URBAN TRAFFIC CONGESTION

March 27, 2008, Jose A. Gomez-Ibanez

OUTLINE:

1. CONGESTION AND ECONOMIC GROWTH

2. MENU OF REMEDIES
   - BETTER UTILIZING EXISTING CAPACITY
     - METERING ACCESS
     - PRICING ACCESS
   - BUILDING ADDITIONAL CAPACITY
     - HIGHWAYS
     - METROS
   - CHANGING LAND USE

HO CHI MINH CITY

CHALLENGES OF ECONOMIC GROWTH

1. URBAN POPULATION AND EMPLOYMENT GROWTH

	2005	2025
HCMC population (000)	6,240	10,000
HCMC employment (000)	2,676	4,523
Share services	49%	56%

2. INCREASE IN PER CAPITA TRIP RATES AND LENGTH

	trips/capita/day
HCMC:	1.4
United States:	4 - 5

HO CHI MINH CITY

CHALLENGES OF ECONOMIC GROWTH

3. SHIFT TO THE PRIVATE AUTO

THRESHOLD US$3,000 GDP PER CAPITA

TYPICAL EVOLUTION:

ANIMAL POWERED (walk, cycle)	→	MOTORIZED PUBLIC (bus)	→	MOTORIZED PRIVATE (car)

HO CHI MINH CITY:

ANIMAL POWERED (walk, cycle)	→	MOTORIZED PRIVATE (motorcycle)	→	MOTORIZED PRIVATE (car)

USE OF STREET CAPACITY

	BICYCLE	MOTOR-CYCLE	BUS	AUTO
Passenger car equivalents (PCEs) per vehicle	0.15 – 0.4 (?)	0.15 – 0.4	2 - 4	1
Passengers per vehicle	1	1.2	40	1.2
Passengers per PCE	2.5 – 6.7	3.0 - 8.0	10 - 20	1.2

SHANGHAI: 2000 vs. 2020

	Walk	Bike	Bus	Metro	Motor bike	Car, taxi	All modes
Pkm 2000	7%	27%	39%	0% ?	12%	15%	100%
Pkm 2020	3%	9%	21%	16%	13%	48%	100%
Passengers/ vehicle		1	40		1.2	1.2	
PCEs/vehicle		0.2	3		0.2	1	
PCEs in 2000, per 100 pass.	0	5.4	3.0	0	2	12.5	22.9
PCEs in 2020, per 100 pass.	0	1.8	1.6	0	2.2	40	45.6

HO CHI MINH CITY: 2002 vs. 2020

	Walk	Bike	Bus	Metro	Motor bike	Car, taxi	All modes
Pass. 2000	n.a.	19%	5.1	0%	74%	1.9%	100%
Pass. 2020	n.a.	0.6%	24.5%	10%	43.3%	21.6%	100%
Passengers/ vehicle		1	40		1.2	1.2	
PCEs/vehicle		0.2	3		0.2	1	
PCEs in 2000, per 100 pass.	0	3.8	0.4	0	12.3	1.6	18.1
PCEs in 2020, per 100 pass.	0	1.2	3.7	0	7.2	18	30.1

MENU OF REMEDIES

1. BETTER MANAGING EXISTING CAPACITY
   - METERING ACCESS (ENGINEERS)
   - PRICING ACCESS (ECONOMISTS)
2. BUILDING ADDITIONAL CAPACITY
   - HIGHWAYS
   - METROS
3. CHANGING LAND USE

ALTERNATIVE REMEDIES

HO CHI MINH CITY MASTER PLAN

NEW HIGHWAYS (within 2nd ring road):

- Four elevated expressways (~ US$ 400 million each)
- Bridges and tunnels to Thu Thiem (District 2)
- East-west expressway
- Plus build outer ring roads

NEW METROS

- 6 Urban MRT lines (~ US$1 billion each)
- 3 monorail lines

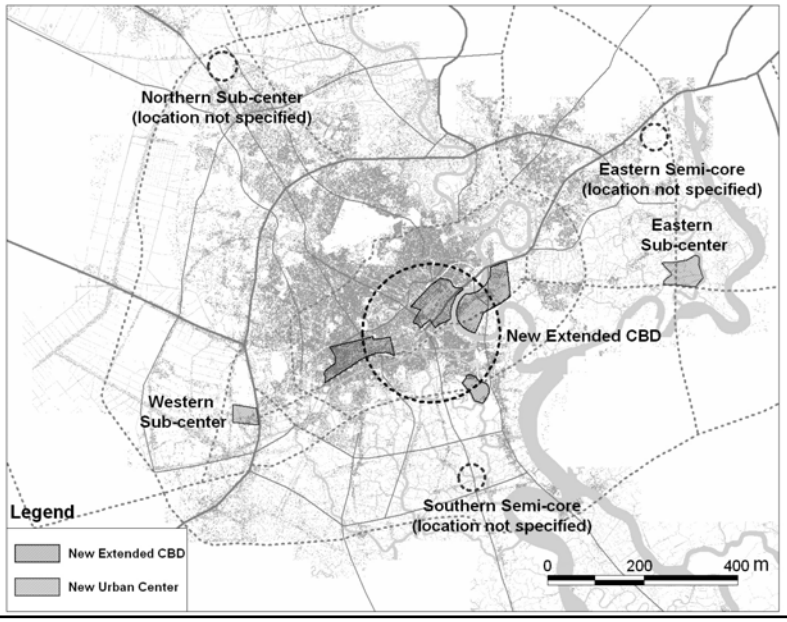
DECENTRALIZED LAND DEVELOPMENT

- Extended CBD (District 1, Cho Lon, Saigon South, Thu Thiem)
- Four satellite sub-centers
- New airport to east

FOUR PROPOSED ELEVATED EXPRESSWAYS

SIX PROPOSED UMRT LINES

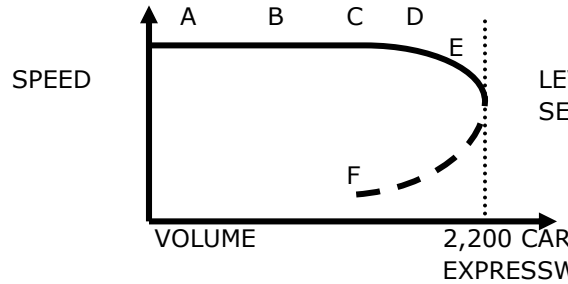
EXTENDED CBD AND SUBCENTERS



MANAGING CAPACITY:

ENGINEER'S PERSPECTIVE

SPEED-VOLUME CURVE



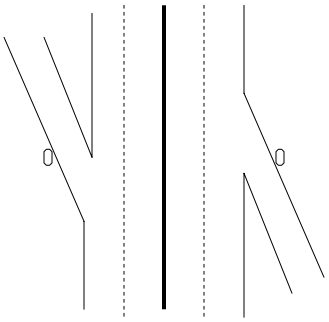
SOLUTIONS

- PHYSICAL METERING
- PRIORITY FOR HIGH-OCCUPANCY VEHICLES (BUSES)

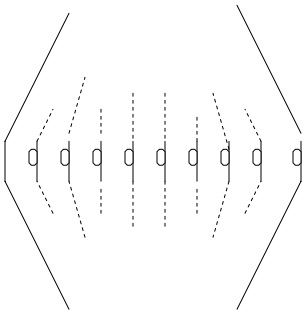
MANAGING CAPACITY:

PHYSICAL METERING

AT FREEWAY RAMP



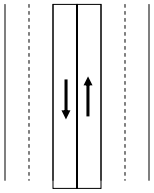
AT FACILITY ENTRANCE



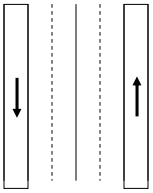
MANAGING CAPACITY:

BUS PRIORITY LANES

MEDIAN



CURB SIDE



ISSUES

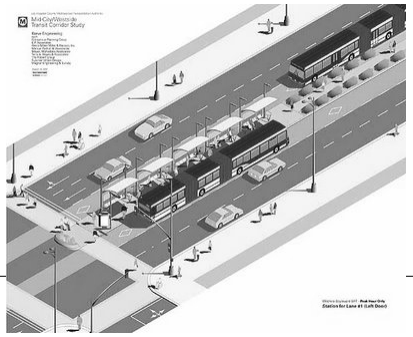
- ☐ Enforcement
- ☐ Turns
- ☐ Passenger access (if median)
- ☐ Congestion on remaining lanes

MANAGING CAPACITY:

BUS RAPID TRANSIT (BRT)

CHARACTERISTICS

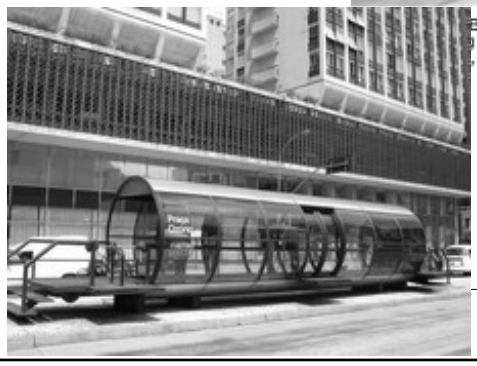
- Segregated busways and stations
- High frequency services
- High platform boarding
- Pay before boarding
- Special operators



CRITIBA BRT

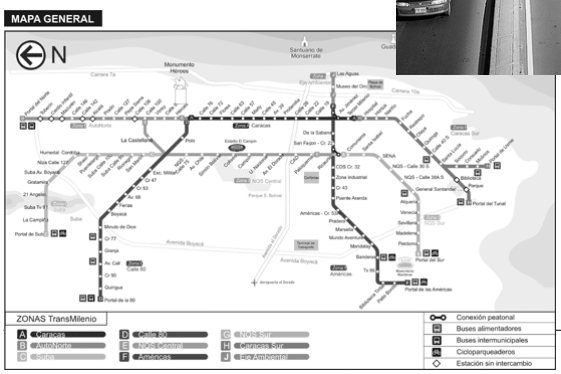
- 1970, Brazil
- 15,000 phd

Brazil's BRT boarding islands provide for
fare collection and a platform level with the
, speeding both boarding and deboarding



BOGOTA BRT

- 2002, Colombia
- 42,000 phd



MANAGING CAPACITY:

BRT PRO & CON

PRO:

- High speed, high volume
- Cheaper, easier to build than Metro
  - BRT: $2-$15 mil/km
  - Metro: $50-350 mil/km
  - LRT: $15-$40 mil/km

CON:

- Not full separation from other traffic
- Spillover congestion

MANAGING CAPACITY:

HO CHI MINH CITY EXPERIENCE

- BUS LANES: Rejected
  - Safety, congestion objections of motorcyclists
- BRT: Proposal on hold
  - $58 million, 17 km = $3.4m/km
- MOTORCYCLE LANES: Everywhere!
  - Mixed blessing: Critical for motorcycles
    But bad for buses

MANAGING CAPACITY:

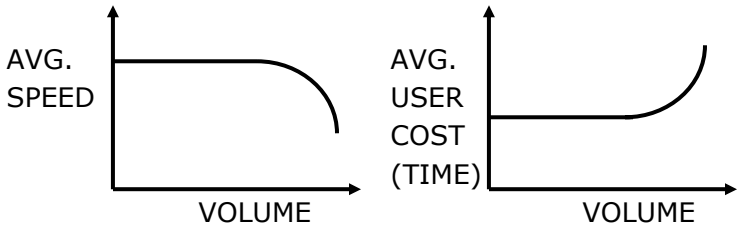
ECONOMIST'S PERSPECTIVE

- CONGESTION AN "EXTERNAL" COST
  - Motorists ignore the delays they impose on other highway users
- SOLUTION: PRICE
  - "Congestion tolls"

MANAGING CAPACITY:

ECONOMIST'S PERSPECTIVE

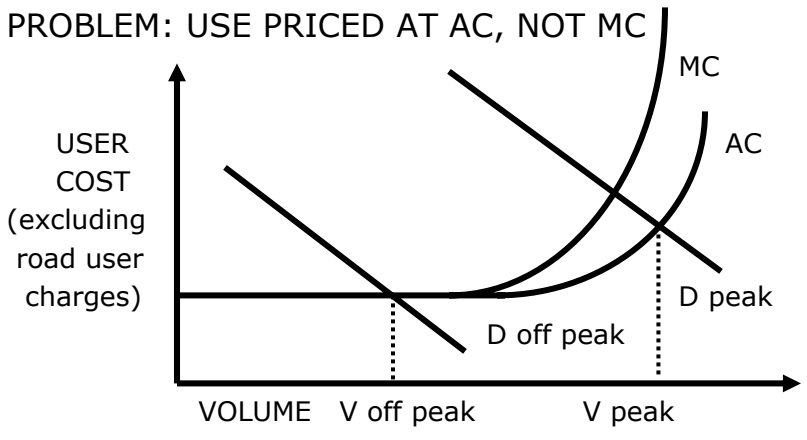
TRANSLATE SPEED-VOLUME CURVE INTO USER COST CURVE



MANAGING CAPACITY:

ECONOMIST'S PERSPECTIVE

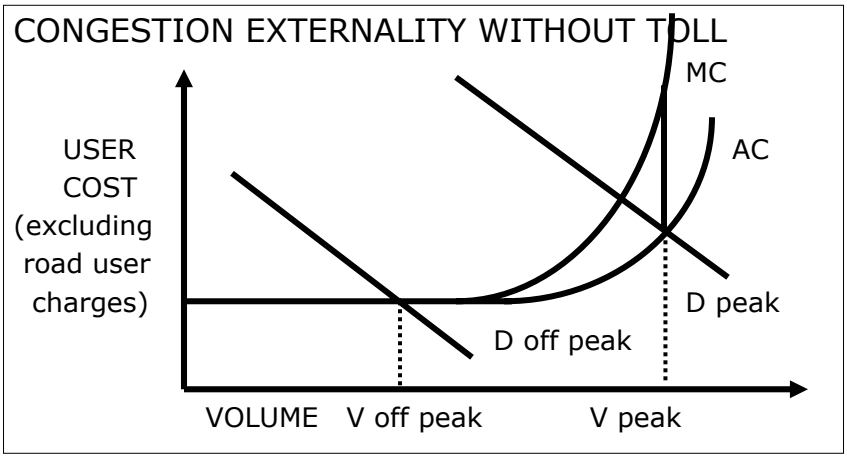
PROBLEM: USE PRICED AT AC, NOT MC



MANAGING CAPACITY:

ECONOMIST'S PERSPECTIVE

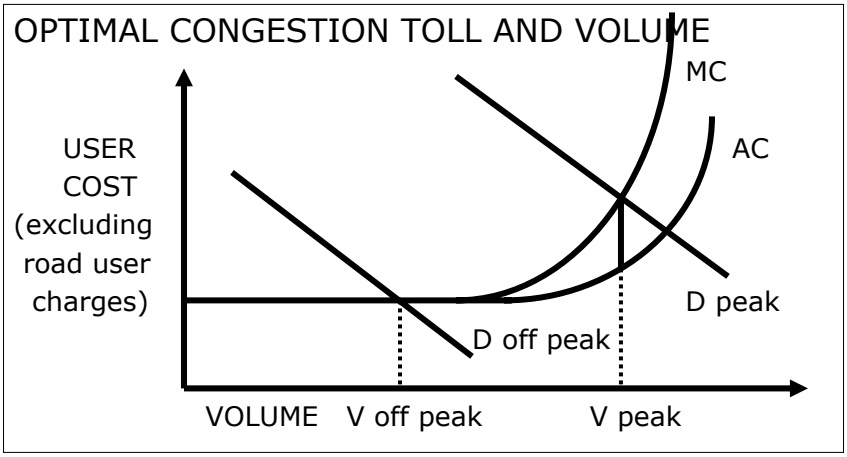
CONGESTION EXTERNALITY WITHOUT TOLL



MANAGING CAPACITY:

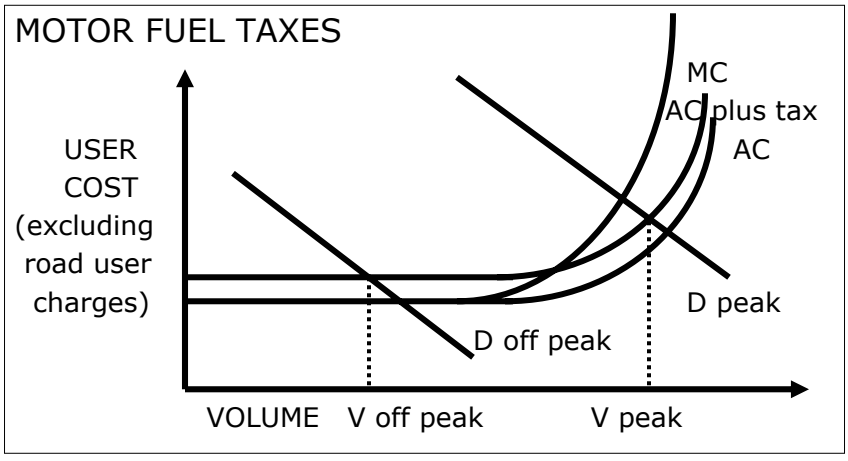
ECONOMIST'S PERSPECTIVE

OPTIMAL CONGESTION TOLL AND VOLUME



MANAGING CAPACITY:

ECONOMIST'S PERSPECTIVE



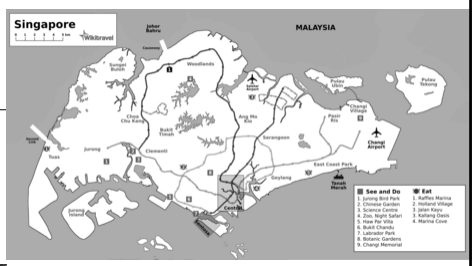
MANAGING CAPACITY:

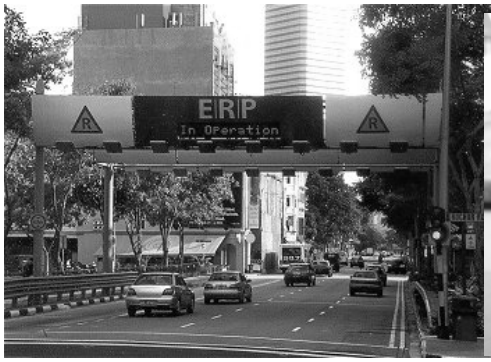
CONGESTION CHARGE EXPERIENCE

CITY	YEAR	TECHNOLOGY
SINGAPORE	1974	PAPER
	1998	ELECTRONIC
SCANDANAVIA (toll rings)	1980s	VIDEO
LONDON	2003	VIDEO
GERMANY (autobahn trucks)	2006	GPS
NEW YORK ?	2010 ?	VIDEO ?

SINGAPORE: ELECTRONIC

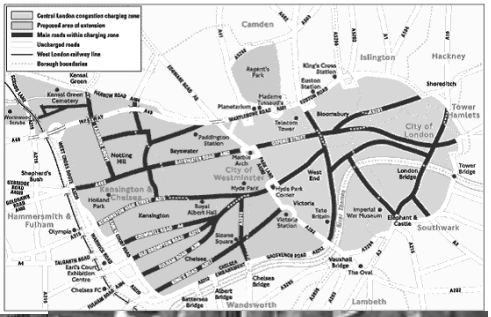
1974: Paper license
1998: Electronic tag





LONDON: VIDEO

2003



MANAGING CAPACITY:

CONGESTION CHARGING PRO & CON

PRO:

- VERY EFFECTIVE IN REDUCING CONGESTION
- AVOIDS PROBLEMS OF ALLOCATING LANES TO DIFFERENT USERS

CON:

- POTENTIAL SPILLOVER TO UNCHARGED AREAS (especially with video or paper)
- POLITICAL OPPOSITION OF MOTORISTS

ADDING NEW CAPACITY:

CONGESTION VS ADDING CAPACITY

METHOD OF INCREASING CAPCITY	(1) TOLERATE ADDITIONAL CONGESTION	(2) BUILD MORE CAPACITY (Highway or Metro)
MARGINAL COST TO SOCIETY OF ACCOMODATING ONE MORE USER	CONGESTION TOLL	SUBSIDY PER PASSENGER NEEDED TO PAY FOR FACILITY IMPROVEMENTS
EXAMPLE:		
Too Little Capacity	$6	$2
Too Much Capacity	$2	$6
Correct Capacity	$4	$4

ADDING NEW CAPACITY:

HO CHI MINH CITY EXAMPLES

1. ELEVATED EXPRESSWAYS: COST PER PEAK PCE ADDED

$397 MILLION FOR 4th ELEVATED EXPRESSWAY

- Implies ~ US$10 per PCE of capacity in peak period*
- Excludes feeder road costs and blighting effect of elevated road

* Assumes capacity of 2000 PCEs per lane-hour, 2 lanes in peak direction, 4 peak hours per day, 250 workdays per year, 10 percent discount rate and perpetual life.

2. METRO: ONE KEY IS WHERE RIDERS COME FROM

SUPPOSE SUBSIDY IS $2 PER METRO RIDER

- If all riders from cars: $2.40 per PCE removed*
- If all from bus: $26.67 per PCE removed**
- If all from motor bikes: $12 per PCE removed***
- If one-third from each: $13.69 per PCE removed

* Assumes car is 1 PCE and carries 1.2 passengers
** Assumes bus is 3 PCEs and carries 40 passengers
*** Assumes motorbike is 0.2 PCEs and carries 1.2 passengers

CHANGING LAND USE

HCMC LAND USE PLAN

- PRINCIPLES OF PLAN
  - Accommodate population growth and higher income lifestyle, but
  - Avoid building on poorly suited land (flood- prone south and east) and
  - Protect heritage of historic core
- TRANSPORTATION COSTS NOT A MAJOR CONCERN
- LAND USE PLAN NOT TERRIBLY CONSISTENT WITH SOME PRINCIPLES
  - E.g., Thu Thiem and Saigon South
- TRANSPORTATION COMPONENTS NOT ALWAYS CONSISTENT WITH LAND USE
  - MRT serves historically protected area

CONCLUSIONS

- CONGESTION A SERIOUS PROBLEM, ESPECIALLY AS ECONOMY GROWS
- USE METERING (e.g. current motorcycle lanes lanes, BRT), PRICING OR BOTH
- BULDING HIGHWAY AND MRT CAPACITY IMPORTANT, BUT KEEP COSTS REASONABLE
- TRANSPORTATION SHOULD NOT NECESSARILY BE THE KEY DRIVER OF THE LAND USE PLAN
- THESE POLICIES EASIER NOW THAN LATER