



Parking Pricing as TDM Tool

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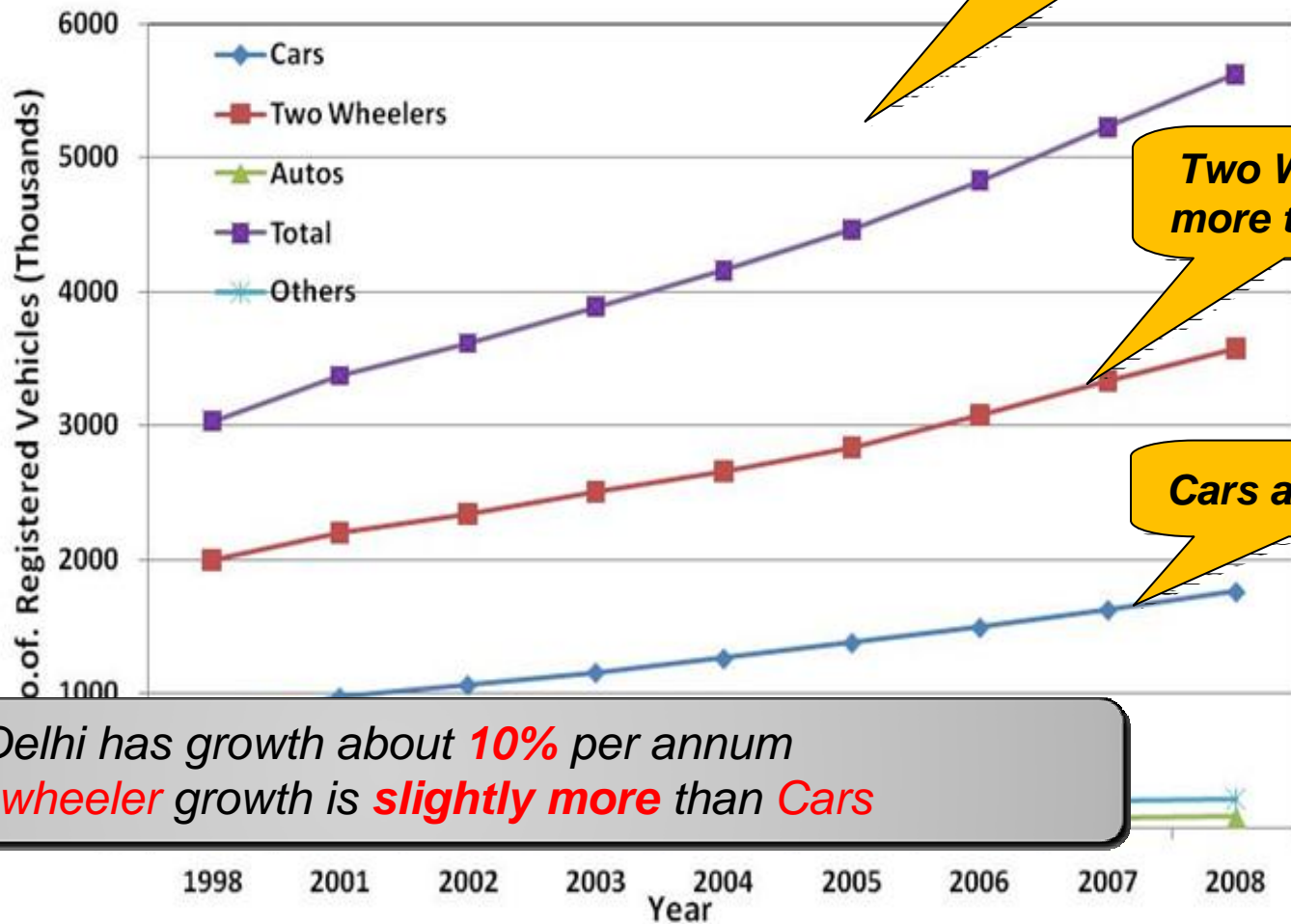
Focus on

- Traffic Situation of Urban Cities*
- Travel Demand Management (TDM) Measures*
- Parking Pricing as TDM Tool*
- Parking Pricing Policy for Indian Context*



Traffic Situation of Urban Cities

□ Vehicle growth is exponential



6.9 Millions
(May 2011)

Two Wheelers
more than 60%

Cars about 30%

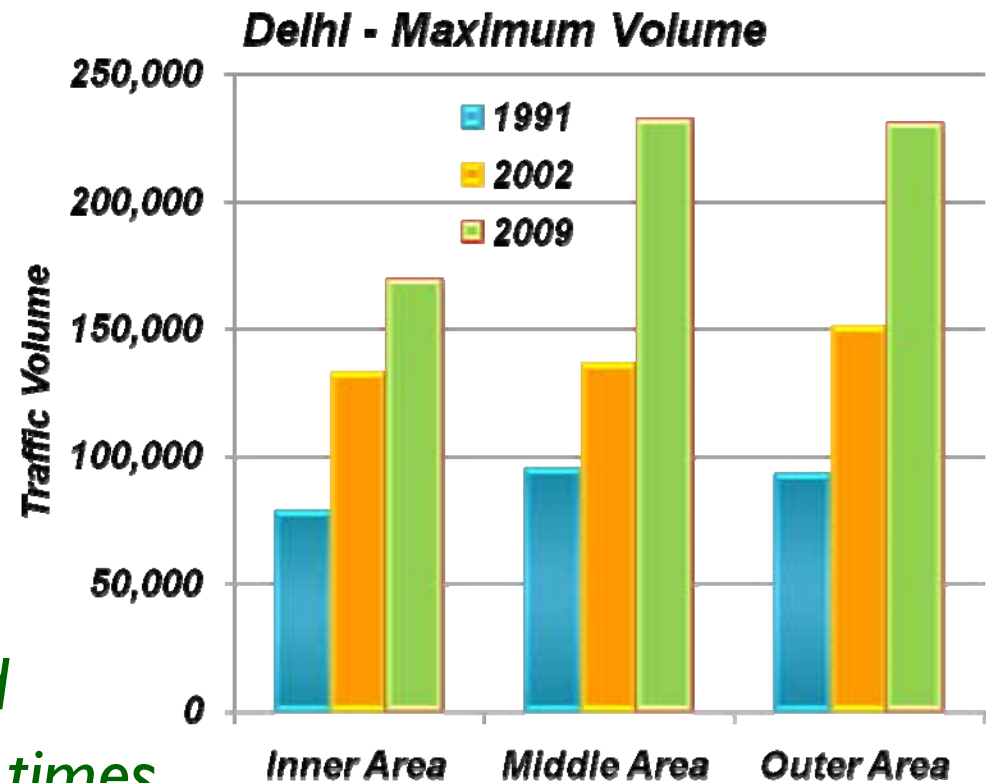
Delhi has growth about **10%** per annum
Two wheeler growth is **slightly more** than Cars

More than **1,000** vehicles are getting registered in Delhi

Traffic Volume & Speeds

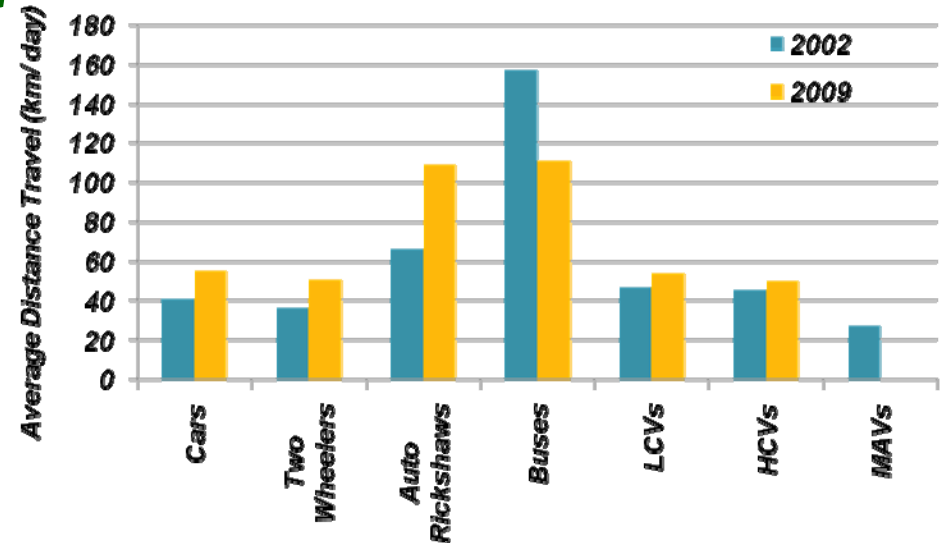
❑ Congested Roads (Increased Traffic Volumes)

❑ Reduced speeds and increased travel times



VKT (Vehicle Kilometers Travelled)

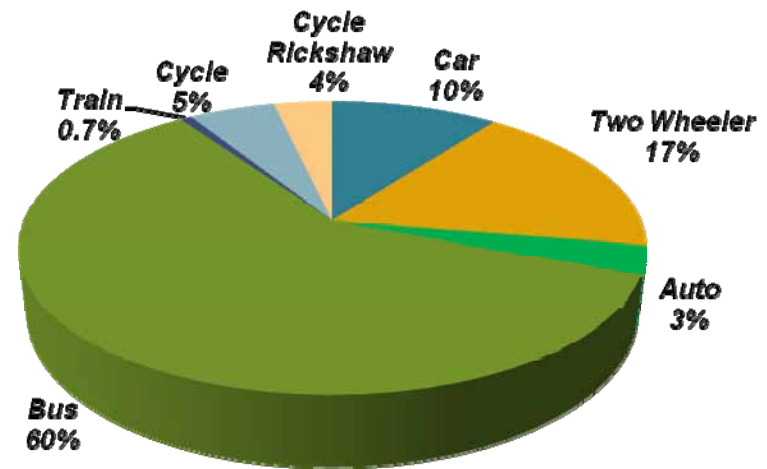
- Distance travelled also increased as the economic activities have increased



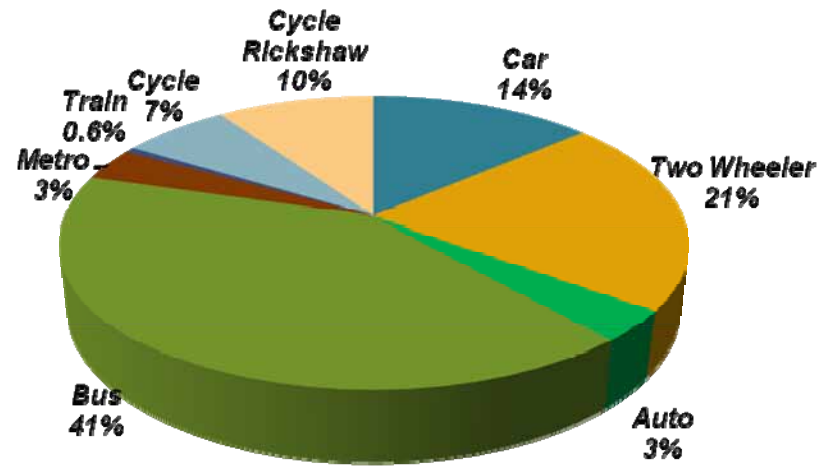
- Total VKT/day is increasing with about 15% annum (79.234 Million in 2002; 150.56 Million in 2009)
- More than 80% by private vehicles

Commuter Modal Share

Modal Split 2001



Modal Split 2007



Metro could attract only 3% of Trips

Delhi Metro

- ❑ Even after Phase III, only 30% of the trips by Metro*
- ❑ Mainly takes trips from buses*
- ❑ Private Modes (cars and two wheelers) are still predominant*

Unless good connectivity with feeder buses, Metro would not be able to reduce any congestion



*Parking Demand
exceeds Supply in
Nehru Place*

Heavy Parking Demand in Lajpat Nagar



Acute Parking Demand in Chandni Chowk Area



Peak Projected Parking Demand (in ECS) in the Horizon Year (2010)

S. No.	Name of the Location	Parking Supply	2005	Parking Demand as per Scenario I*
1	Nehru Place	3717	7713	11601
2	Lajpat Nagar	1598	2604	4052
3	Chandni Chowk	2102	4572	6891
4	Sadar Bazar	1113	1762	2628
5	Kamla Nagar	1806	3333	4941
6	Ajmeri Gate	1217	2176	3194
7	Darya Ganj	3100	5423	8090
8	Krishna Nagar	1091	1297	1901
9	Karol Bagh	3585	5352	8022

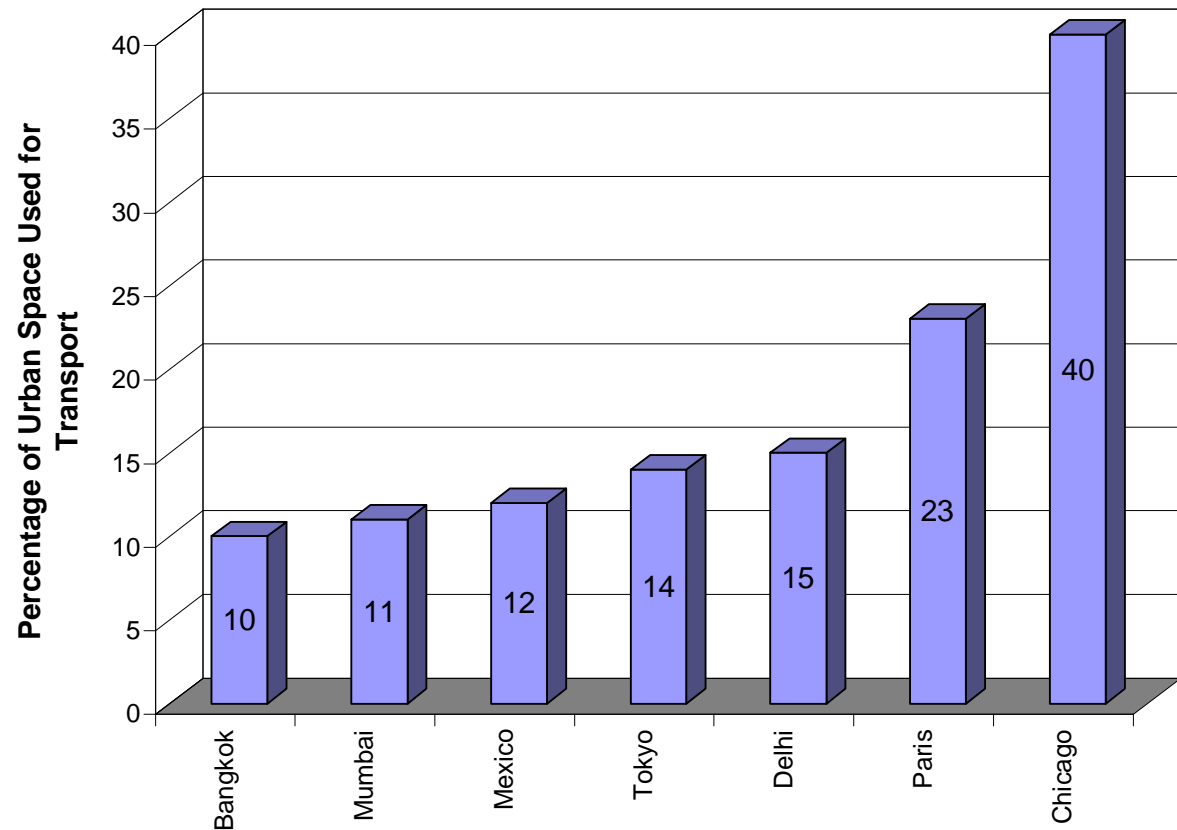
** Assuming an annual Growth rate of 10 % Car & 6 % 2w*

Demand was more than double at some locations

Demand will further increase a minimum of 50% by 2010

General Theory

- Problems increased due to exponential growth of vehicles and the infrastructure (road length) has not grown



Delhi has comparable Transport Infrastructure with respect to Developed Cities

Travel Demand Management (TDM)

- ❑ Increasing the supply will never give a solution in transportation context*
- ❑ Instead of reduce the demand in other terms managing travel demand*
- ❑ Travel Demand Management (TDM) Measures are very appropriate for the current context*

Travel Demand Management (TDM)

- ❑ *Travel Demand Management (TDM) are mainly to restrict the travel the way presently going on*
 - *Land use development controls*
 - *Public transport integration*
 - *Parking controls and management*
 - *Regulatory controls such as odd/even systems*
 - *Physical measures such as bus and pedestrian priority*
 - *Pricing & charges through fuels, annual taxes*
 - *Congestion charging*

- *Study the individual mode choice behaviour*

Mode Choice Model

□ **Logit Model** $P_M = \frac{e^{U_M}}{e^{U_M} + e^{U_T}}$

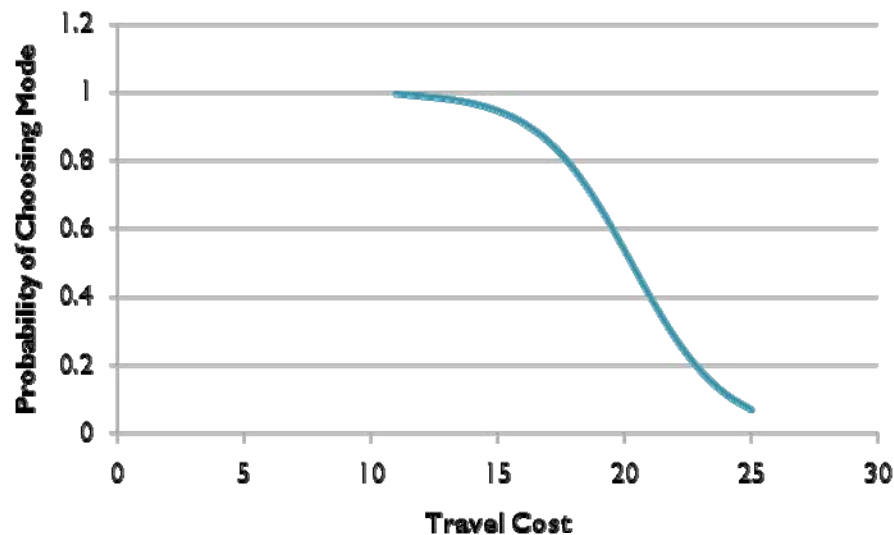
$$U_M = a_1 * TC_M + a_2 * CFT_M$$

$$U_T = a_0 + a_1 * TC_T + a_2 * CFT_T$$

where P_M is probability of choosing Metro

U_M and U_T are utility functions for Metro and Train respective

Parameter	Estimated Value	Standard Error	t-Value
Train Bias (a_0)	2.2292	1.0103	2.21
Travel Cost (a_1)	0.5474	0.2536	2.16
Comfort (a_2)	0.0059	0.0377	0.16



Some Examples

- Increasing parking fees from approximately \$0.28 to \$1.19 per hour reduced VMT 11.5% and emissions 9.9%

	Canadian Study			Los Angeles Study		
	Before	After	Change	Before	After	Change
Drive Alone	35%	28%	-20%	55%	30%	-27%
Carpool	11%	10%	+9%	13%	45%	+246%
Transit	42%	49%	+17%	29%	22%	-24%
Other	12%	13%	-8%	3%	3%	0%

Region	Price	VMT	Trips	Delay	Fuel	ROG	Revenue
Bay Area	\$1.00	-0.8%	-0.9%	-2.7%	-1.0%	-0.8%	\$473
	\$3.00	-2.1%	-2.4%	-7.0%	-2.4%	-2.3%	\$1,399
Sacramento	\$1.00	-1.0%	-1.1%	-2.5%	-1.1%	-1.1%	\$142
	\$3.00	-2.6%	-2.8%	-6.5%	-2.7%	-2.8%	\$419
San Diego	\$1.00	-0.9%	-1.0%	-2.5%	-1.0%	-0.9%	\$271
	\$3.00	-2.4%	-2.6%	-7.0%	-2.5%	-2.5%	\$800
South Coast	\$1.00	-0.9%	-1.1%	-2.9%	-1.1%	-1.0%	\$1,408
	\$3.00	-2.5%	-2.8%	-8.5%	-2.7%	-2.6%	\$4,151

(Source: cited in VTPI, TDM Encyclopedia 2011)

What other cities are doing:

- ❑ **Portland, Oregon:** An overall cap of 40,000 parking spaces downtown increased public transport usage from 20-25 per cent in the 1970s to 48 per cent in mid 1990s.
- ❑ **Boston:** Parking requirements frozen at 10 per cent higher than the 1973 levels has helped meet the federal clean air standards.
- ❑ **Shenzhen:** Hike in parking fees during peak hours lead to 30 per cent drop in the parking demand.
- ❑ **Tokyo:** Despite high car ownership Tokyo provides less parking slots-only 0.5 slots per 100 sq meters in commercial buildings.
- ❑ **Bremen:** No free parking in city centre. Parking charges higher than public transport cost.
- ❑ **Bengaluru:** Variable parking price with higher rates during peak hours and lower prices during off-peak hours.

(Source: Down To Earth, Jan 2011)

Parking Pricing

- *Parking Pricing may be implemented as a*
 - *TDM strategy (to reduce vehicle traffic)*
 - *Parking Management strategy (to reduce parking problems)*
 - *to recover parking facility costs*
 - *to generate revenue for other purposes*
 - *or for a combination of these objectives*

Parking Pricing in the Indian context

□ Demand Management

- Higher Parking Fee
- Variable Parking Fee
- Area based Parking Fee

Curtail the travel or restrict the travel before it get generated
Changing mode

□ Issues in the Supply Side

- APMS (Advanced Parking Management System)
- Multi-storey Parking Facilities
- ITS Tools

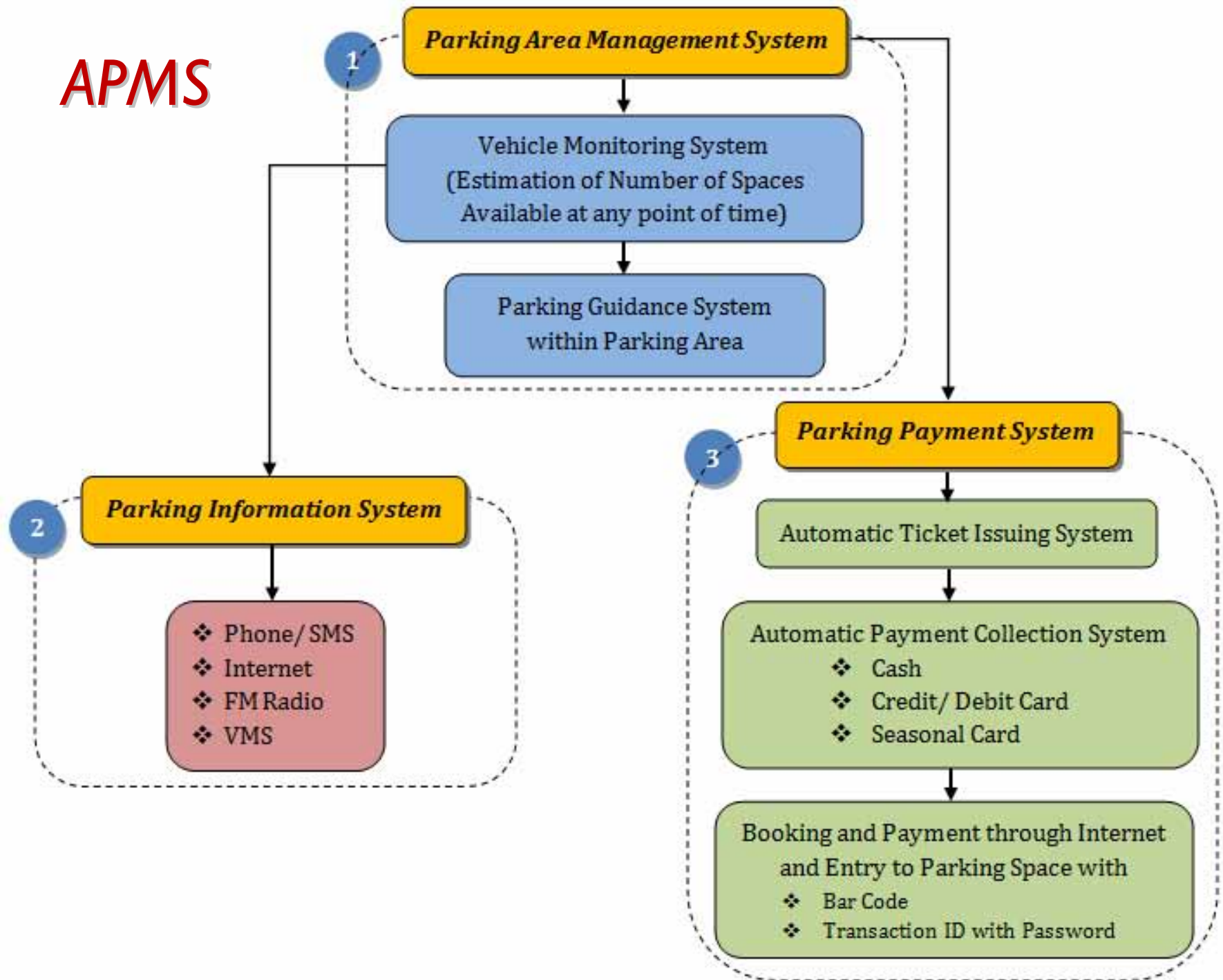
Organise/ manage exiting parking problems

However, these policies have to be critically examined with transport models/ simulation models before they implement

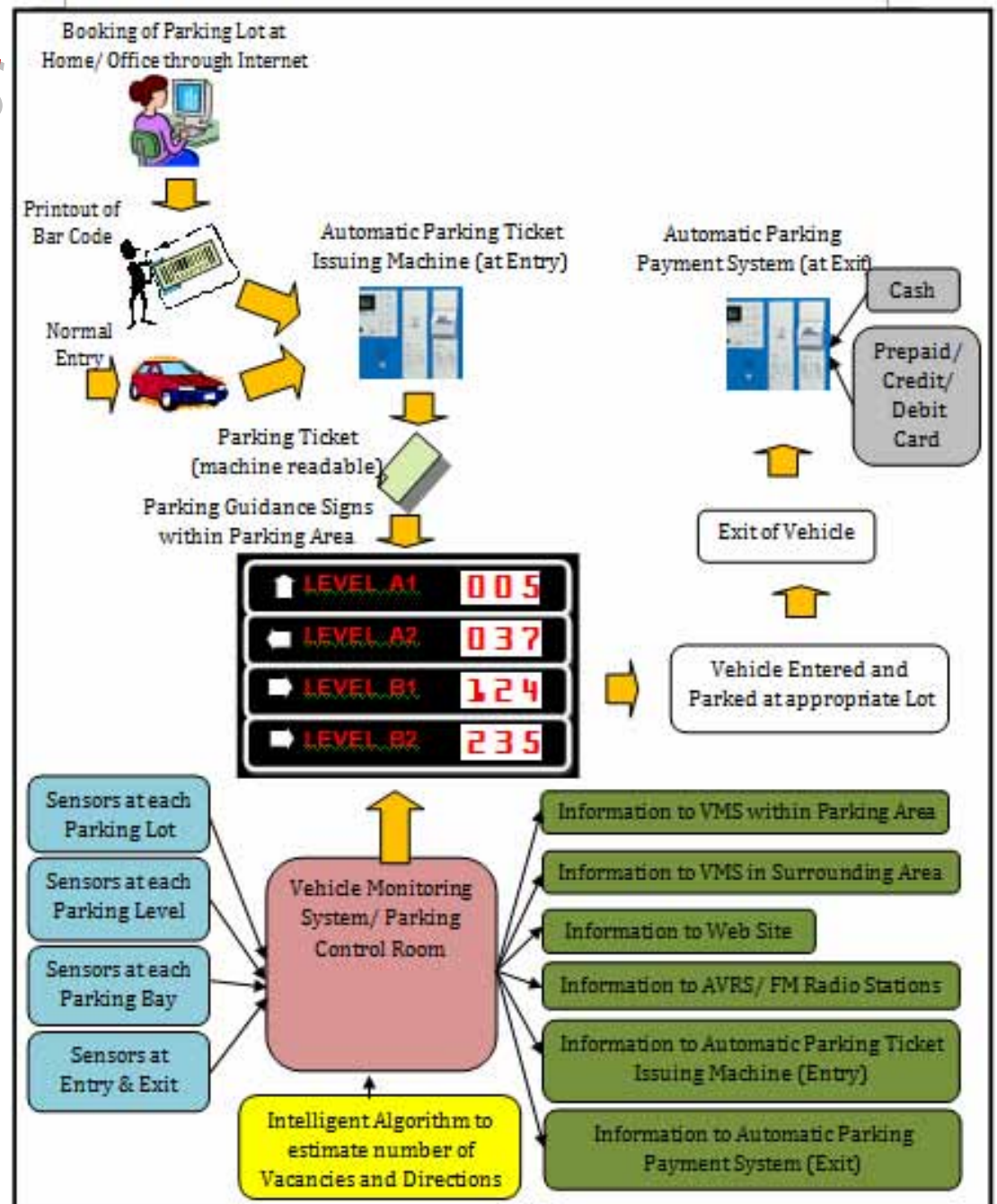
Parking Pricing Policies in the Indian context

- Policies have to be critically evaluated and quantify their benefits*
- Increase modal share of public transport by 10%*
 - leading to reduction of vehicle kilometres travelled (VKT) or in other words traffic congestion by about 30%.*
 - reduction in travel by private modes can lead to reduction in vehicular pollution in terms of CO, HC, NO_x and PM by around 35% to 40%.*
 - accidents and fatalities are expected to reduce by around 20 to 30% leading to a saving of Rs. 300 million per annum.*

APMS



Design of APMS



Summary

- Availability of Parking Space is must while Purchase/ Registration of Vehicle (similar to proof-of-parking in Japan)*
- Parking Tax along with other Taxes*
- Parking Pricing as an instrument can be very effective for management of travel demand as a whole*

However, these policies have to be critically examined with transport models/ simulation models before they are implemented



Thank You