Data Requirement and Availability

TO MEASURE INDICATORS DEVELOPED FOR LCMP

Deepty Jain

Capacity Building Workshop for
Low-Carbon Comprehensive Mobility Plan
11 – 13 April 2012
India Habitat Centre, New Delhi

TRIPP

IIT Delhi

Overview of Indicators developed

1. **Mobility and accessibility- Modal shares**
2. **Mobility and accessibility- Travel time**
3. **Mobility and accessibility- Trip length**
4. **Mobility and accessibility- land use parameters**
5. **Infrastructure quality, ease and comfort**
6. **Safety**
7. **Security**
8. **Affordability**
9. **Environmental impacts-Emissions, Fuel consumption**
10. **Environmental Impacts-land resource depletion**
11. **Health Hazards**
12. **Economic Indicators**

TRIPP

IIT Delhi

Measuring indicators requires Detailed HH surveys and Modelling exercise

- All modes
  - pedestrians,
  - bicycles,
  - public transport (bus formal),
  - public transport (tempos),
  - para-transit (cycle rickshaw),
  - para-transit (auto),
  - motorized two wheeler and
  - cars
- Across all sections of society
  - Slum dwellers,
  - Within the slums, of households living in katcha housing
  - Recent migrants to the city and temporary migrants to the city
  - Households living in relocated sites
  - SC households
  - Minority groups
  - street vendors etc.
  - Where required the data should also be disaggregated by sex.

TRIPP

IIT Delhi

City profile

Data required	Description	LCMP	CMP
Location	Geographical location	Y	Y
	Climatic condition	Y	
Land area	Total land area	Y	Y
	Growth pattern (Municipal corporation- Master plans)	Y	
	Identification of notified areas (Master plans)	Y	
Regional linkages		Y	Y
Demography	Population growth trend	Y	Y
	Number and size of HH	Y	Y
	Age-sex pyramid (census)	Y	
Socio-economic data	**Population by social group* (census/NSSO)**	Y	
	Population by income/expenditure at zone	Y	Y
	Vehicle ownership by social group	Y	Y

- Climatic condition
  - To build climate adaptive measures
- Growth pattern in previous years
  - To determine distribution of activities in BAU and alternative scenarios
- Identification of notified areas
  - These are the restricted areas where the urban dynamics of distribution of activities does not occur
- Age-sex pyramid
  - This determine number and type of trips likely to occur (education, work, etc.)
- Population by social group
  - This factor is important for inclusive planning in cities

City structure

Data required	Description	LCMP	CMP
Land use pattern	Map	Y	Y
Population density	Disaggregated at the level of study	Y	Y
Mix intensity	**Determined by job-housing ratio or balance in a zone or level of study**	Y	
Land consumption by land use		Y	Y

- Mix intensity
  - It is an important component of urban form having impact on
    - trip length,
    - number of trips and
    - thereby mode choice.
    - Data sources- Housing (Census) and Jobs (ITO/NSSO)

Transport Network Inventory - Pedestrians

Along Road

Name of road	Width of footpath (m)		From	To	Length (km)	Encroachment/ other barriers	Pavement condition	Lighting		Clear marking	Segregation tools to separate footpath from MV lane	Barrier free design
	L	R						Left	Right			
						Parking/ vendors/trees/ light poles/ other services	Rated	y/ n	y/n	Direction/property/ zebra crossing / intersect	kerbs/ green belt/ fences/ etc.	Access at entry/ guiding tiles/ audible

At Intersection

Name of intersection	Type of intersection	Type of crossing	Signalized	Pedestrian accentuated signal	Traffic calming tools	Crossing distance	Barrier free access
	At grade/ flyover/ clover leaf, etc.	Level/ raised/ grade separated	y/n	y/n	Rumble strips/ speed breakers		guiding tiles/ audible pedestrian crossing

Transport Network Inventory – NMV

Along Road

Name of road	Width of NMV lane (m)		From	To	Length (km)	Encroachment	Pavement condition	Lighting		Clear marking	Segregation tools to separate NMV lane from other modes
	L	R						L	R		
						Parking/ vendors	Rated	y/ n	y/n	Direction/ property/ intersection	In existing CMP from footpath only

At Intersection

Name of intersection	Type of intersection	Type of crossing	Signalized	NMV accentuated signal	Traffic calming tools	Crossing distance	Other facilities
	At grade/ flyover/ clover leaf, etc	Level/ raised/ grade separated	y/n	y/n	Rumble strips/ speed breakers		NMV box etc.

Parking Area

Name of Parking lot	Location	Nearest Pt stop	Distance to PT stop	Number of Parking	Parking charges

Transport Network Inventory – Para-transit Autos and Cycle Rickshaws

Data required	Description	LCMP	CMP
Para-transit (auto rickshaw and cycle rickshaw)	Restricted / non-restricted	Y	Y
	Number of parking by specification of parking areas	Y	
	Distance of formal parking from bus stop	Y	
	Distance between parking stations	Y	
	Parking charges	Y	

- Number of Parking, parking charges and distance

Parking Area					
Name of Parking lot	Location	Nearest Pt stop	Distance to PT stop	Number of Parking	Parking charges

  - Parking charges has impact on the operators and hence on the fare charges

Para-transit System-
Auto, Cycle Rickshaw and Shared Auto

Fleet inventory

Owner	Fleet size	Type of fleet	Fleet utilization rare	Use	Average Vehicular km/day	Average Vehicle age	Occupancy		Average Passenger per day
							Peak hour	Average	
		Capacity rating		Shared/ para					

Route inventory for shared auto rickshaws

Route number	Route length	Location covered	Headway	Average passengers / day	Average routing time		Average Delays
					Peak hr	Average	

Cost and Fare

Operator	Operation cost per km	Tax levied	Fare structure	Revenue per km	Profit/ loss

Transport Network Inventory- Public Transport (Bus)

Name of road	Width of Bus lane		From	To	Length (km)	Bus lane location wrt road section	Type of bus infrastructure	Bus lane Segregation tools	No. of routes catered	Average speed
	L	R								
						Median/ left side	open/close	Kerbs/lane marking/ fences		

Bus stop details

Name of Bus stop	Location	Bus stop capacity	Location wrt road section	Type of bus stop	Traffic calming tools	Access distance to bus stop from either side	Barrier free access	Passenger amenities
	X, Y coordinates		Median/ left side	Staggered/ island	Rumble strips/ speed breakers		y/n	Sitting area/ toilets/ hawkers

Public Transport System

Fleet inventory

Owner	Fleet size	Type of fleet	Fleet utilization rate	Vehicular km	Average vehicle age	Occupancy		Average Passenger per day
						Peak hour	Average	
		Mini bus/ standa						

Route inventory

Route number	Route length	Location covered	Headway	Average passengers/ day	Expected route time	Average routing time		Average Delays
						Peak hr	Average	

Cost and Fare

Operator	Operation cost per km	Tax levied	Fare structure	Revenue per km	Profit/ loss

Transport Network Inventory- Personal Motorized Vehicles

Along Road

Name of road	Width (m)		From	To	Length (km)	No. of lane	Lighting	Average speed			Road encroachment	On road Parking restriction	Vehicle restriction		
	L	R						MTW	Cars	IPT			PMV	NMV	IPT
											Parking/vendor/other	R/UR			

At intersection

Name of intersection	Type of intersection	Signalized	Turning time from each direction	Type of traffic operation	Signal Phasing	Intersection design
	At grade/ flyover/ clover leaf, etc	y/n		Automated / Human		

Parking areas

Name of Parking lot	Location	Type of Parking	Nearest Pt stop	Distance to PT stop	Number of Parking	Parking charges	
						MTW	Car
		On/off road					

Traffic Study
Condition, Safety And Security

Data required	Description	LCMP	CMP
Traffic count	Screen line by modes	Y	Y
	At intersection by modes	Y	Y
Delay and Queue length	Queue length by mode	Y	Y
	Delay by mode	Y	
	Travel speed by mode	Y	Y
Number and location of fatalities on road	**By victim mode (Traffic police)**	Y	
	By impacting vehicle (Traffic police)	Y	
Reported crimes	**Disaggregated by mode (Police)**	Y	

- Delay by mode – time taken by different modes on different

Fatality data

Accident number	Location	Nature of accident	Victim mode	Impacting mode	Number of fatalities

- Reported crimes – are under-reported
  - Security while using different modes

Modelling Travel Demand
Household Survey

Data required	Description	LCMP	CMP
Personal information	Age	Y	Y
	Gender	Y	Y
	Occupation	Y	Y
	Monthly income	Y	Y
	Vehicle ownership and age of vehicle	Y	Y
	Monthly expenditure on transport	Y	Y
Transport infrastructure rating for different modes	Perception about Safety	Y	Y
	Perception about security	Y	Y
	Perception about comfort	Y	Y

TRIPP

IIT Delhi

Modelling Travel Demand- Household Survey

Data required	Description	LCMP	CMP
Trip making information	Trip purpose	Y	Y
	Trip origin and destination	Y	Y
	Travel distance	Y	
	Mode used	Y	Y
	Access and egress mode	Y	
	Access and egress public transport stop	Y	
	Distance to access and egress public transport stop	Y	
	Travel time to access and egress	Y	
	Average waiting time to board Public transport	Y	
	Total travel time	Y	Y
	Total travel cost	Y	Y
	Average mileage if PMV used	Y	
	Fuel used	Y	
	Reason for using the mode used	Y	

Perception study- Household stated preference survey

Data required	Description	LCMP	CMP
Safety	Walking	Y	
	Bicycling	Y	
	Para-transit	Y	
	Public Transport	Y	
	MTW	Y	
	Cars	Y	
	On different road types and in urban areas	Y	
Security	Using different modes	Y	
	On different types of roads	Y	
	Under different urban conditions	Y	
Modal shifts	From PMV to walk and vice-versa	Y	
	From PMV to bicycle and vice-versa	Y	
	From PMV to PT and vice-versa	Y	
	From walk to PT and vice-versa	Y	
	From bicycle to PT and vice-versa	Y	

Environmental Condition & City Budget Analysis

Data required	Description	LCMP	CMP
Air quality levels	NOx, CO_2, CO, SO_x concentration by location	Y	Y
Noise levels	By location	Y	Y
Investment trends in transport on different modes		Y	Y
Tax policies for different modes		Y	Y
Percentage of subsidy granted		Y	Y
Fuel price	Previous years trend	Y	Y

Data for Developing Alternate Scenarios

Data required	Description	LCMP	CMP
Socio-economic profile	Population growth	Y	Y
	Economic growth- per capita income/household income	Y	
	Vehicle ownership trend	Y	
	Economic sector growth	Y	
New development areas	Location	Y	Y
	Area	Y	Y
	Land use plan	Y	
	Number of residential population	Y	Y
	Number of Jobs	Y	Y
	Year of completion	Y	Y
Proposed projects	Type of project	Y	Y
	Location	Y	
	Project profile	Y	Y
	Purpose of project	Y	Y
	Current status	Y	Y
	Target year of completion	Y	Y
	Likely impacts of project on travel pattern, traffic and land use	Y	

Conclusion

- Indicators for LCMP need to take into account-
  - Energy and emissions
  - Social sustainability
  - Policies and economic aspects
- Indicators should be measured for all modes and explicitly consider social groups
- Need to have more details about trip making-
  - access and egress trips as they are the major components
- For safety and security indicators- perception study can be taken
- Data from secondary sources must be cross checked

THANK YOU

IIT Delhi

TRIPP