

Methodology for Preparing Low Carbon Mobility Plan

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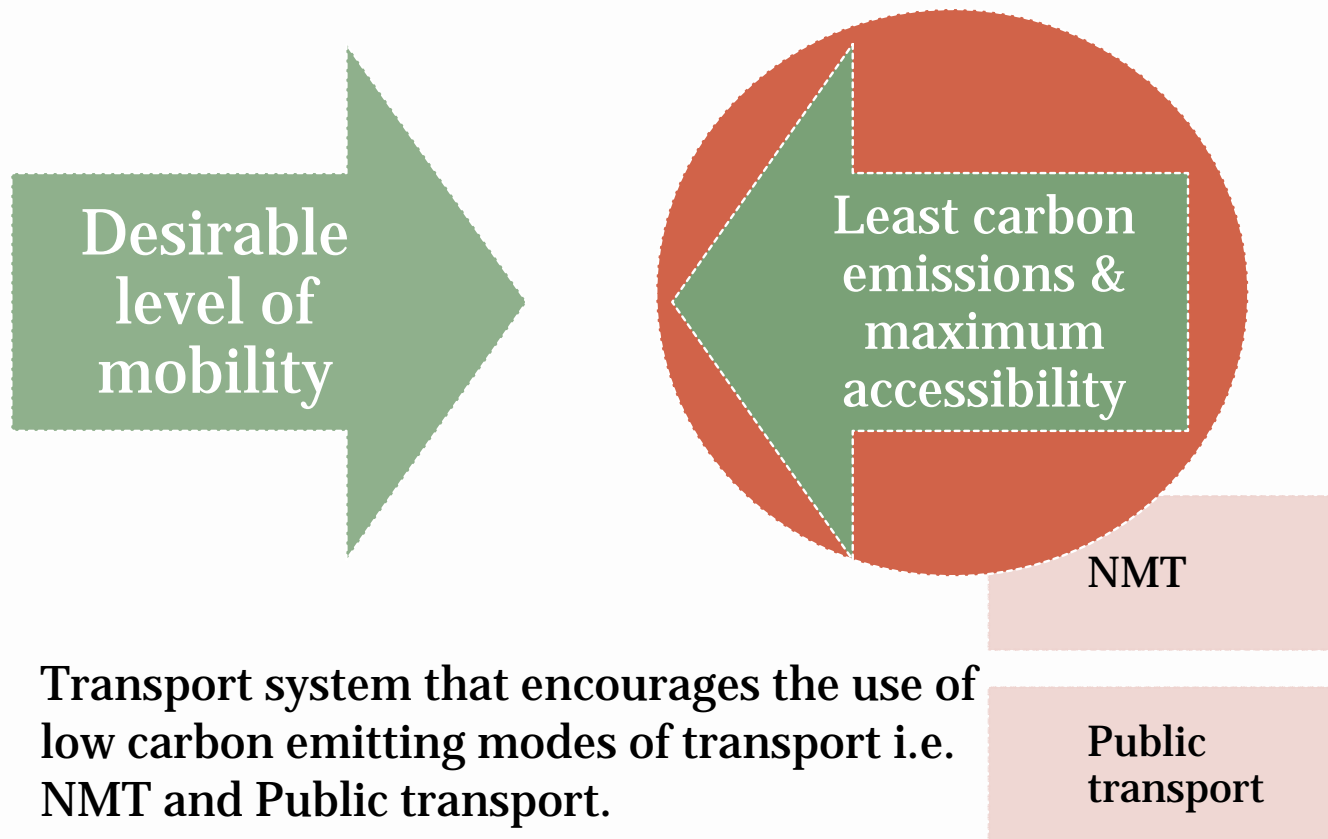
**PROMOTING LOW CARBON TRANSPORT IN INDIA
NATIONAL WORKSHOP 19-20 OCTOBER, 2011, DELHI**



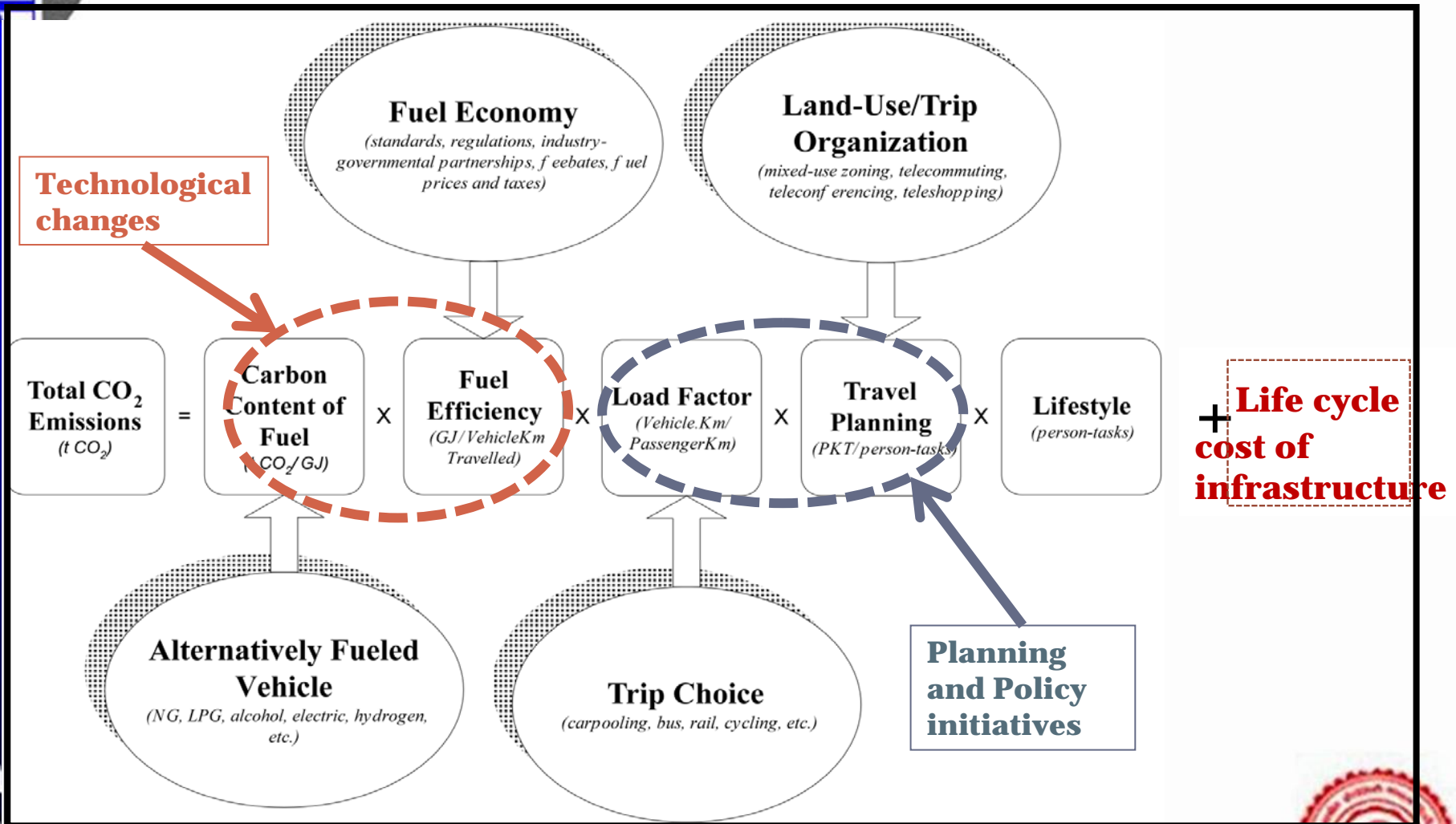
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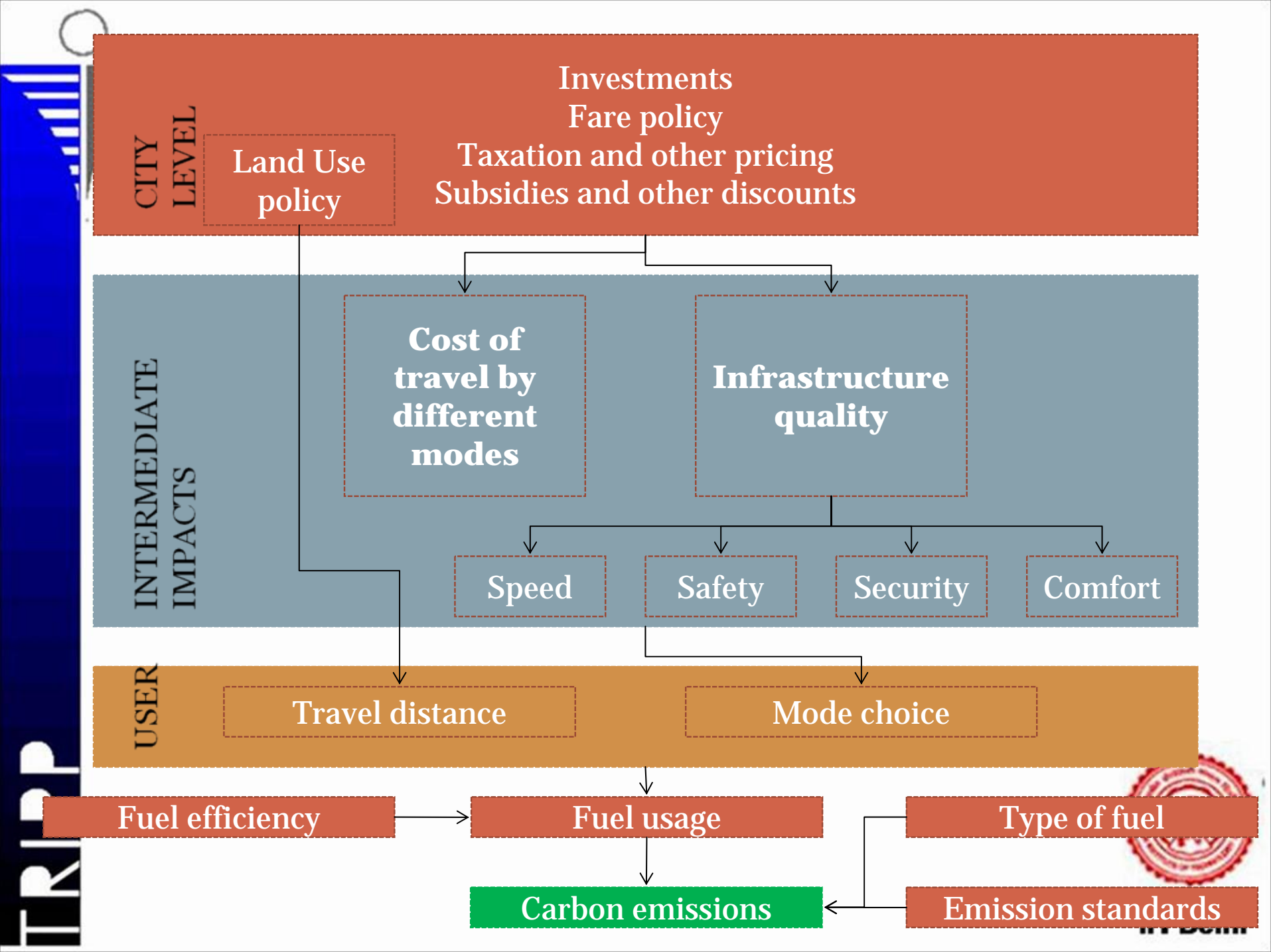
TRIPP

What is low carbon transport?



Factors Impacting Emission Levels





CITY LEVEL

Land Use policy

Investments
Fare policy
Taxation and other pricing
Subsidies and other discounts

INTERMEDIATE IMPACTS

Cost of travel by different modes

Infrastructure quality

Speed

Safety

Security

Comfort

USER

Travel distance

Mode choice

Fuel efficiency

Fuel usage

Type of fuel

Carbon emissions

Emission standards



Indian context

- NMT and Public transport is used by people who do not have other choice: **CAPTIVE USERS**
- Captive users may shift to carbon intensive modes because of
 - Existing hostile NMT and public transport infrastructure
 - Increase in income levels & changed aspirations
- Short trip lengths due to compact city structure resulting in high percentage of potential users of NMT
- Land use policy with regards to low income/ informal sector

Low carbon mobility plan

Retain

Shift

Improve



Expected Outcome of LCMP

- **Propose strategies and plans to**
 - Cause NMT and public transport users to shift from captive to choice users
 - Encourage the use of NMT and public transport by the potential users
 - Technological improvements to reduce emissions from motorized transportation
 - Reflections on land use and shelter policy
- **Evaluate the impact of strategies, plans and projects on emissions, accessibility, and social sustainability**



Other transportation studies

- **City Traffic and Transportation Study**
 - Study existing traffic situation and transport network
 - Identify issues related to mobility
 - Proposed transport projects to meet travel demands
- **Comprehensive Mobility Plan**
 - To improve mobility of people rather than of vehicle
 - Integrate land use and transport planning
 - Develop urban growth and transport network scenarios and estimate travel demand
 - Propose plans and strategies to meet the travel demand



Comparison Between CMP and LCMP

Comprehensive Mobility / Accessibility Plan are Way Forward to The City Traffic And Transportation Study for Appropriate Planning of Infrastructure and Land Use to Meet The Future Travel Demands

HOWEVER

Comprehensive Mobility Plan do not Analyze The Impact of Different Strategies on Environment and Society





Comparison between aims

CMP

- Projects to meet present and future mobility demand
- Achieve desirable development goal depends on the objectives set by the responsible authority

LCMP

- Strategies to reduce emissions from transport without compromising the mobility needs
- Desirable development goal is reduce travel demand by motorized transport

The logo for TRIPP (Traffic and Transport Planning Institute) is located in the top-left corner. It features a stylized white circle above a grey triangle, which is set against a blue background with white horizontal stripes. The word "TRIPP" is written vertically in white capital letters along the left edge of the blue background.

Comparison between Objectives

CMP

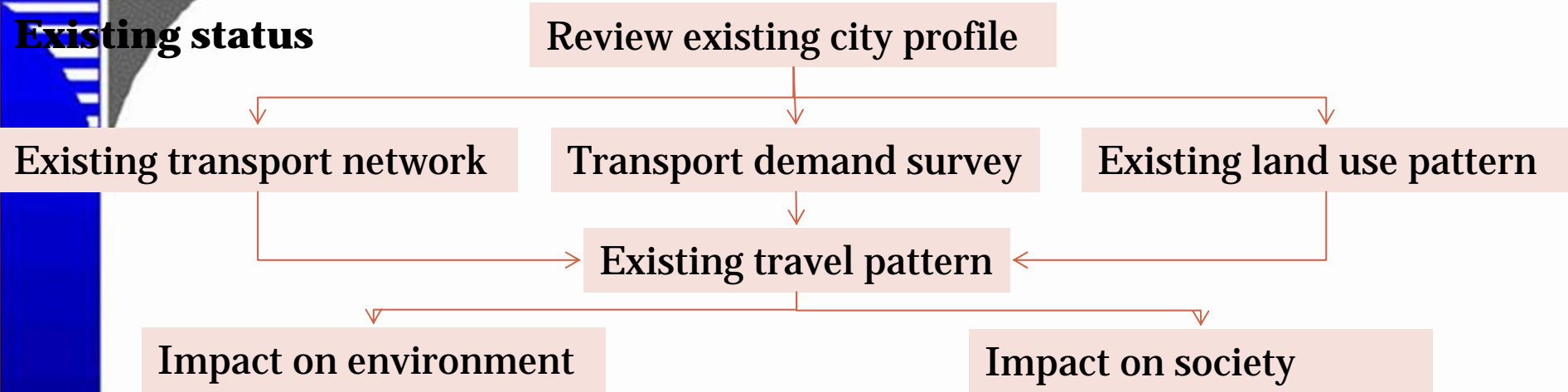
- Understand present day traffic characteristics and forecast travel demand
- Lay vision and goals for desirable urban development of city
- Illustrate a basic plan for urban development and transport infrastructure to achieve the set goals

In addition to the objectives of CMP, LCMP-

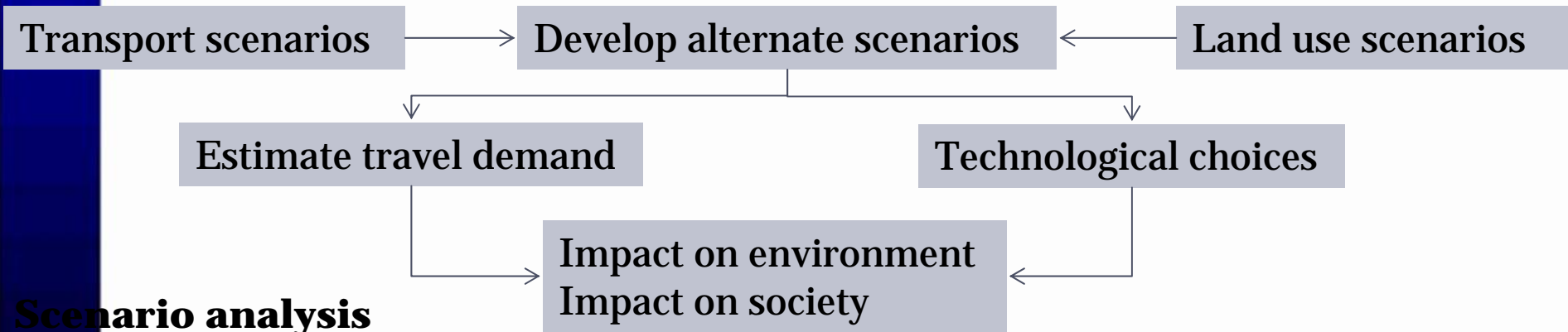
- Analyze impacts of existing travel pattern and land use on environment and society
- Analyze **impact of alternate scenarios**
- Lay plan to meet desirable mobility having minimum impact on environment and improving social sustainability

Steps to prepare LCMP

Existing status

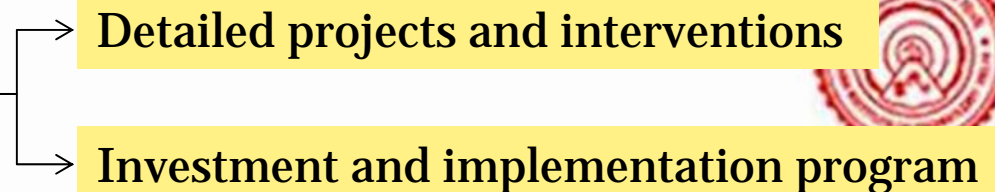


Scenario analysis



Project proposal

Select desired scenario





Data Requirement

TO PREPARE LOW CARBON MOBILITY PLAN



IIT Delhi

Data for LCMP needs to be collected for

- **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 & age-group**

- 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.



City profile

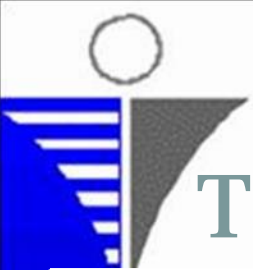
| Data required | Description | LCMP | CMP |
|---------------------|--|------|-----|
| Location | Geographical location | Y | Y |
| | Climatic condition | Y | |
| Land area | Total land area | Y | Y |
| | Growth pattern | Y | |
| | Identification of notified areas | Y | |
| Regional linkages | | Y |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



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 |





Transport Network Inventory - Pedestrians

| Data required | Description | LCMP | CMP |
|---------------|---|------|-----|
| Footpath | Width | Y | Y |
| | Single sided/both side | Y | Y |
| | Continuity | Y | Y |
| | Encroachment by other activity/vehicles | Y | Y |
| | Pavement condition | Y | Y |
| | Lighting | Y | |
| | Clear markings | Y | Y |
| Intersections | Signalized crossing | Y | Y |
| | Level/raised crossing | Y | Y |
| | Traffic calming tools like speed breakers | Y | Y |
| | Intermediate crossing sections | Y | |
| | Crossing distance | Y | Y |
| Access | Barrier free access to bus stops | Y | |
| | Barrier free access to footpaths | Y | |



Transport Network Inventory – NMV

| Data required | Description | LCMP | CMP |
|------------------------|---|------|-----|
| Lanes | Cycle lanes/tracks | Y | Y |
| | Width of cycle lanes/tracks | Y | Y |
| | Both sided/single sided | Y | Y |
| | Encroachment by other activity/vehicles | Y | Y |
| | Lighting | Y | |
| | Pavement condition | Y | Y |
| Intersection treatment | Signalized intersections | Y | Y |
| | Traffic calming tools | Y | Y |
| | Traffic calming for access to properties | Y | |
| Parking | Number of parking | Y | |
| | Distance of parking from PT stop | Y | |
| | Parking charges | Y | |

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 | |



Transport Network Inventory- Public Transport (Bus)

| Data required | Description | LCMP | CMP |
|----------------|---|------|-----|
| Infrastructure | Dedicated bus lanes (type and description) | Y | |
| | Average speed on different roads | Y | Y |
| Bus stop | Number of bus stops | | Y |
| | Bus stop inventory | Y | Y |
| | Average distance between bus stop | Y | |
| | Location of bus stop with respect to junction | Y | Y |
| | Passenger amenities on bus stop | Y | Y |
| | Number of bus terminals | | Y |





Transport Network Inventory- Personal Motorized Vehicles

| Data required | Description | LCMP | CMP |
|---------------------|--|------|-----|
| Road infrastructure | ROW | Y | Y |
| | Number of lanes | Y | Y |
| | Average speed on different roads | Y | Y |
| | Road encroachment | Y | Y |
| | Lighting | Y | |
| Intersections | Type of intersection- signalized/un-signalized | Y | Y |
| | Turning time from each direction | Y | |
| | Signal phasing | Y | |
| | Existence of Area Traffic Control System | Y | Y |
| | Type of Signal Operation | | Y |
| Parking | Ownership type | | Y |
| | Parking regulations | Y | Y |
| | Number of parking | Y | Y |
| | Parking charges by mode | Y | Y |



Public Transport System

| Data required | Description | LCMP | CMP |
|--------------------|---|------|-----|
| Fleet usage detail | Type of ownership | | Y |
| | Number of bus by type of bus (standard, mini, low floor), fuel used and age | Y | Y |
| | Fleet utilization rate | Y | |
| | Vehicular kilometer | Y | Y |
| | Percentage occupancy- peak hour and average | Y | Y |
| | Total passengers per day | Y | Y |
| Route detail | Route inventory | Y | Y |
| | Number of bus routes | | Y |
| | Headway on different routes | Y | Y |
| | Average route speed | Y | Y |
| | Service reliability | Y | Y |
| Cost and fare | Operation cost per km | Y | Y |
| | Tax levied | Y | |
| | Fare structure | Y | Y |
| | Revenue per km | Y | |
| | Profit/loss | Y | Y |

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

| Data required | Description | LCMP | CMP |
|--------------------|---|------|-----|
| Fleet usage detail | Type of ownership | Y | Y |
| | Number of para-transit by type (shared, personal autos and cycle rickshaw), fuel used and age | Y | Y |
| | Vehicular kilometer | Y | Y |
| Route detail | Route inventory for share auto | Y | |
| | Average waiting time for auto, cycle rickshaw and shared auto | Y | |
| Cost and fare | Operation cost per km | Y | Y |
| | Tax levied | Y | |
| | Fare structure | Y | Y |
| | Revenue per km | Y | Y |
| | Profit/loss | Y | Y |

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 injury/fatalities on road | By victim mode | Y | |
| | By impacting vehicle | Y | |
| Reported crimes | Disaggregated by mode | Y | |



Modelling Travel Demand- Household Survey

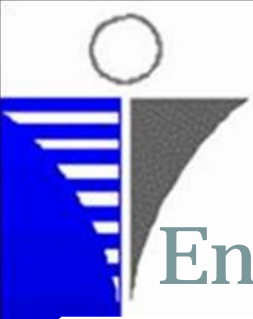
| Data required | Description | LCMP | CMP |
|---|--------------------------------------|------|-----|
| Personal information | Age | Y | Y |
| | Gender | Y | Y |
| | Occupation | Y | Y |
| | Monthly income | Y | Y |
| | Vehicle ownership and age of vehicle | Y | Y |
| | Monthly expenditure on transport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



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 | | |





Environmental Condition & City Budget Analysis

| Data required | Description | LCMP | CMP |
|---|---|------|-----|
| Air quality levels | NOx, CO2, CO, Sox 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 | |

Type of Scenarios- Brief

- **LCMP requires selecting desirable scenario having maximum impact in reducing emissions and improving social sustainability.**
- **Thus alternate scenarios to be build for LCMP needs to meet the desirable outcomes of LCMP i.e.**
 - Retain the existing modal share of NMT and PT
 - Cause shift from carbon intensive to environmental friendly modes
 - Induce technological changes to reduce emission levels from motorized transport



Type of Scenarios

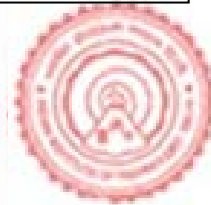
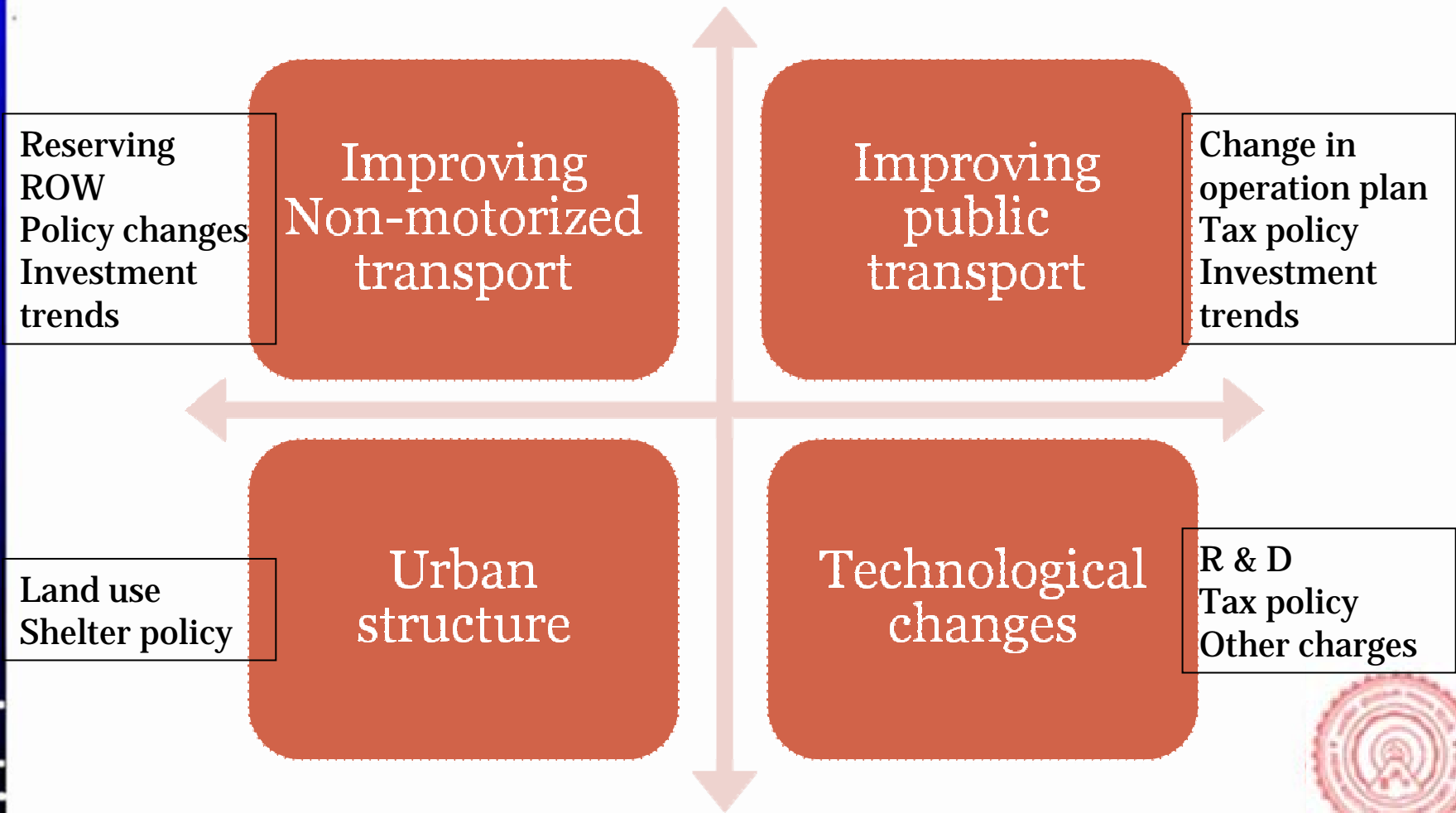


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2.3

Existing transport network

a. Condition of footpath

Percentage of roads with footpaths $\geq 2\text{m}$; percentage of footpaths with proper lighting and pavement

a. Infrastructure quality for cycles

Percentage of roads with cycle lanes/tracks $\geq 2\text{m}$; designated area for cycle parking

a. Public transport – level of service

Average headway, fleet utilization; average and peak hour bus occupancy; percentage of population within 10 min walking distance; fare structure; Vehicle efficiency

a. Infrastructure quality for Private motorized vehicles

Average speed on roads; Designated parking area; parking charges; vehicle efficiency

a. Level of service of infrastructure

Average travel time on roads by different modes including pedestrians, cycles and cycle rickshaws; average travel time at intersection for different modes; crossing travel time by pedestrians and bicyclists; transfer time for public transport system

2.4

Safety

a. Risk imposed to different by mode users

b. Risk imposed by different mode users on all road users

c. Overall safety

2.5

Security

Number of reported crimes while using different modes

2.6

Environmental impacts

a. Air quality index

b. Noise level index by location



| | |
|-----|---|
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| | |
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THANK YOU

