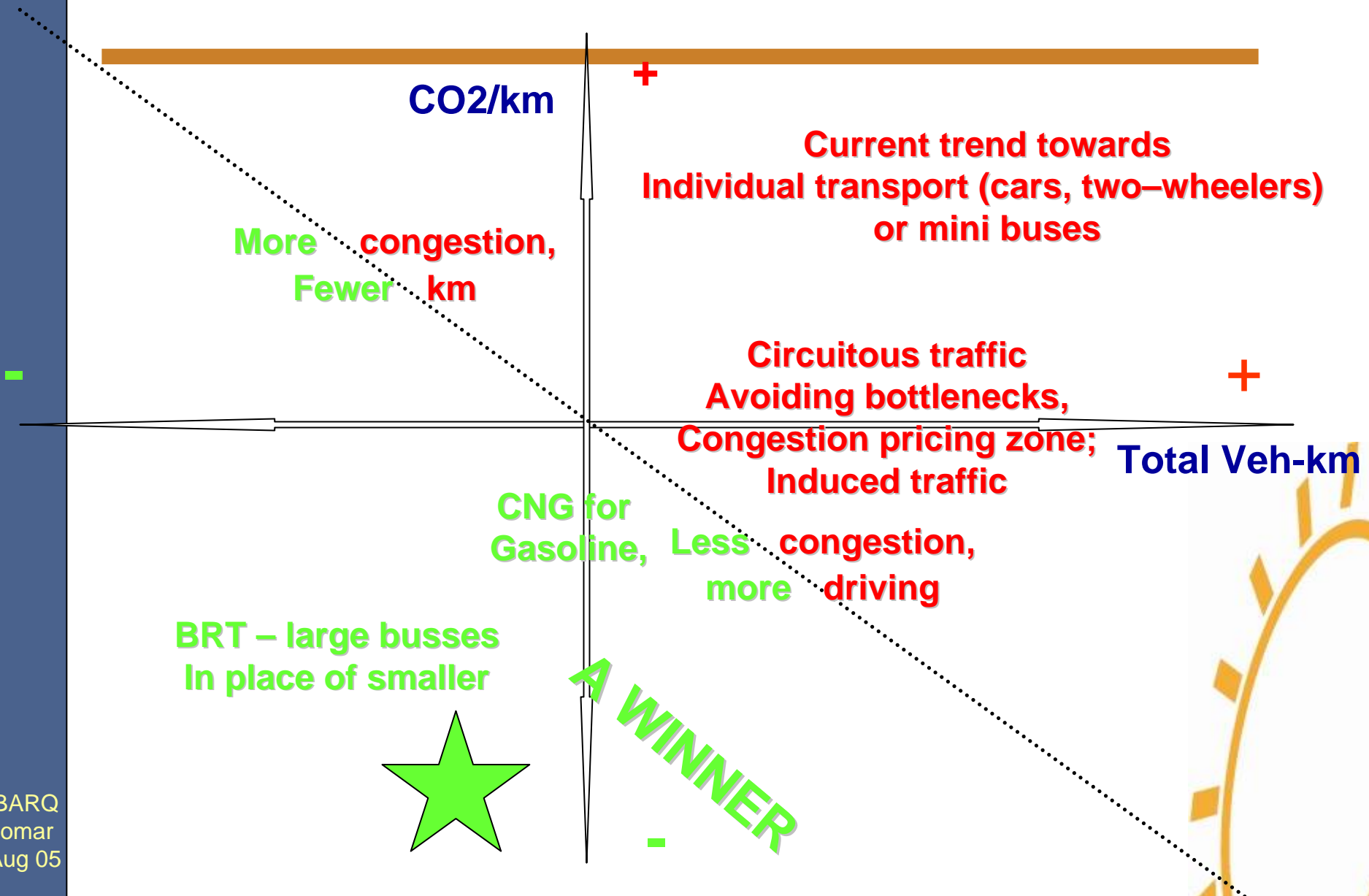
BRT HAS MANY HIDDEN ADVANTAGES AS STRONG AS TECHNOLOGY ITSELF

Transport Project Outcomes:

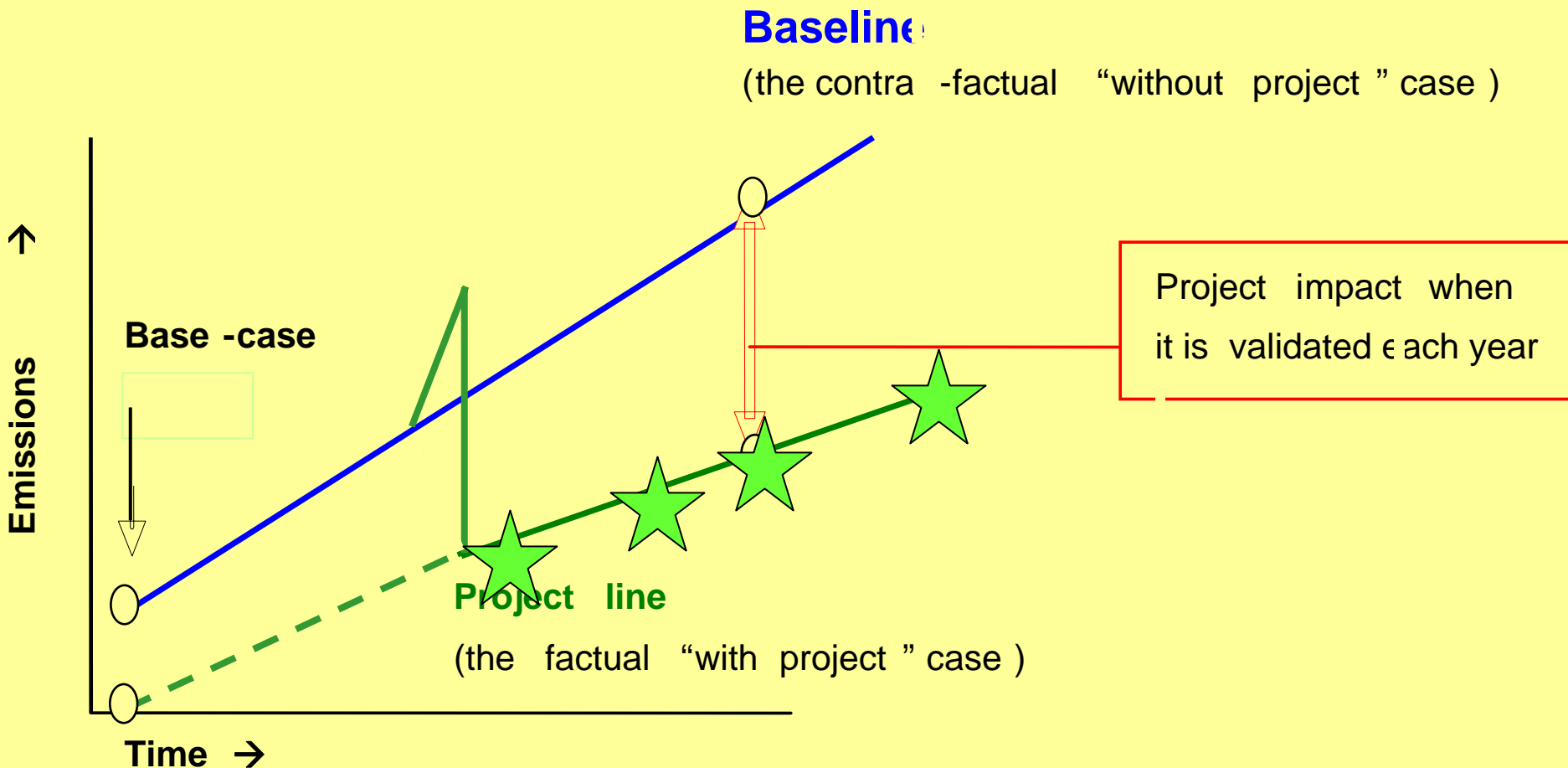
Not Always Less Carbon, Hopefully Better Transport



Transport Project Outcomes: More or Less Carbon?

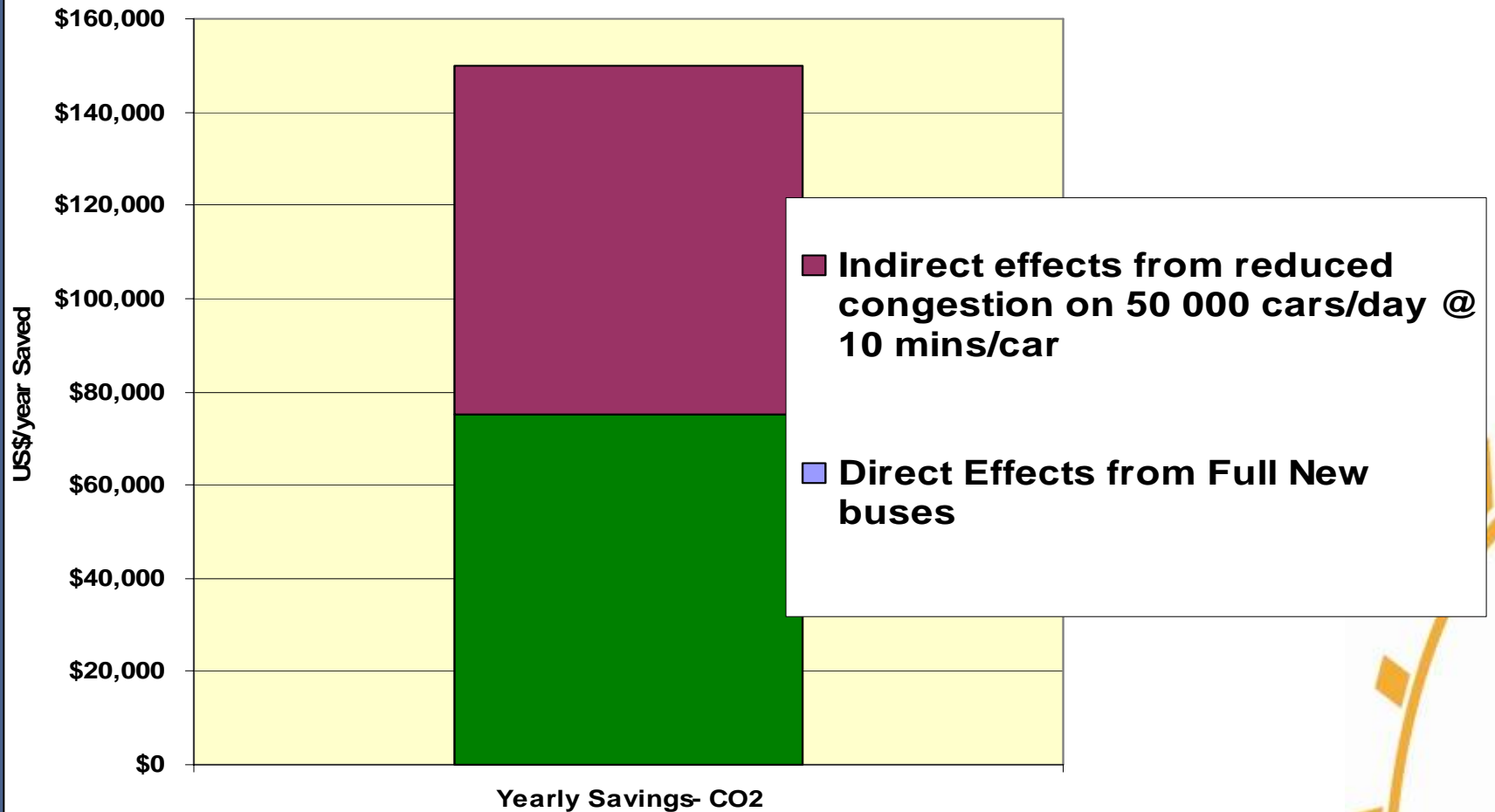


MEASUREMENTS HAVE TO CONTINUE OVER TIME.

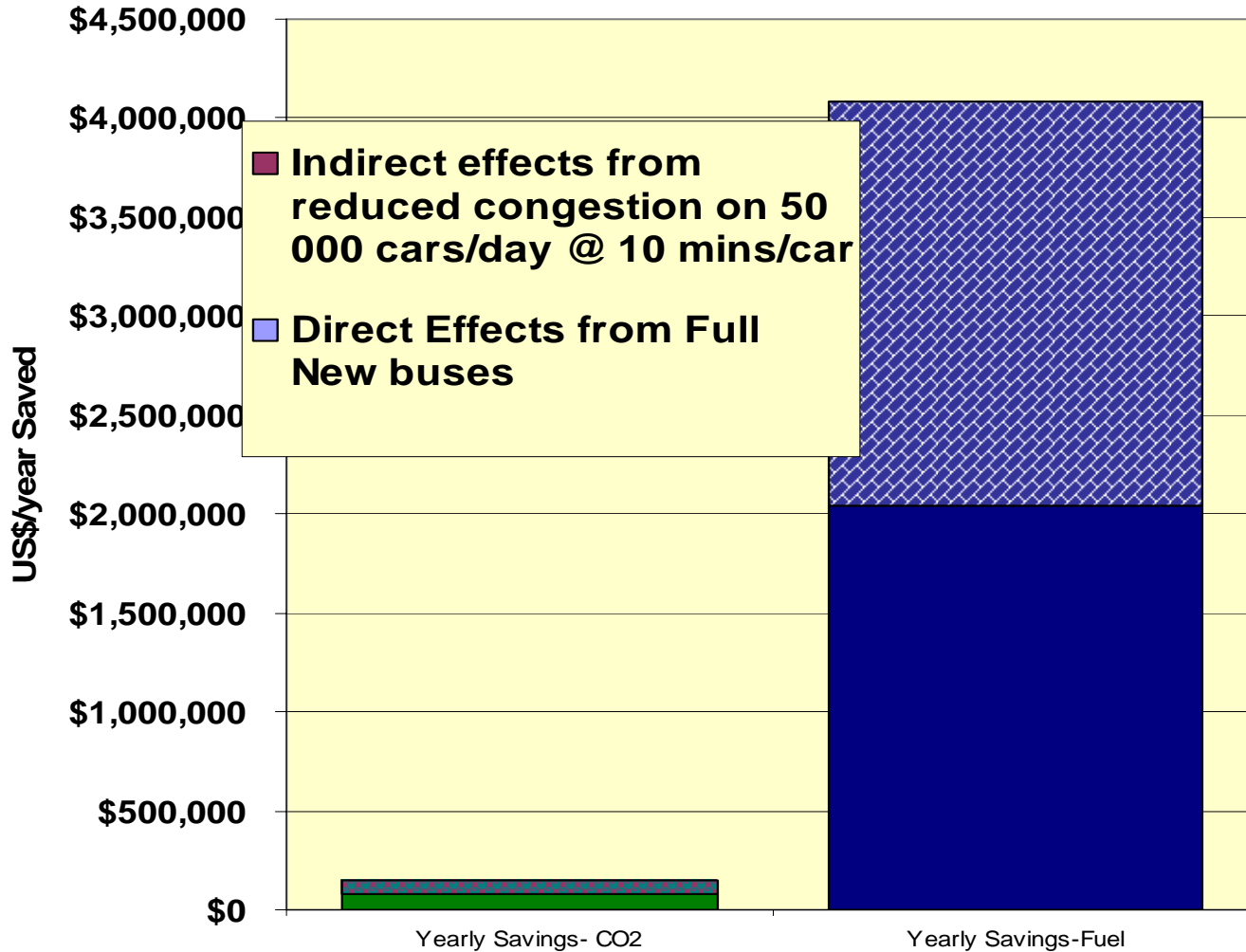


Dynamic Base-line & Project-line over time
After John Rogers, Trafalgar SA, Mexico

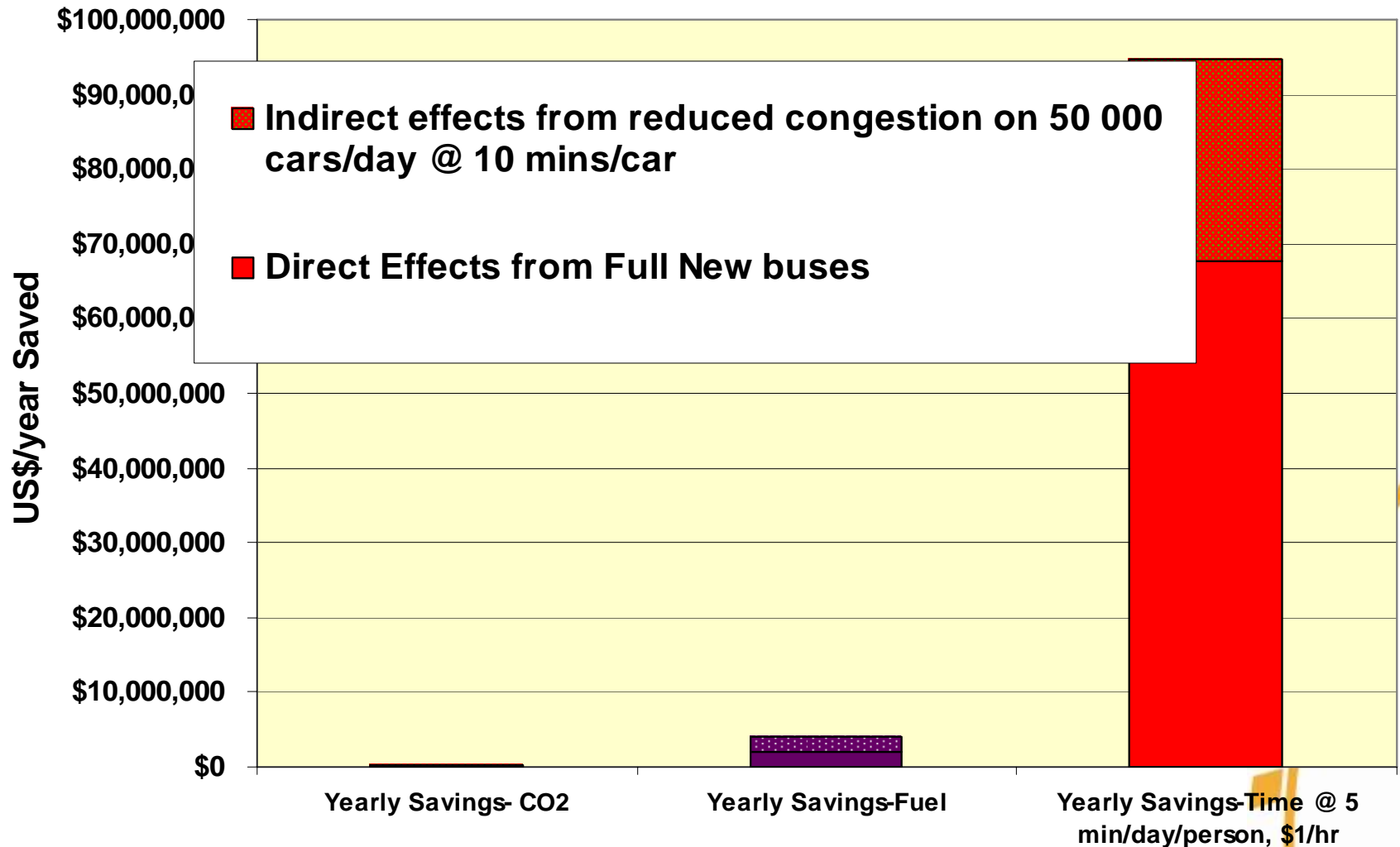
GHG Savings at \$5/Tonne: Hypothetical Insurgentes Corridor Case



GHG, Fuel Savings (\$340/tonne): Hypothetical Insurgentes Corridor Case



GHG, Fuel, Time (\$1/hour) Savings



WHAT COULD MOTIVATE GHG SAVINGS: BETTER CITIES, SUSTAINABLE TRANSPORT

Fuel Saving and Energy Security

- Importers Concerned in China
- “Ex-Exporters interested”: Mexico, Indonesia
- US still a poor example

Cleaner Skies from Clean Transport

- Trend is to cleaner, but more vehicles
- BRT and other low-impact solutions save some GHG

Selling CO2 “Savings”

- Small potatoes and hard to motivate
- Even harder to measure and verify

***CO2 Never Emitted is the Easiest and Cheapest to Save:
Don't Put the Cart Before the Horse***



NAGGING ISSUES: MAKING THE HORSE DRAW THE CART

- **The Mobility Ladder – Will Western Patterns Spread?**
 - Is 20 000 km/year in a 2 tonne vehicle--the US -- inevitable?
 - Are their high-access, low mobility worlds (two-wheelers)?
 - What policies can fairly limit km traveled?
- **Technology Issues: Is Lean and Clean Enough?**
 - Asia and L America are catching up – are dirty vehicles gone?
 - What will/could replace fossil fuels for vehicles?
 - What are the real limits to fuel economy – does it matter?
- **Can We (Experts, Banks, NGOs, Companies, Bilaterals) Help?**
 - Should “we” intervene with money, policies, technology, examples?
 - Which modes of intervention have worked?

***IS HELP ON THE WAY?
STAY TUNED FOR THE NEXT THREE TALKS***



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Thank you !



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