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THE WRI CENTER FOR TRANSPORT AND THE ENVIRONMENT

The Role of Market-based Instruments -Road Pricing, Parking Fees and Congestion Pricing

Lee Schipper
Wei-Shiuen Ng

Dec. 12, 2006
Jogjakarta, Indonesia

WORLD RESOURCES INSTITUTE

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Project Locations

- Mexico City, Mexico
- Querétaro, Mexico
- Porto Alegre, Brazil
- Shanghai, China
- Xi'an, China
- Pune, India
- Hanoi, Vietnam
- Istanbul, Turkey

Prospects

- Leon de Guanajuato, Mexico
- Monterrey, Mexico
- Lima, Peru

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Sustainable Transport - Leaves no Burdens

- **Economic Sustainability**
  - Each mode bears full social costs
  - Affordable to users and authorities
  - Attractive as public or private business
- **Social Sustainability**
  - Promotes access for all, not just a few
- **Environmental Sustainability**
  - Minimizes accidents and damage to human health
  - Reduces greenhouse gas emissions

In this framework, full cost accounting is essential.

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Costs of Urban Transport

- **Resource Costs and Charges**
  - Vehicles and their operation (including licenses, taxes)
  - User charges (tolls, parking, fares, etc)
- **Provider Costs Paid by Local and National Authorities**
  - Road construction and maintenance
  - Other fixed infrastructure (including airports, terminals etc)
  - Rolling stock, buses, etc.
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  1. Environmental impacts – air pollution, water pollution and noise
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Total Costs = Resource Costs + Charges Paid + Provider Costs + External Costs

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The Unpaid Costs of Urban Transport

- **Do road users pay full direct costs?**
  - User fees, taxes, etc
- **Do users pay full social costs?**
  - Air, water, noise pollution, congestion
- **Fairness of the road charging system**
  - On whom do unpaid costs fall upon?
  - Users of different transport mode
  - Vulnerable social groups
- **Market instruments can internalize such transport costs**



Cost of Traffic Congestion

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  - US$68 billion in 2002 in 75 US urban areas
  - In Western Europe, gridlock will increase by 188% on urban roads by 2010
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Market-based Instruments - Backbone of the Solution

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  - Internalization of costs, reducing externalities
  - Price mechanism is a tool for policy enforcement
  - Price instruments have immediate influence on the cost of driving
- **The higher the cost, the less car use, less energy consumption and emissions**
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WHAT, WHY, HOW OF CONGESTION PRICING?

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  - Allocates scarce space to improve access
  - Confronts road users with s.r. marginal costs
  - Demonstrated to reduce car traffic where applied
- **Part of a Comprehensive Package**
  - Need clear plans on transit, parking vehicle taxes
  - Sensitive outreach very important
  - Monitoring to show results key
- **Many Technological Options – that's not an issue**
  - Reduce system and collection costs
  - Increase convenience, lower "false positives"
  - Increase payment options, etc.

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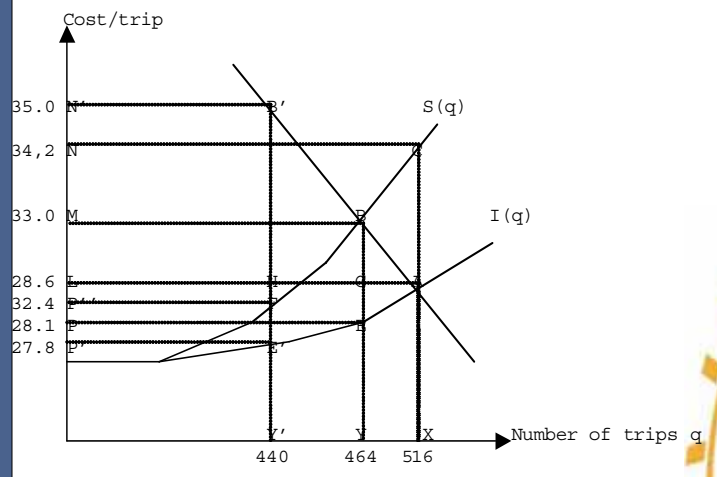
Time Gains & Surplus Losses (from Prudhomme)

Figure 2 – The Stockholm Toll



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The Uncollected Bill for Urban Transport –

- **Roads and Road Space**
  - Marginal cost of peak capacity high
  - Alternative uses of space – NMT, BRT, etc
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The Uncollected Bill for Urban Transport – Key Issues

- **Efficacy**
  - Traffic reduction/time saving: when, where?
  - Revenues compared with collection costs
  - Hassles – how easy or hard
- **Economic Efficiency**
  - Direct impact – cost of a reduced trip, elasticity
  - Social cost-benefit (not so simple)
  - Future costs avoided
- **Equity**
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UNSETTLING ISSUES FROM CONGESTION PRICING

- **Long Run vs Short Run Impacts**
  - How much less traffic than otherwise?
  - What are affects 5-10 years later?
  - How did evolution of city change?
- **Technical Issues for Planning**
  - Elasticities of usage
  - Value of time
  - Costs/value of alternative transit
- **Technical and Social Challenges**
  - What are best enforcement options?
  - Is privacy an issue?
  - Is equity an issue

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Impacts on Various Groups Consider Three Kinds of Travelers

- **Surface Collective Transport (bus, taxi)**
  - Great time loss and unreliable travel times
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- **Middle – Singapore, Mexico, etc**
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  - Urban middle class, poor lose time
- **Low Income**
  - Minority (<10%) clog up streets for majority
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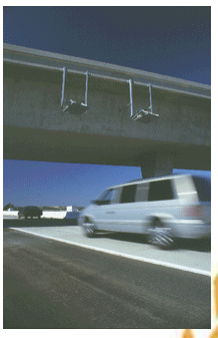
Types of Road Pricing

- Road tolls
- Congestion pricing
- Cordon fees
- HOT lanes
- Vehicle use fees
- Road-space rationing



The Singapore Experience

- Manual road pricing (ALS) introduced in the Central Business District (CBD) since 1975
- High manpower needs, inconvenient, limited in varying road pricing charges
- Automated with the Electronic Road Pricing (ERP) system replaced the manual scheme in 1998
- 45 ERP gantries currently in operation

Congestion Pricing

Definition

- A type of road pricing intended to reduce traffic congestion by encouraging travelers to shift to other times, routes and modes

Difference in prices

- Tolls are significantly higher during congested periods and lower or non-existent during un-congested periods
- Toll rates can be based on a fixed schedule, or be dynamic

Benefits

- The only proven mechanism to achieve large, short-term modal shifts away from private transport to public transport
- More effective in regulating car use than increases in fuel taxes

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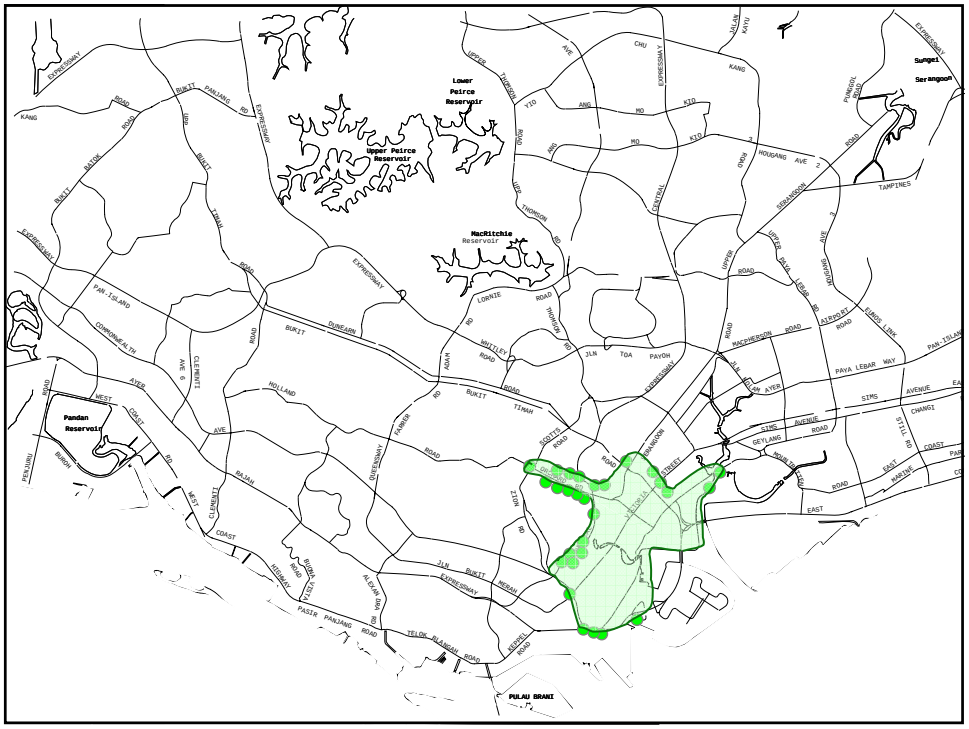

Congestion Pricing in Singapore

Area Licensing Scheme (ALS)

- Traffic volume decreased by more than 50% when pricing was introduced in 1998
- Average speed in the CBD doubled to 36km per hour

Electronic Road Pricing (ERP)

- Traffic volume in the CBD decreased by 7-8% during morning peak and off-peak hours
- 28% increase in traffic volume during evening peak hours
- In 2004, an average of 260,000 ERP transactions were generated daily
- ERP generates a revenue of $55 million per year

In-vehicle Unit (IU) and the CashCard

London Congestion Charging

The London Scheme

- Cordon pricing
- Flat fee of £5 per day between 0700 and 1830 hrs, Mon – Fri
- Charging area of 21km² involves monitoring and charging 2000,000 vehicles per day
- Before pricing scheme – average traffic speeds 15km/hr
- Revenue retained locally to fund improvements in local transport

Effects of Congestion Charging

- Traffic entering the zone has decreased by 18%, and by 15% within the zone
- Congestion reduction of 30% inside charging zone
- Traffic speed has increased by 37%
- 65,000 to 70,000 fewer car trips entering the zone
- Direct effect on business activity was small
- Public transport catered for people switching transport mode

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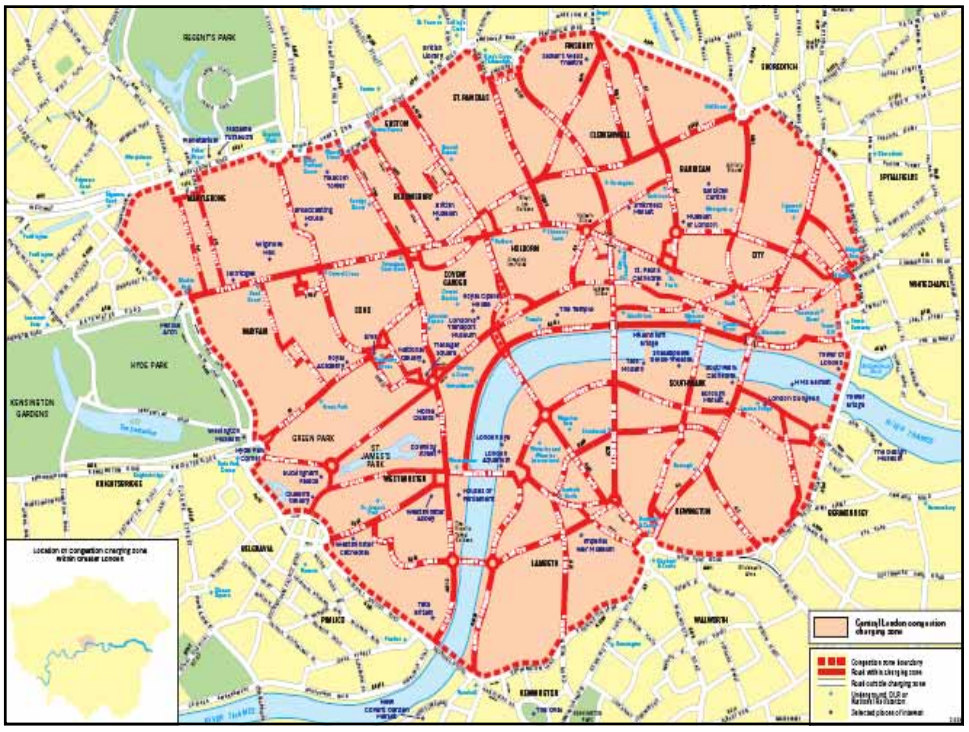

Stockholm

A newly proposed system

- Started in January 2006
- Vehicles entering the inner city area are charged US$1.27 – US$2.54 per trip

Impact

- Traffic volume decreased by 25%, removing 1000,000 vehicles during peak hours
- Increasing daily public transit rider-ship by 40,000
- Daily revenue of US$500,000 to $2.7 million

Public acceptance

- Vote in Sept 06 narrowly favored continuation of the system

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Other Successful Cities

Norway

- Cordon charges have been used in Norway to manage traffic entering three major cities: Bergen, Oslo, and Trondheim
- In 1991, Trondheim established a toll ring around its downtown area
- Electronic tolling systems are used to collect the fees, which vary by the time of day

France

- Since 1992, variable tolls have been used in France to spread peak-period traffic on congested portions of major intercity tollways
- Succeeded in reducing congestion by shifting traffic from the peak period

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Other Successful Cities

Canada

- In 1997, variable pricing was implemented on a toll road (Highway 407) in Toronto, Ontario.
- Fees are based on the time of day, vehicle class, and distance traveled.
- Pricing program expected to reduce congestion on Highway 407 and generated approximately $70 million in the first year of operation.

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Parking Fees

The High Cost of Free Parking

- Average car is parked 95% of the time
- Average parking space costs more than average car
- With free parking, streets cluttered (e.g. Hanoi)
- "Tragedy of the commons"

Hidden Aspects

- Most common fringe benefit offered to workers in the U.S.
- Cost of parking subsidy is about 1% of the GNP and 4 times the amount of funding for public transit
- Free parking spaces have other values

Reducing the Price of Parking

- Charge performance-based prices for curb parking
- Return revenue to the metered districts to pay for added public services

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Changing Curb Parking Policy

Searching for curb parking

- 8%-74% of cars in congested traffic
- Average time between 3 and 14 min

Market-priced curb parking

- Eliminates economic incentive to cruise
- Yield 5%-8% of the total land rent in a city, sometimes more revenue than the property tax
- Charging the right price – balance the demand

Goal of right pricing - Variable-pricing policy

- Achieve a curb-space vacancy rate that reduces cruising
- 15% of curb spaces should remain vacant
- Right price will vary to ensure this rate
- Right price emerges from the right occupancy rate

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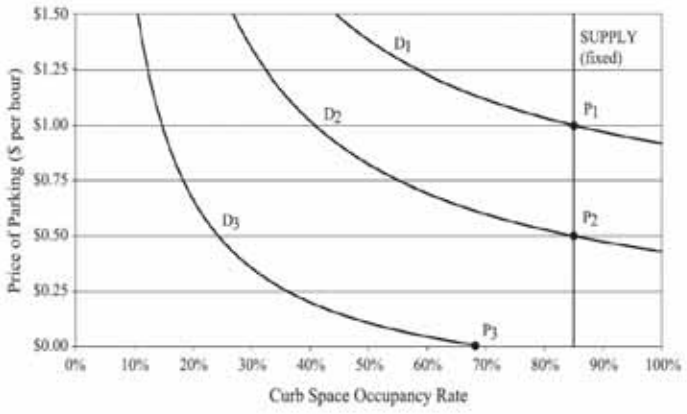
The Market Price of Curb Parking



Source: D.C. Shoup, "The ideal source of local public revenue". 2004.

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Pasadena – A model city

- Pasadena, California - a model for good parking policy, (Shoup, 2004)
- No parking meters until 1993- all curb parking was free
- Each parking meter in Old Pasadena generates $1,800 per year, yielding a total of $1.3 million in 2001
- All meter revenue is used for public investments and neighborhood improvement
- Drivers finance all the improved public services, at no cost to the businesses, property owners, and taxpayers

"You Meter Money Will Make the Difference in Old Pasadena"

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Applications and Challenges

Implementation

- Not just another tax charge
- Where will the revenue go?

Public Acceptance

- An effective pricing scheme
- Gaining support from the public and stakeholders

Integration of Instruments

- Has to be part of an integrated strategy
- Alternatives must be provided
- Integrate proven technologies

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Future Trends

Developing schemes that will be more easily and effectively installed

- Technologies on a smaller scale, e.g. cell phones
- Lower cost of implementation
- Improved forecasting, e.g. demand and trip origins
- Better traveler information

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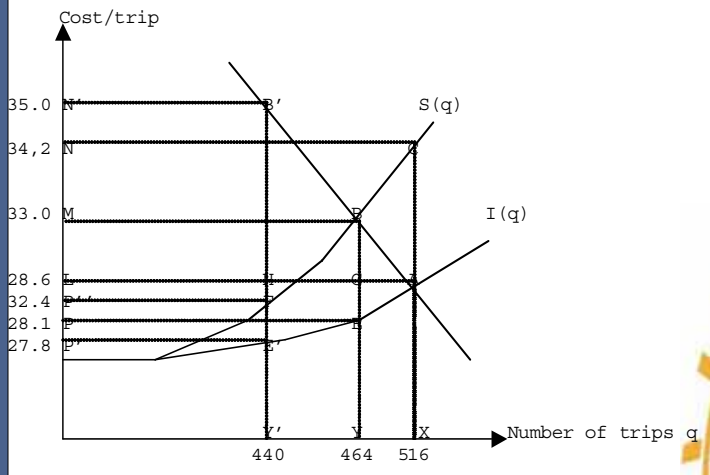

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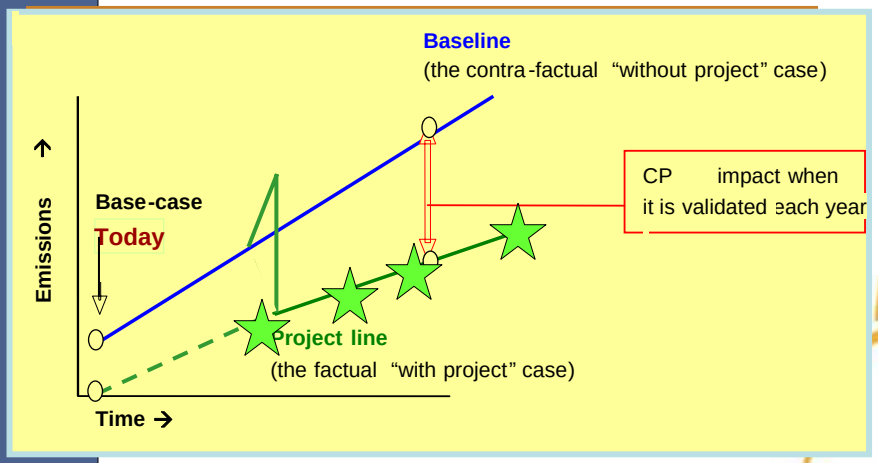
Measurements Have to Continue Over Time - Example: Jakarta with or without CP



Dynamic Base-line & Project-line over time

After John Rogers, Trafalgar SA, Mexico

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Future Trends and Needs

Not Just for Rich Guys

- Put in place early on (Singapore) and avoid car dependence
- Lower cost of implementation
- Need better detection for two-wheelers

Use to Shape City Growth

- Singapore succeeded
- Better to avoid than to rebuild

Developing schemes that will be more easily and effectively installed

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