EMBARQ

THE WRI CENTER FOR SUSTAINABLE TRANSPORT

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

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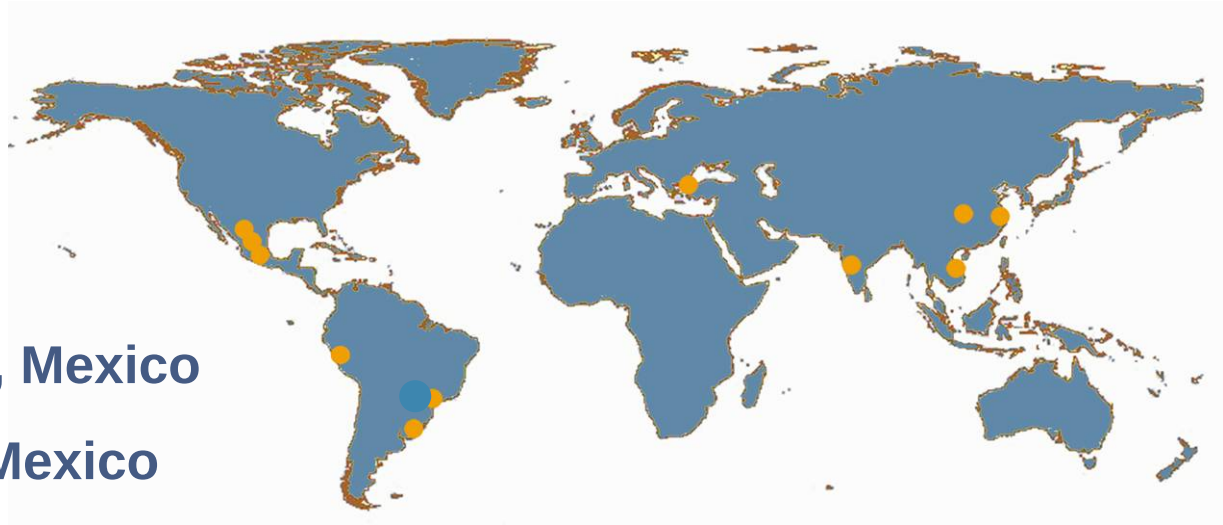
May 25, 2006
Manila, The Philippines

WORLD RESOURCES INSTITUTE

EMBARQ

- A catalyst for socially, financially, and environmentally sound solutions to the problems of urban mobility
- Work with politically and financially empowered authorities, forming public private partnership and direct engagement with cities
- Founded in May 2002 by WRI and the Shell Foundation with a 5 yr, US$7.5 M grant by the SF
- Additional ***EMBARQ*** sponsors include
  - **Hewlett Foundation**
  - **Energy Foundation**
  - **Blue Moon Foundation**
  - **Asian Development Bank**
  - **Netherlands Ministry of Foreign Affairs**
  - **US Environmental Protection Agency**

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

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.

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.
- **External costs imposed on the society**
  1. Environmental impacts – air pollution, water pollution and noise
  2. Road traffic congestion - a symptom of excessive demand for road capacity
  3. Accidents, injury, and death, particularly what is imposed on non-motorized persons

Total Costs = Resource Costs + Charges Paid + Provider Costs + External Costs

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

- **In Developed countries**
  - Nearly 3% of GDP (US$810 billion) in OECD countries
  - US$68 billion in 2002 in 75 US urban areas
  - In Western Europe, gridlock will increase by 188% on urban roads by 2010
- **Situation worse in Asia**
  - Cost of congestion in Korea is 4.4% of its GDP
  - In Bangkok, cost of congestion can be as high as 6% of its GDP
- **Building more roads does not solve the problem**

Applying market-based instruments to better match the increasing demand for road use to the finite supply of roads.

Market-based Instruments - Backbone of the Solution

- **Economic incentives are used to pursue a policy goal**
  - 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**
  - Success means regulation of car use
  - Large improvements seen with small drops in traffic
- **Political acceptance requires other actions**
  - Sincere and measurable improvements in alternatives
  - Consideration of compensation to some
  - Careful consideration of exemptions

Road Pricing

Two Main Impacts

- Revenue generation
- Congestion management

Benefits

- Could achieve cost recovery for urban transport and infrastructure use
- Encourage more efficient transportation
- A demand management strategy

Types of Road Pricing

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

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

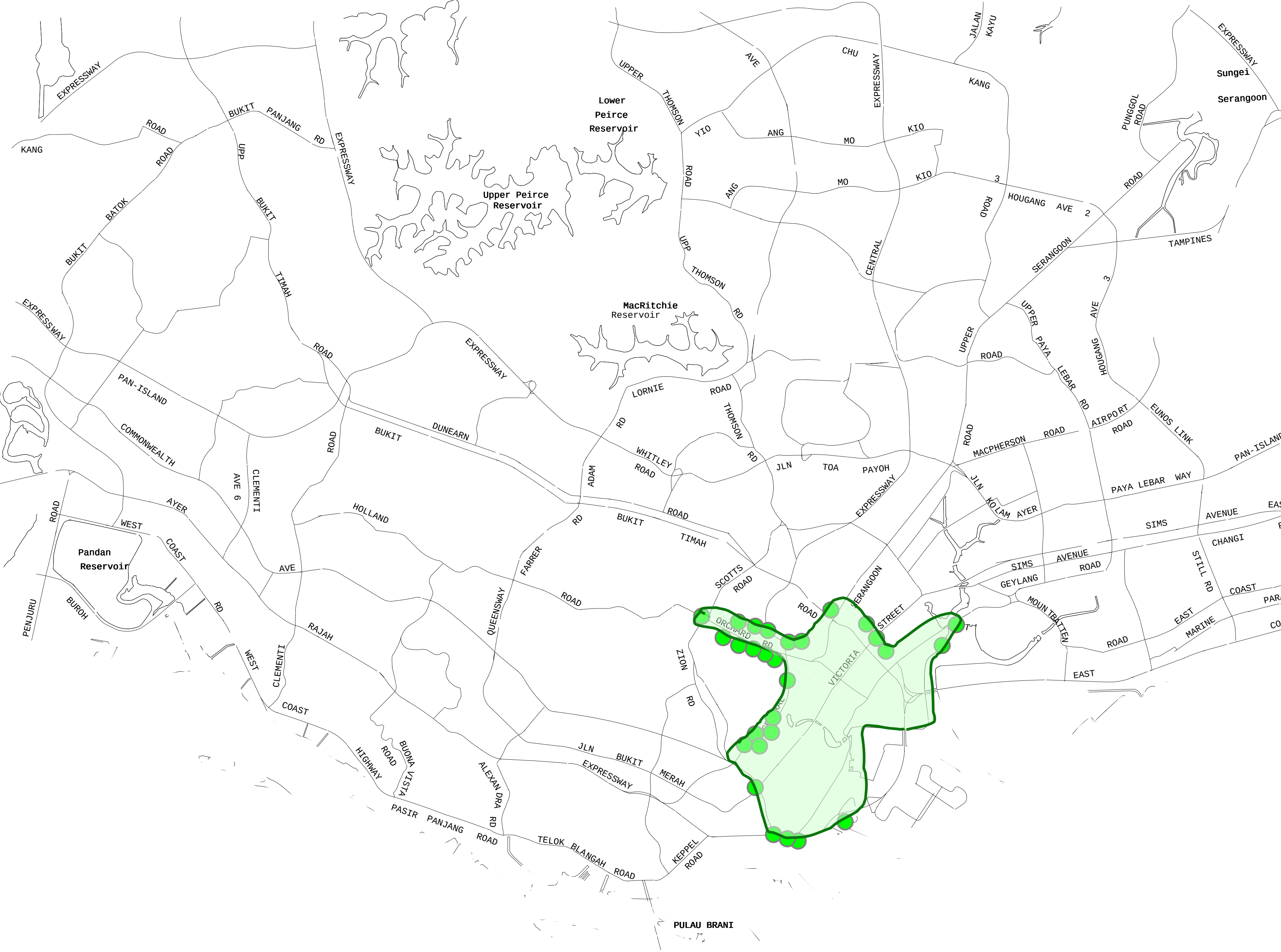
- Tolls are significantly higher during congested periods and lower or non-existent during un-congested periods
- Toll rates can be based on a fixed schedule, or be dynamic

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

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



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MacRitchie
Reservoir
Sungei
Serangoon
Pandan
Reservoir
PULAU BRANI
EXPRESSWAY
KANG
ROAD
BUKIT PANJANG RD
EXPRESSWAY
UPP BUKIT TIMAH ROAD
BUKIT BATOK ROAD
UPPER THOMSON ROAD
YIO CHU KANG
ANG MO KIO AVE
ANG MO KIO
EXPRESSWAY
CENTRAL EXPRESSWAY
JALAN KAYU
PUNGGOL ROAD
HOUGANG AVE 2
HOUGANG AVE 3
TAMPINES
UPP THOMSON RD
UPPER SERANGOON ROAD
UPPER PAYA LEBAR RD
AIRPORT ROAD
EUNOS LINK
PAN-ISLAND
EXPRESSWAY
PAN-ISLAND
COMMONWEALTH
CLEMENTI AVE 6
DUNEARN ROAD
BUKIT TIMAH ROAD
LORNIE ROAD
ADAM RD
WHITLEY ROAD
THOMSON RD
JLN TOA PAYOH
MACPHERSON ROAD
JLN KOLAM AYER
PAYA LEBAR WAY
SIMS AVENUE
EAST
CHANGI
STILL RD
AYER RAJAH
WEST COAST RD
HOLLAND AVE
FARRER RD
QUEENSWAY
SCOTTS ROAD
ORCHARD RD
VICTORIA
SERANGOON
STREET
SIMS AVENUE
GEYLANG ROAD
MOUNTBATTEN
EAST COAST
ROAD
MARINE PARADE
ZION RD
CLEMENTI
WEST COAST HIGHWAY
BUONA VISTA ROAD
ALEXANDRA RD
JLN BUKIT MERAH
EXPRESSWAY
PASIR PANJANG ROAD
TELOK BLANGAH ROAD
KEPPEL ROAD
PENJURU
BUROH

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

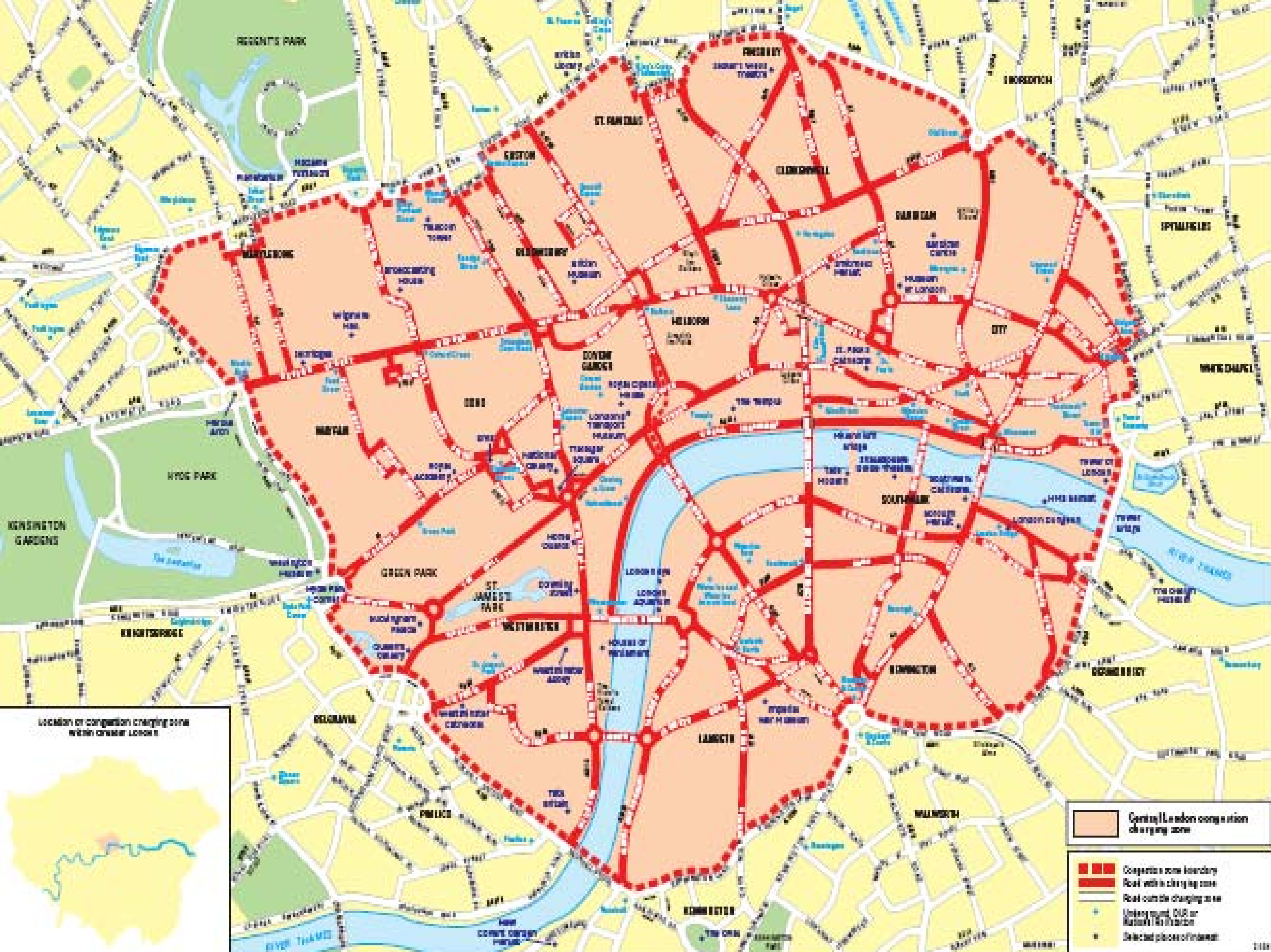
London Congestion Charging

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


REGENT'S PARK
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FINSBURY
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GREEN PARK
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WESTMINSTER
KNIGHTSBRIDGE
BELGRAVIA
LAMBETH
KENNINGTON
BERMONDSEY
PIMLICO
WALWORTH
RIVER THAMES
Location of congestion charging zone within Greater London
Central London congestion charging zone
Congestion zone boundary
Road within charging zone
Road outside charging zone
Underground, DLR or National Rail station
Selected places of interest

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 will occur in Sept 06 to decide if the system should be made permanent
- Current polls very favorable, after initial resistance
- Survey results show decreasing opposition (by 3%) 2 months after the operation of the system

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

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.

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

Changing Curb Parking Policy

Searching for curb parking

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

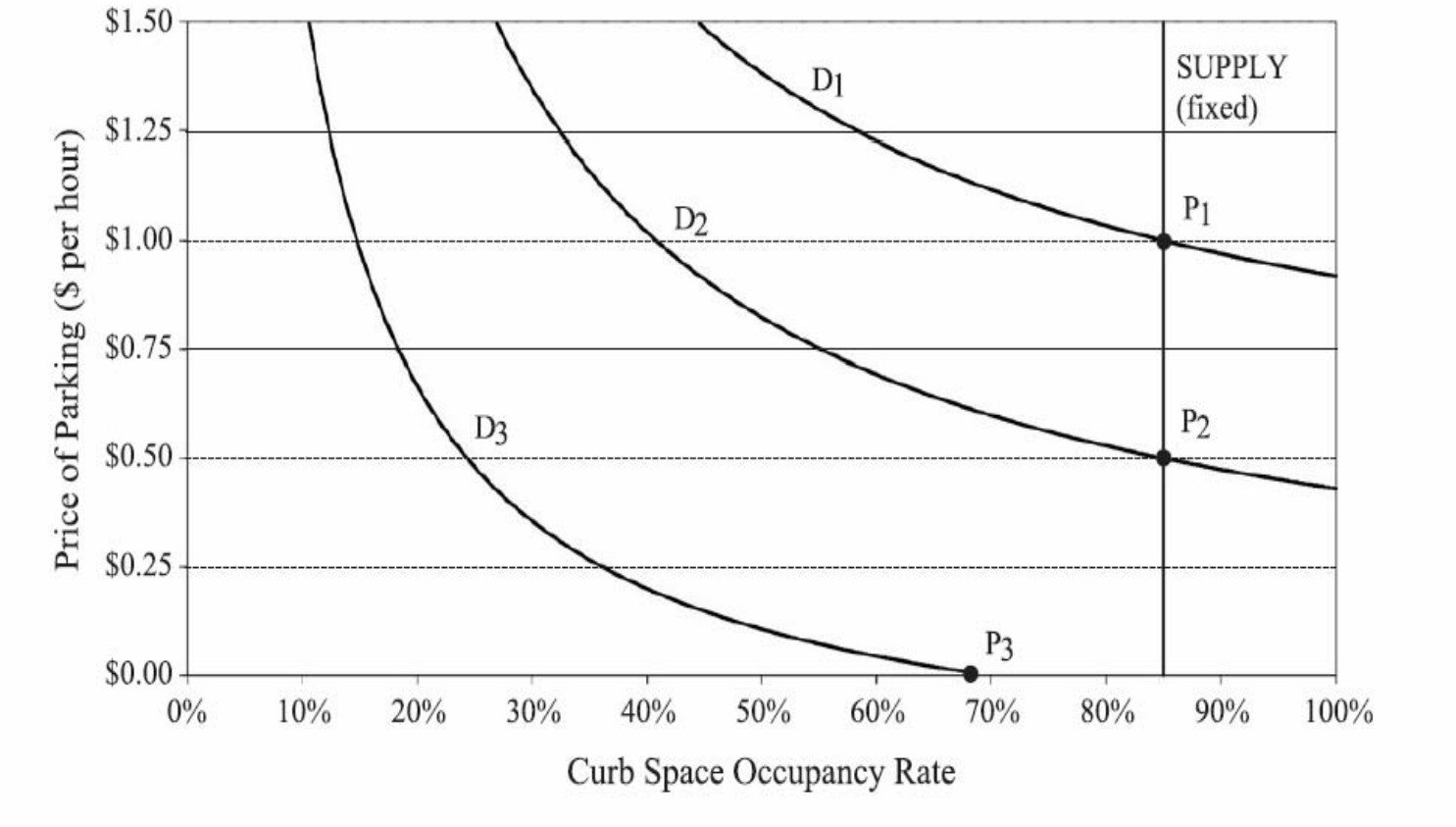
Market-priced curb parking

- 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

The Market Price of Curb Parking



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

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"

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

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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