

Macro Considerations for *Low Carbon Mobility Plan*

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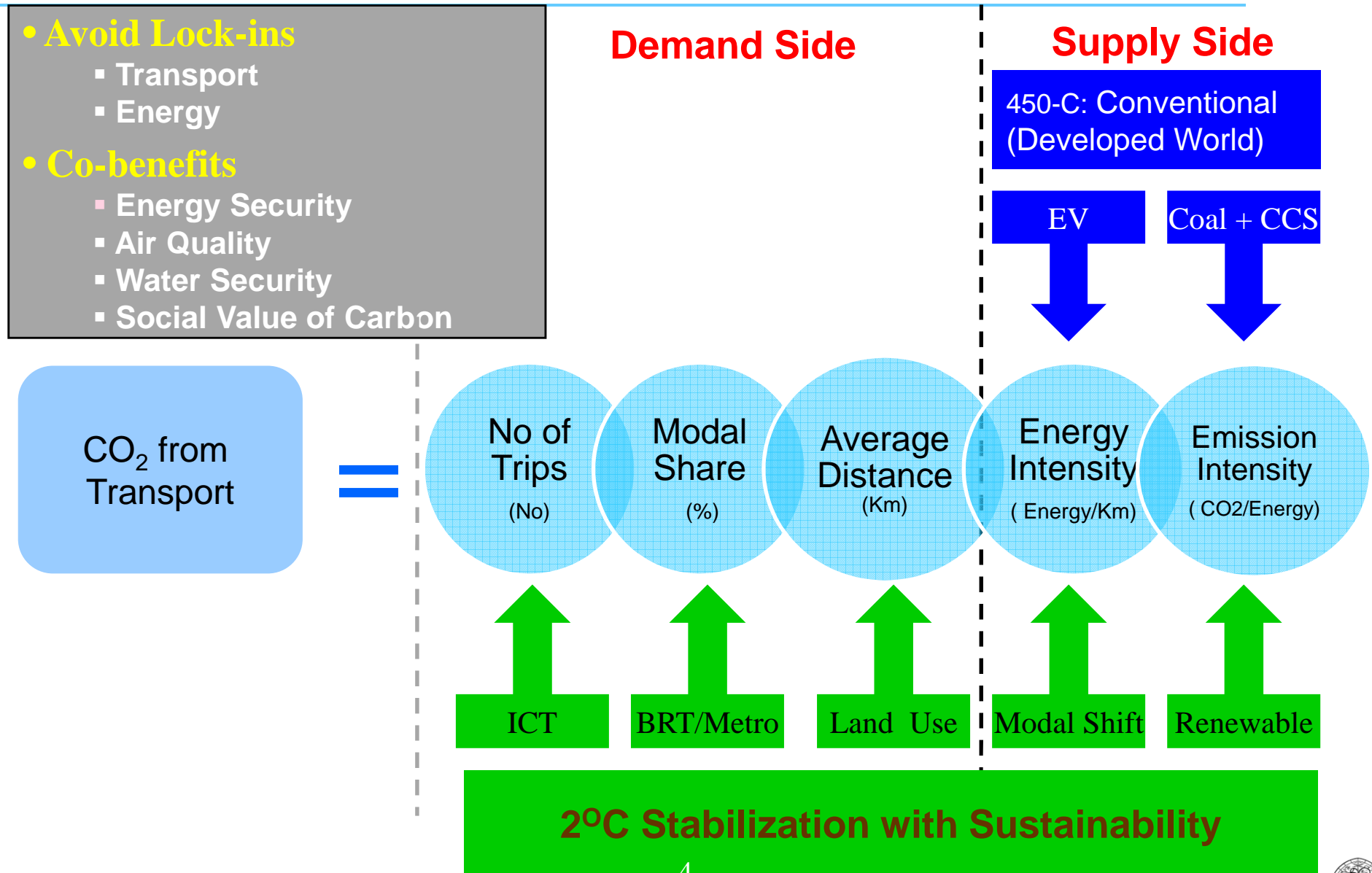
Presented in the
Capacity Building Workshop for Low-Carbon Comprehensive Mobility Plans for Indian Cities
Organized by UNEP RISOE Center, IIMA, IITD, CEPT, 11 to 13 April 2012, New Delhi

Presentation Agenda

- 1. Low Carbon Mobility: Framing**
- 2. Mapping Low Carbon Mobility Options**
- 3. Macro Indicators for Sustainable LCMP**
- 4. LC Methodology: Stepwise Approach**

Low Carbon Mobility: Framing

Low Carbon Mobility: Framing



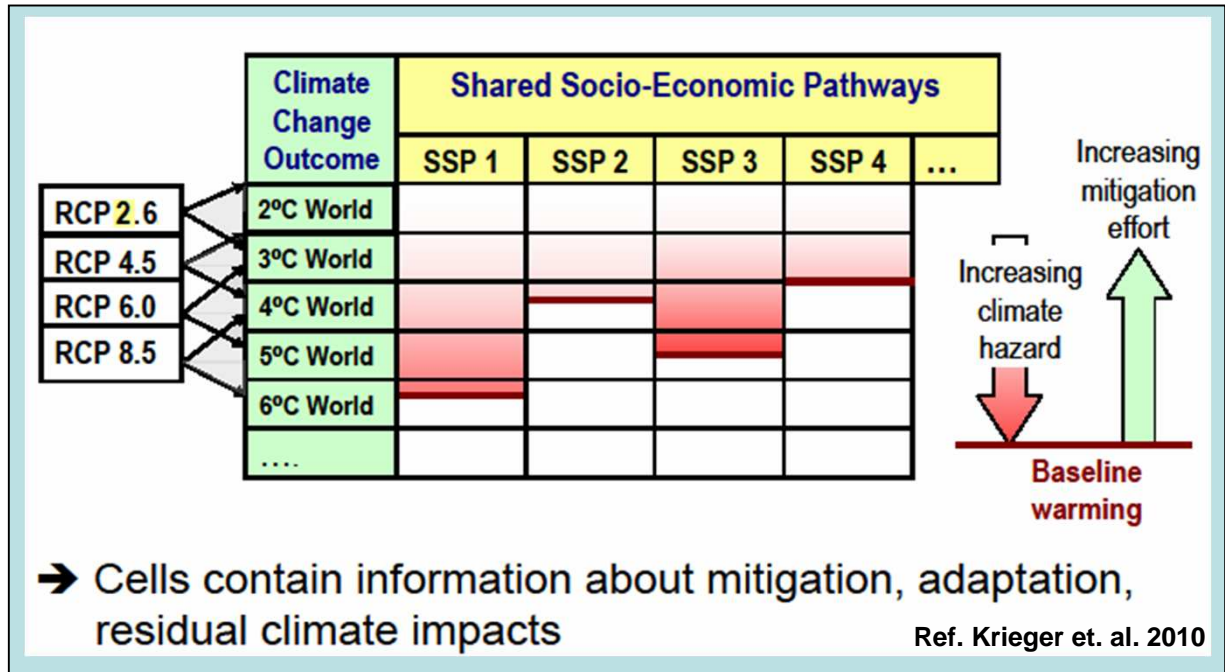
What do we mean by Low Carbon?

Global Climate Stabilization Target

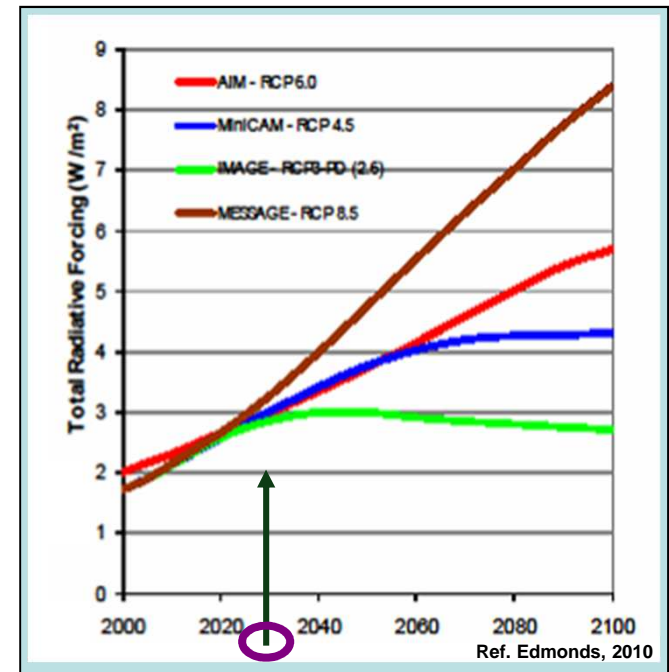
UNFCCC Negotiations

2^oC Temperature Stabilization Target

IPCC Representative Concentration Pathways (RCPs)

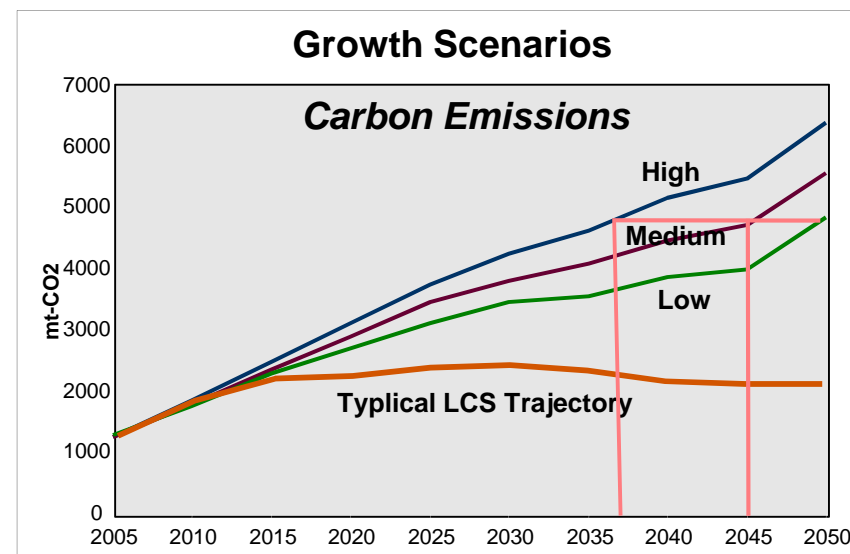
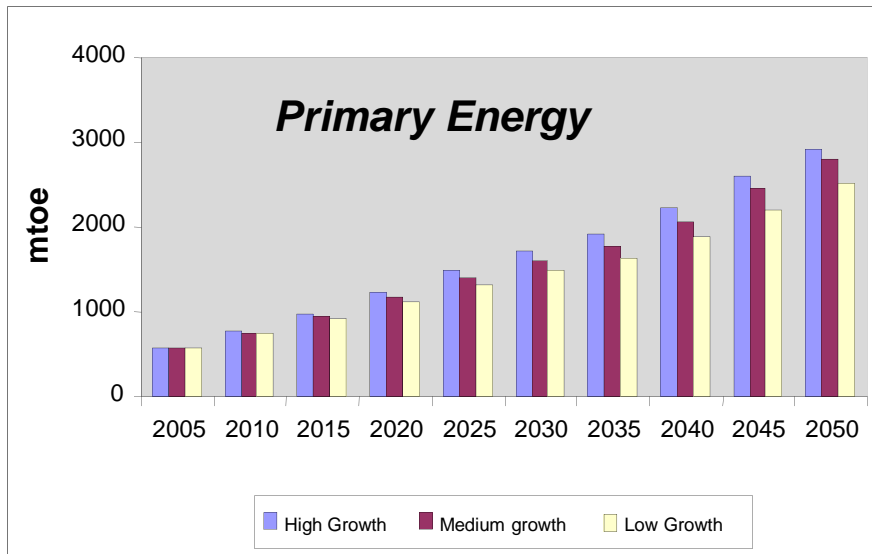
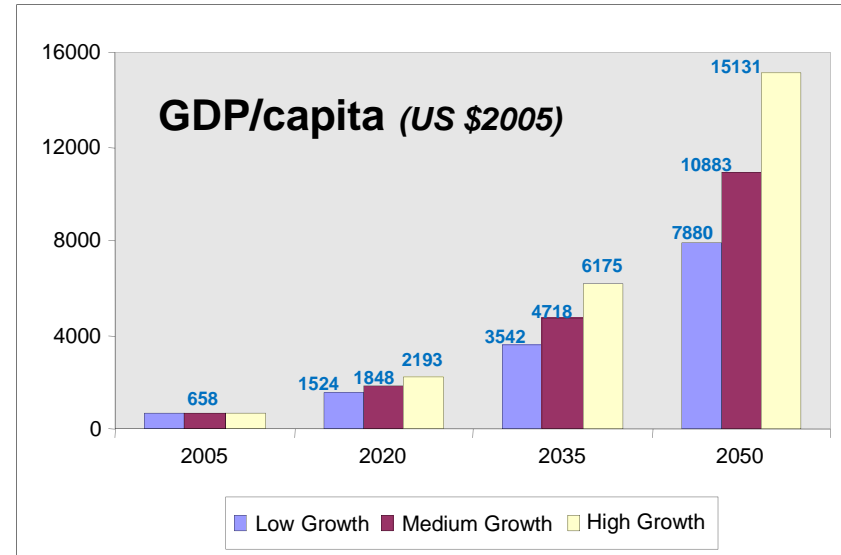
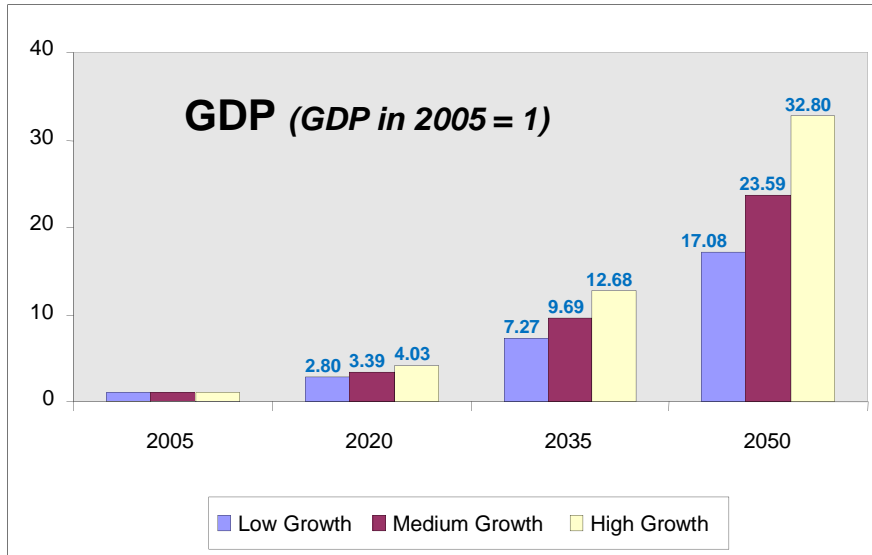


Emission Paths for RCPs



Available online (August 2011)
in 'Climatic Change', Springer

GDP, Energy, Emissions: Indian Scenarios



Mapping Transitions

- **Demographic Transitions**
 - Age, Gender, Urban/Rural, Education/Skills
- **Income**
 - Growth, Distribution
- **Infrastructures**
 - Modes, Investment, Ownership
- **Technologies**
 - Efficiencies, IPRs, Domestic vs. Foreign
- **Governance/Institutions**
 - Market Orientation, Global Interfaces, Effectiveness

Influencing Transitions

Socio-Economic

- Income Distribution (Equity, Welfare)
- Cooperation vs. Competition
- Co-benefits; Discount Rate

Behavioral

- Consumption (Awareness, Policies)
- Conservation (e.g. 3R)

Instruments

- Market / Non-Market
- Direct / Indirect

Coordination

Policies (e.g. Technology)

- Infrastructures
- Vehicles
- R&D
- Domestic Industry

Gaining co-benefits

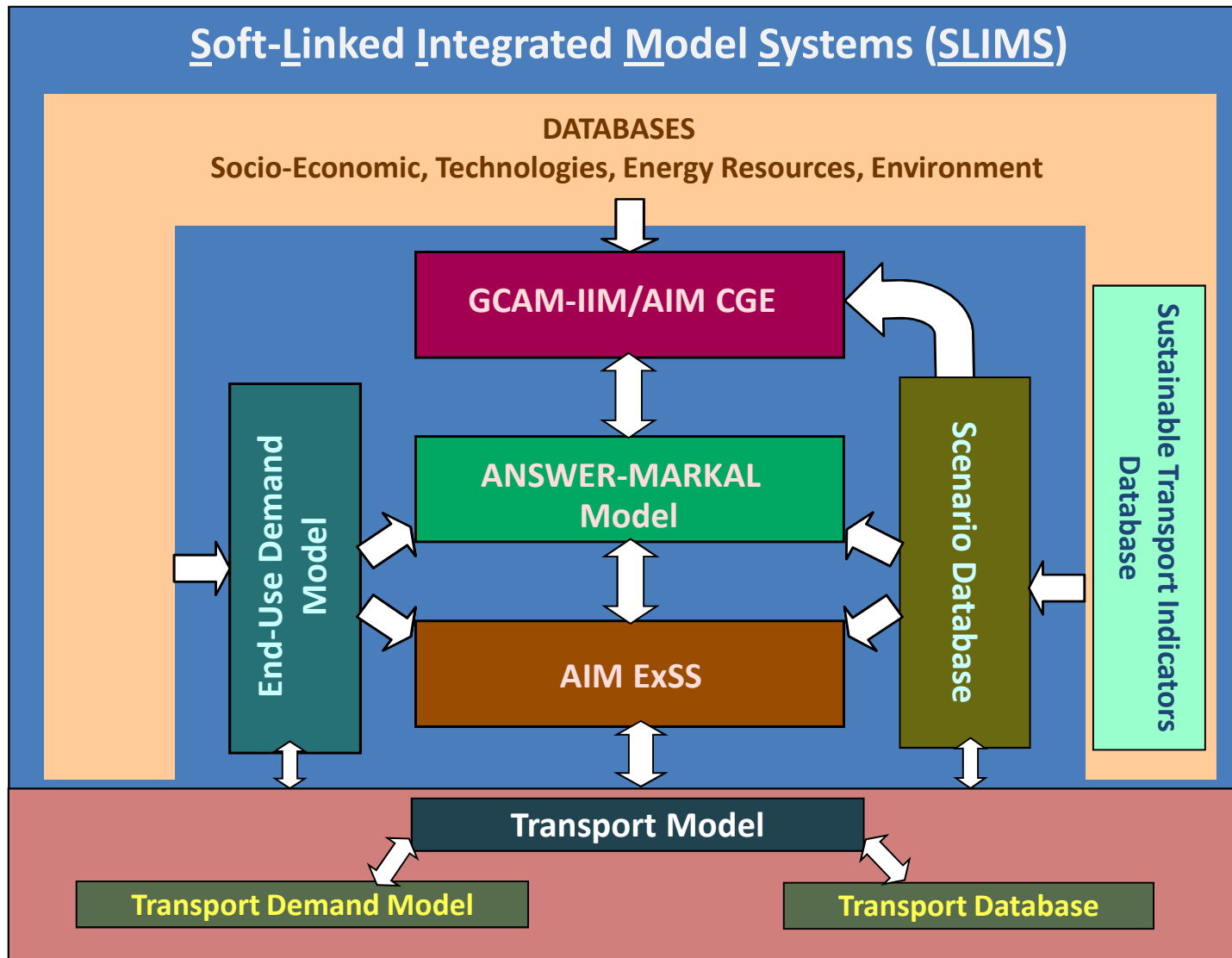
- CO2 and Air Quality
- Energy Security and Low Carbon Energy

Global Carbon Price vs. Social Value of Carbon

- Aligning Global Carbon Markets and National/Local Objectives
- Project Investment: What Carbon Price & Discount Rate?

Mapping Low Carbon Mobility Options

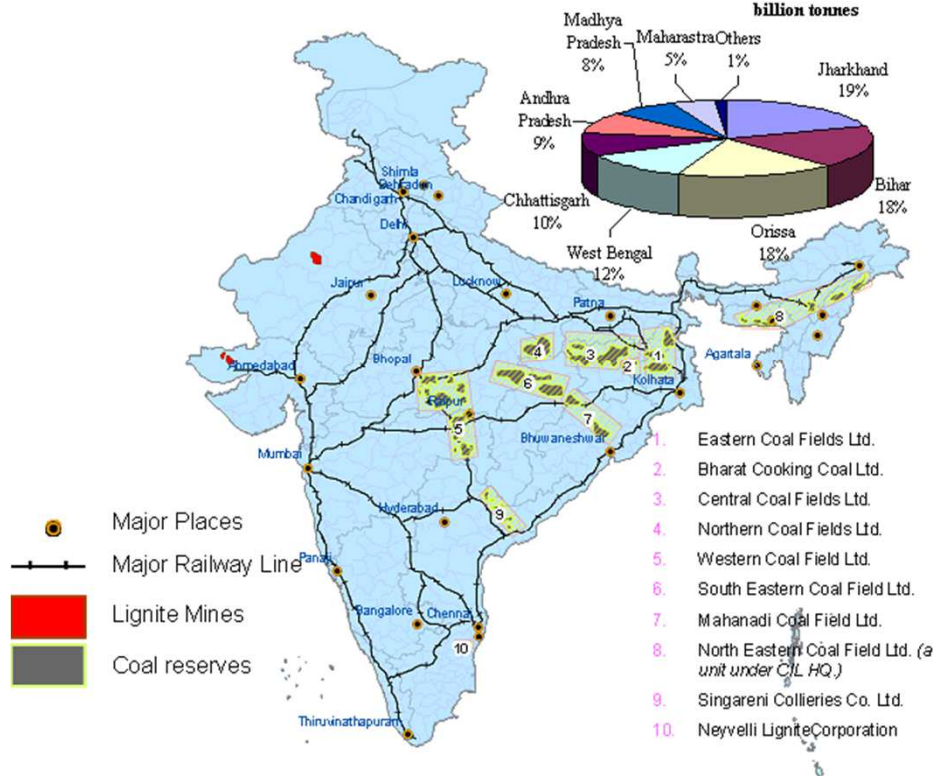
Sustainable Low Carbon Transport: National Level Assessment Methodology



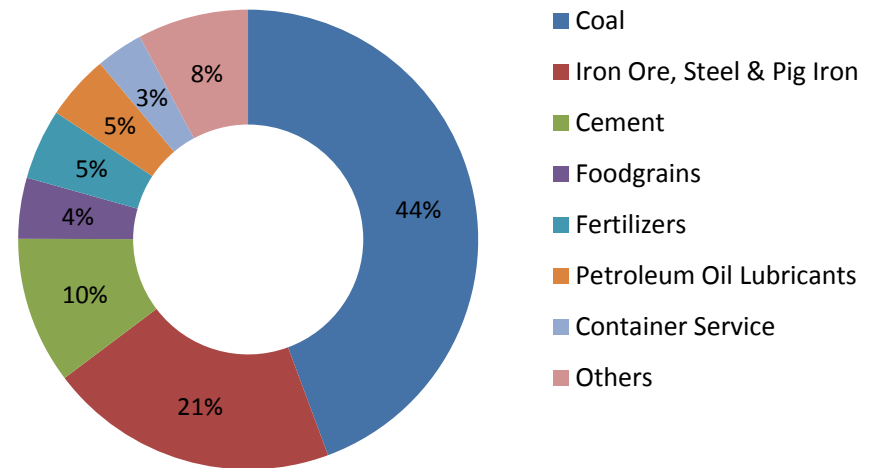
Infrastructure Alternatives: Coal by Wire

State Wise Coal Reserves

Total Proven Reserves 95.9 billion tonnes



Composition of Railway Freight Traffic (%): 2010



Dedicated Infrastructures





Japan will provide technology and financial support for Delhi-Mumbai Industrial Corridor (DMIC) to be developed similar to Tokyo-Osaka corridor for Rail transport

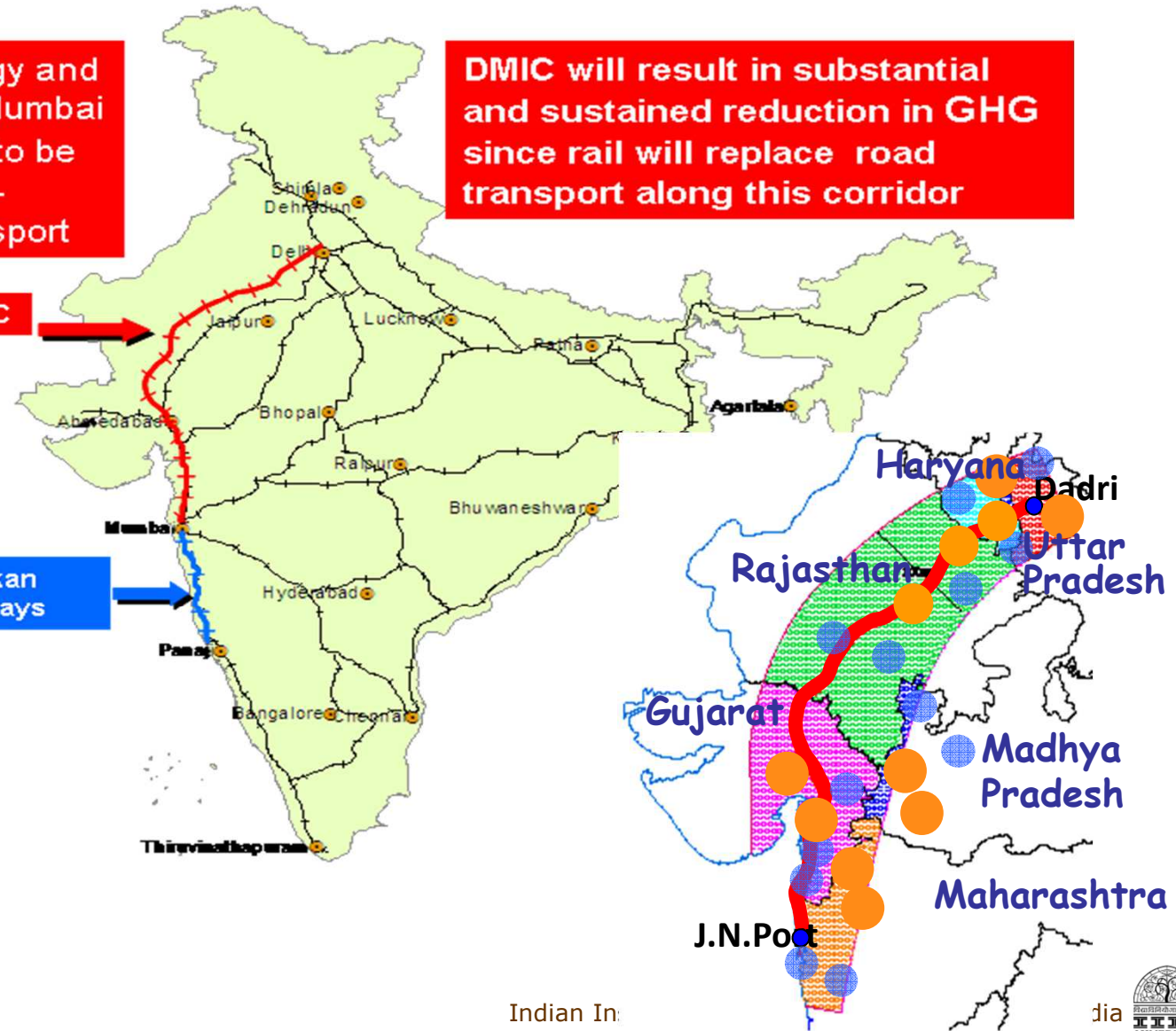
DMIC will result in substantial and sustained reduction in GHG since rail will replace road transport along this corridor

Proposed DMIC

Konkan Railways

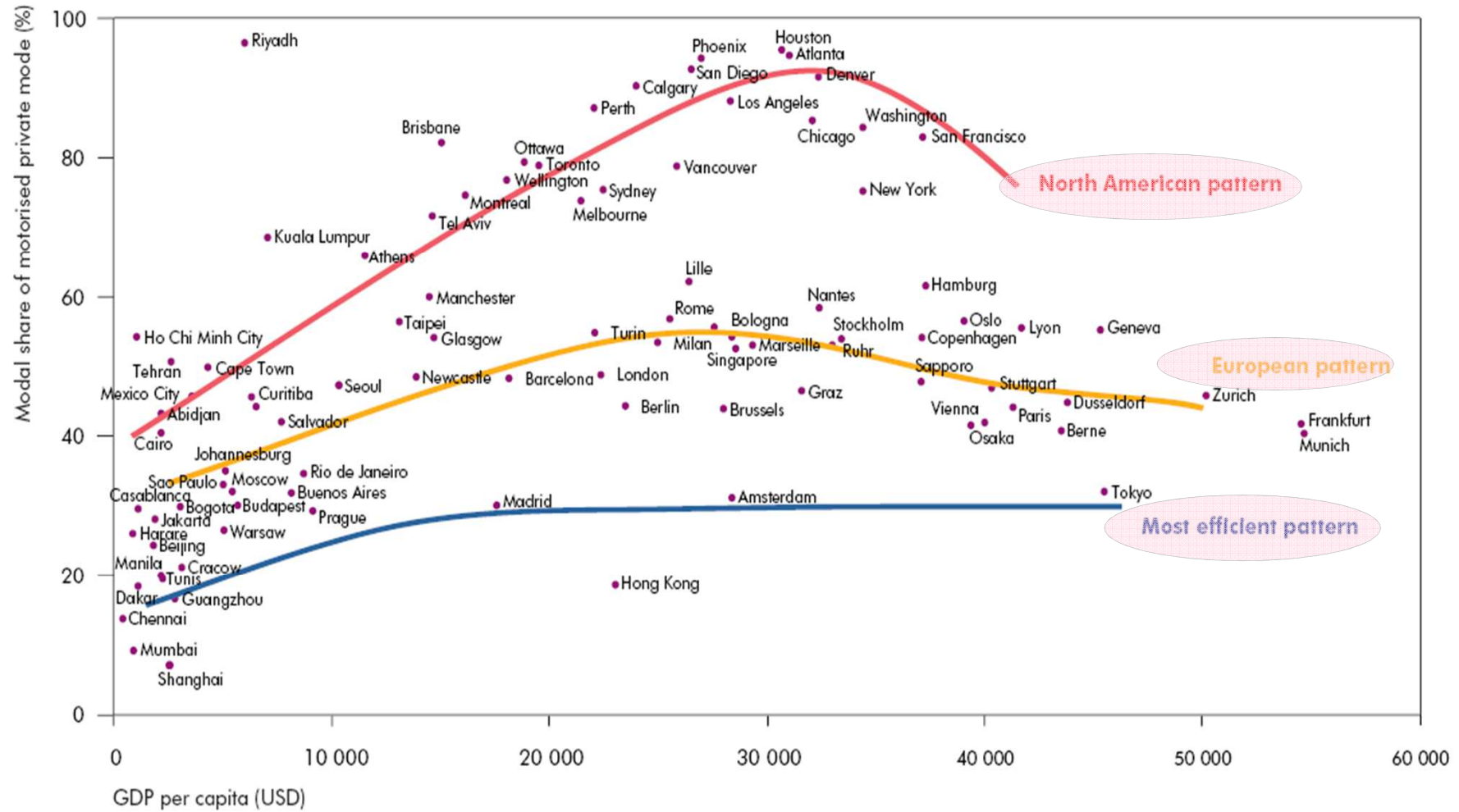
Legend

-  Major Cities
-  Proposed DMIC
-  Konkan Railways
-  Broad Gauge Railway Line



Transport Transitions: Historical Lock-ins

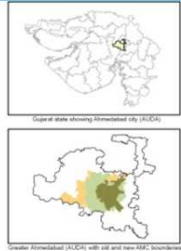
Figure 15.11 ▶ Relationship between GDP per capita and motorised modal share



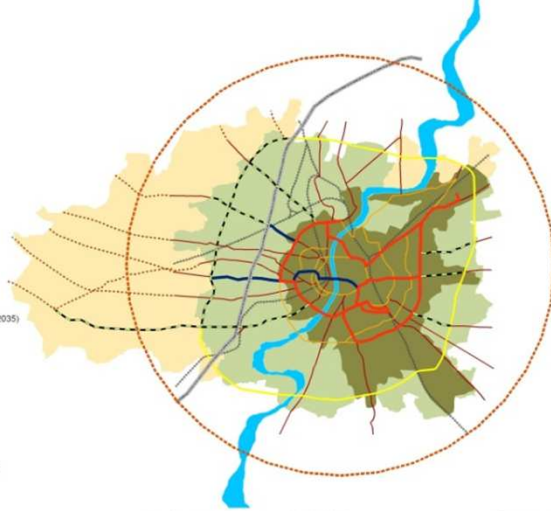
Source: UITP, 2006 (Courtesy of SYSTRA).

City Planning: Co-benefits

Ahmedabad City: Pop. In 2010 - 5.5. Million



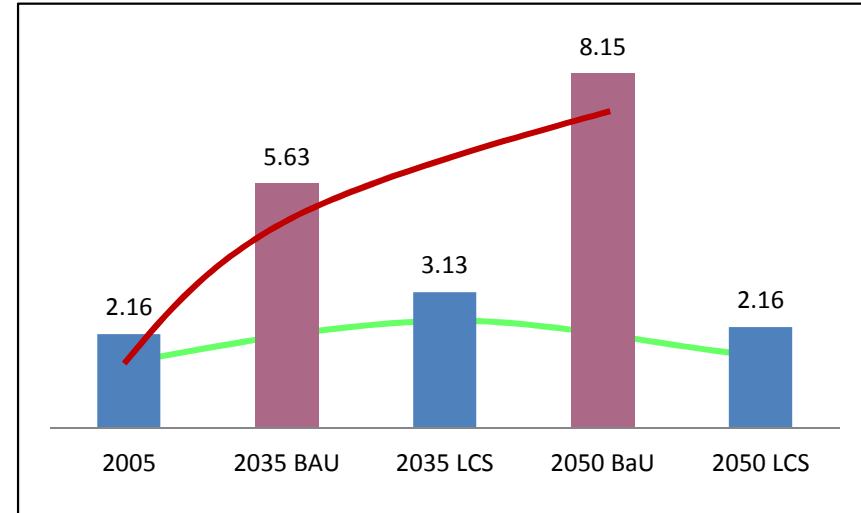
- Legend**
- Expected Ring Road
 - Expected BRTS Routes (2035)
 - Expected extended major radial roads (2035)
 - S.G. Highway
 - S.P. Ring Road
 - Bus Rapid Transit System Phase-I
 - Bus Rapid Transit System Phase-II
 - City's other major ring roads
 - City's major radial roads
 - Railway line
 - Sabarmati River
 - Ahmedabad old boundary (before 2007)
 - Ahmedabad city (after 2007)
 - Ahmedabad city in 2035 (assumed)



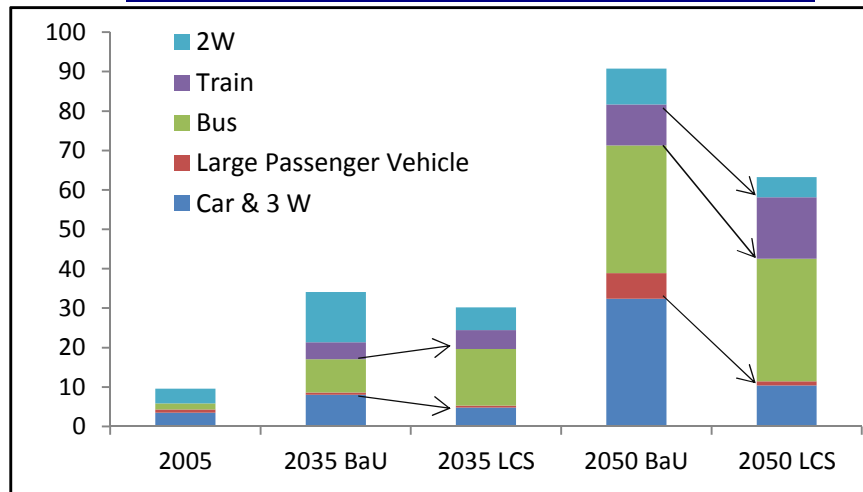
Note: Based on Ahmedabad Janmarg Map, AMC 2010

External boundaries not authenticated

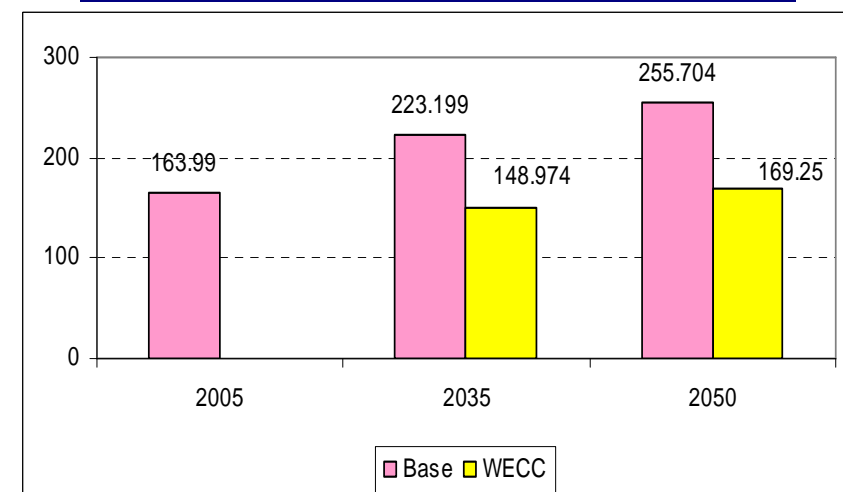
Per Capita CO2 Emissions (Ton)



Co-benefits: Transport Transitions



Co-benefits: Water per capita (ML/million)



Macro Indicators for Low Carbon Mobility

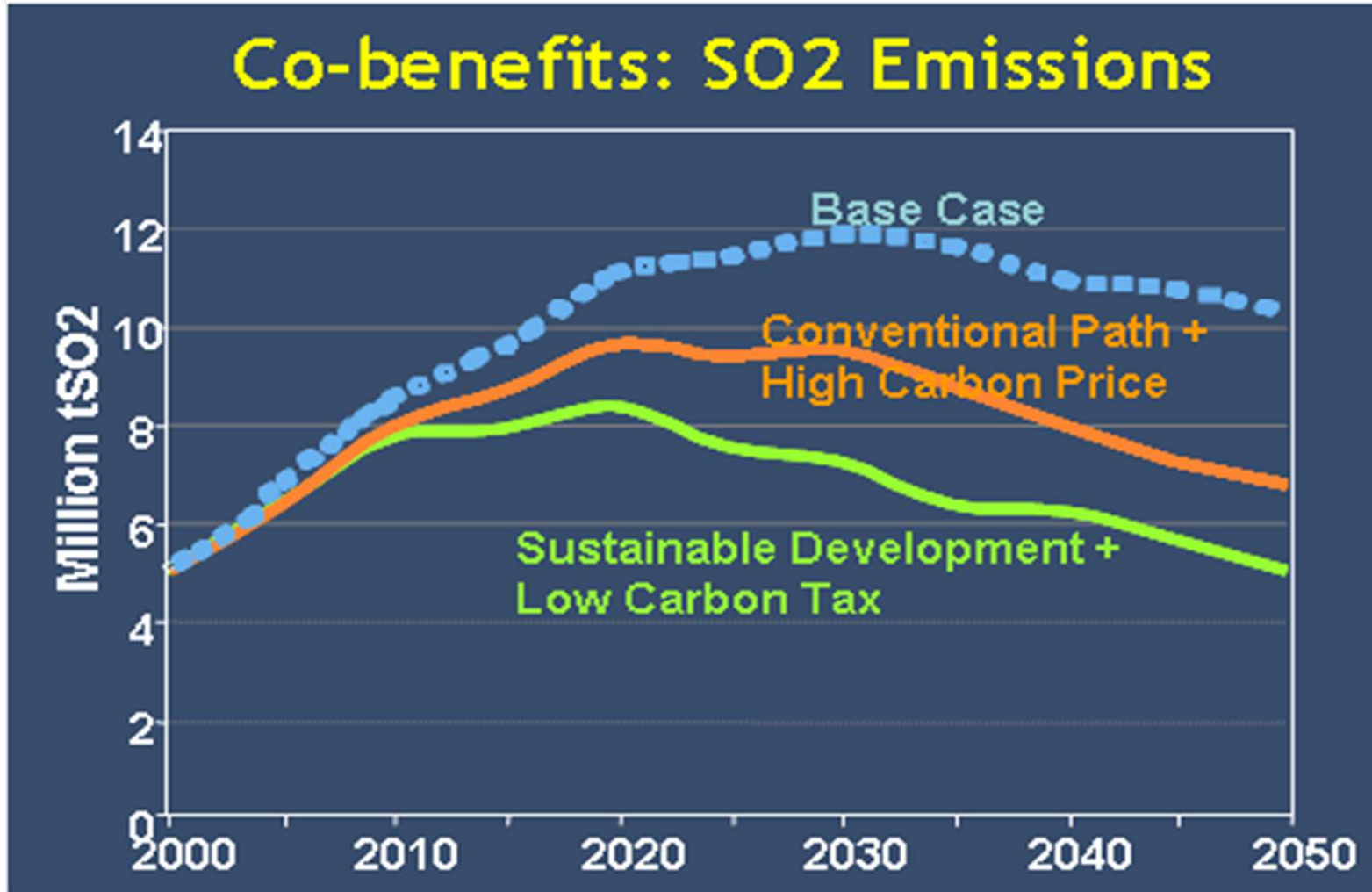
Sustainable & Low Carbon Transport

- 1. Inclusiveness**
- 2. Co-benefits (by aligning 'development and climate' goals)**
- 3. Long-term (Intergenerational) Perspective**
 - Avoid Lock-ins (or irreversibility)**
 - Social Discounting**

Macro Indicators of Low Carbon Transport

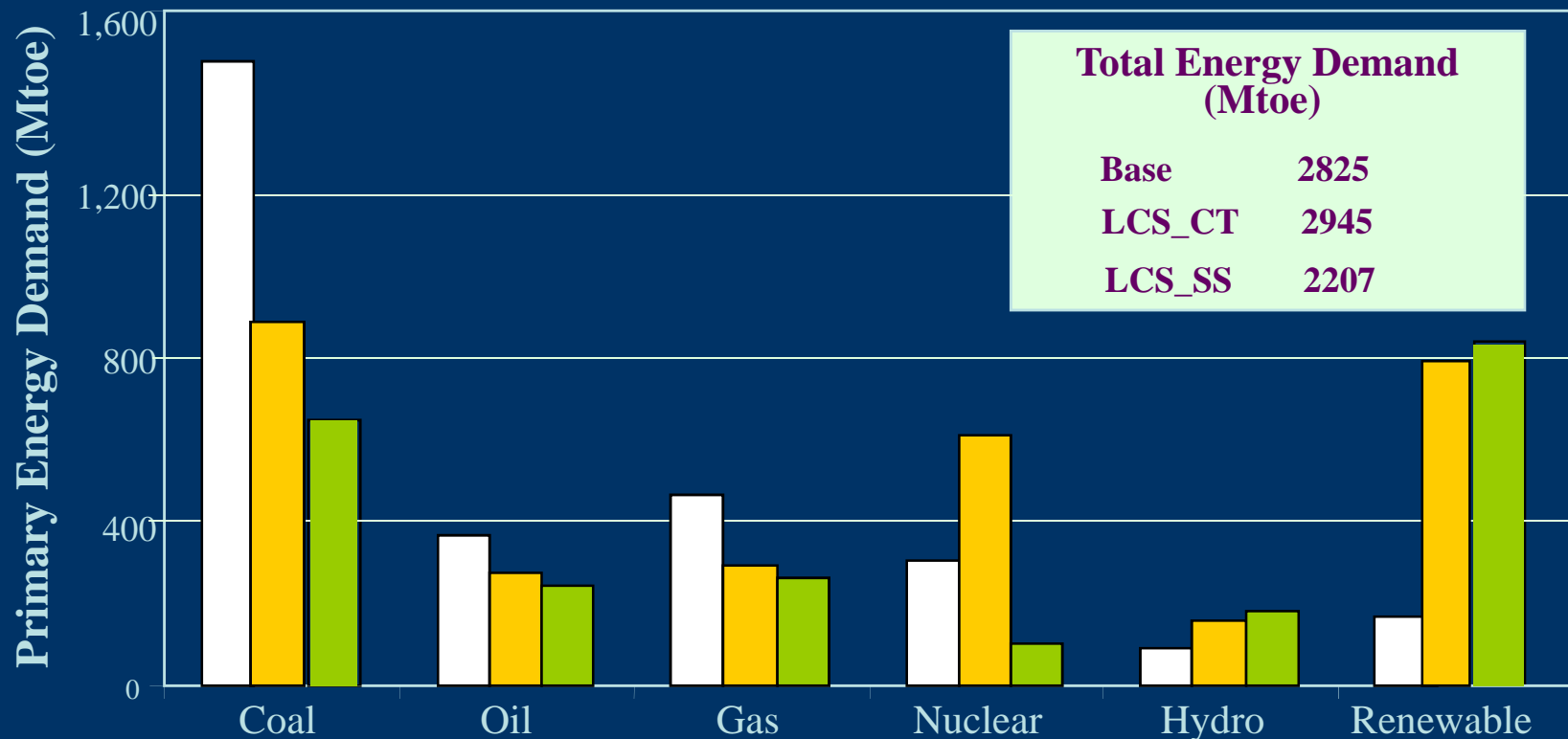
Economic	Carbon Intensity of Transport	Energy Security	Transport Infrastructure Investment	Total Cost of Transport
Social	Access to transport	Transport Subsidies	Food Security	
Environmental	Air Pollution	Water: Pollution & Stress	Safety	
Technical	Vehicle (fleet) Energy & Emissions Efficiency	Carbon Content of Electricity	Transport demand substitution	Operational Efficiency of Transport Infrastructure
Meta/Strategic	Sustainable Urban Form and Structure	National Logistics Grid	Investment in Transport Sector Innovations	

Air Quality Co-benefits of LCS



Energy Security Co-Benefits of LCS

Energy Mix in 2050



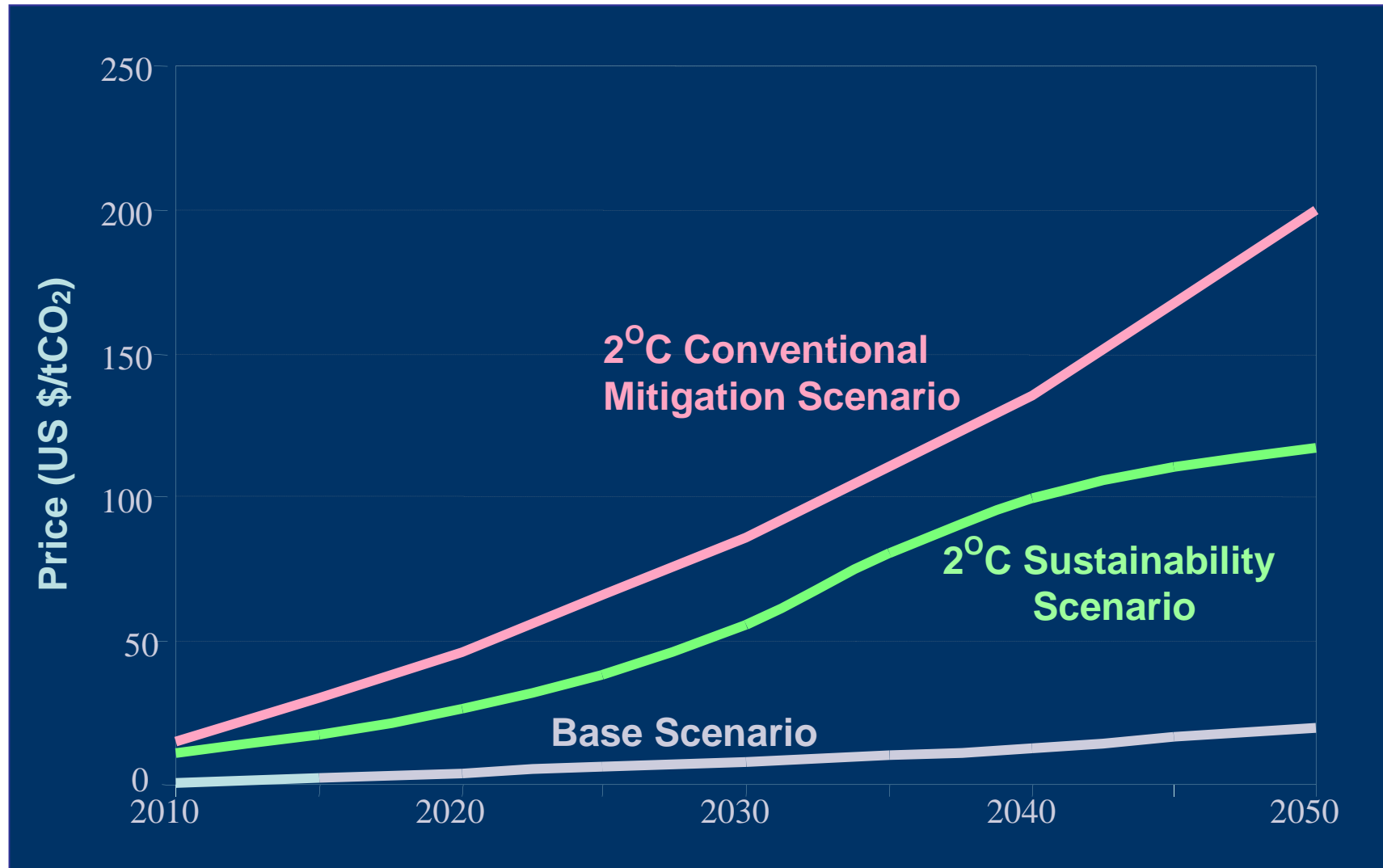
Total Energy Demand (Mtoe)	
Base	2825
LCS_CT	2945
LCS_SS	2207

□ BAU

■ LC- Conv

■ LC- Sust

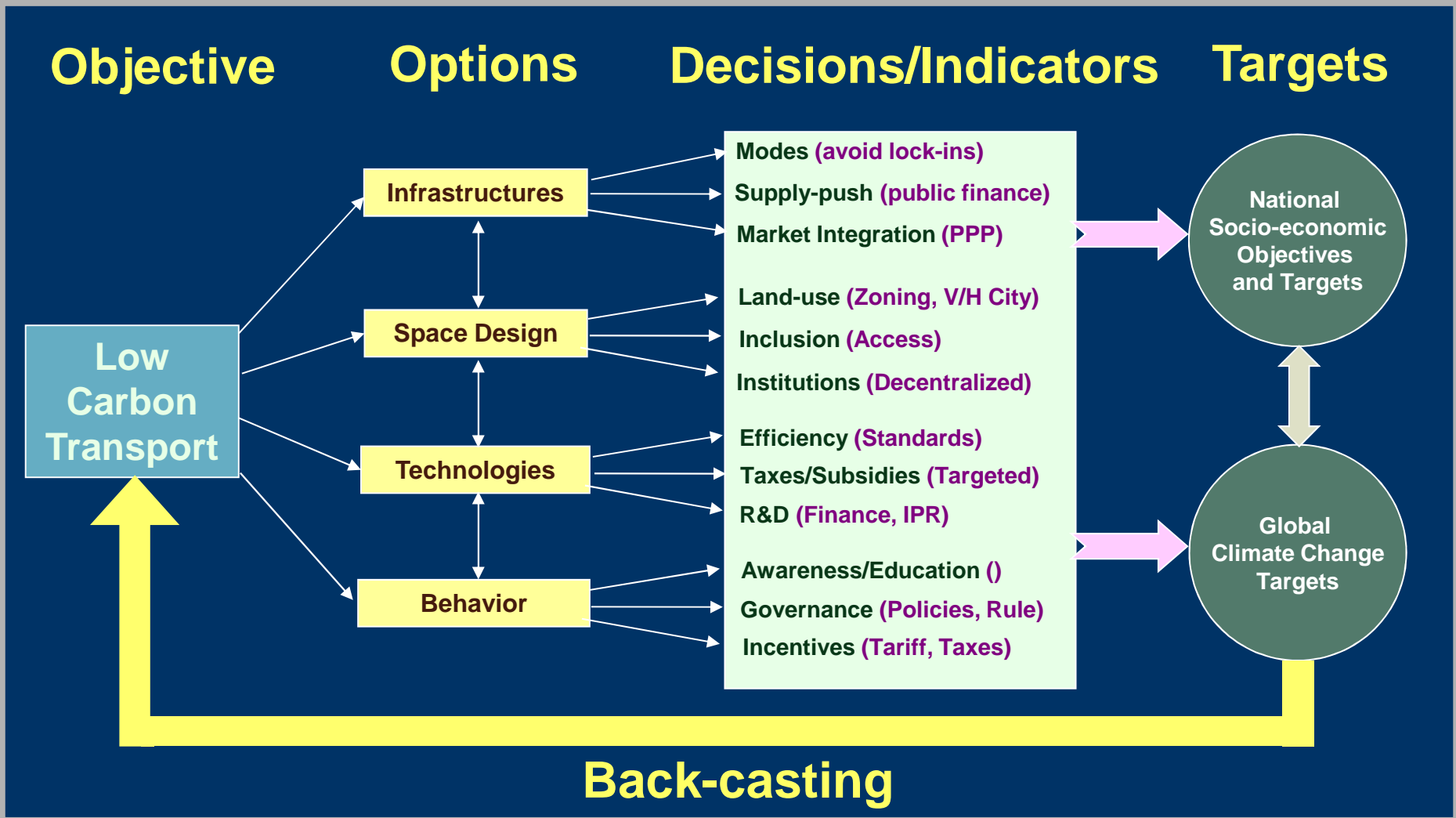
LCS with Lower Social Value of Carbon



Analysis with ANSWER-MARKAL Model

LC Methodology: Steps

Sustainable Low Carbon Mobility Framework



Low Carbon Mobility Roadmap: Method

- 1. Time Frame (Year 2030/ 2050/ 2100)**
- 2. Decide Carbon Target (Carbon Price Profile)**
 - i. City Level**
 - ii. Sector level**
- 3. Macro Data Inputs (Drivers)**
 - i. Demographic (Population, Labour Force)**
 - ii. Economic (Income, Sector Output)**
- 4. Indicators**
- 5. Outputs**
 - i. Mobility Demand**
 - ii. Modes (Infrastructure)**
 - iii. Land-use**
- 6. Finance**
 - i. Aggregate**
 - ii. Project Level**
- 7. Institutional / Implementation**

Low Carbon Mobility Plan

Ahmedabad 2035

Total travel demand (billion passenger km) : 53.3

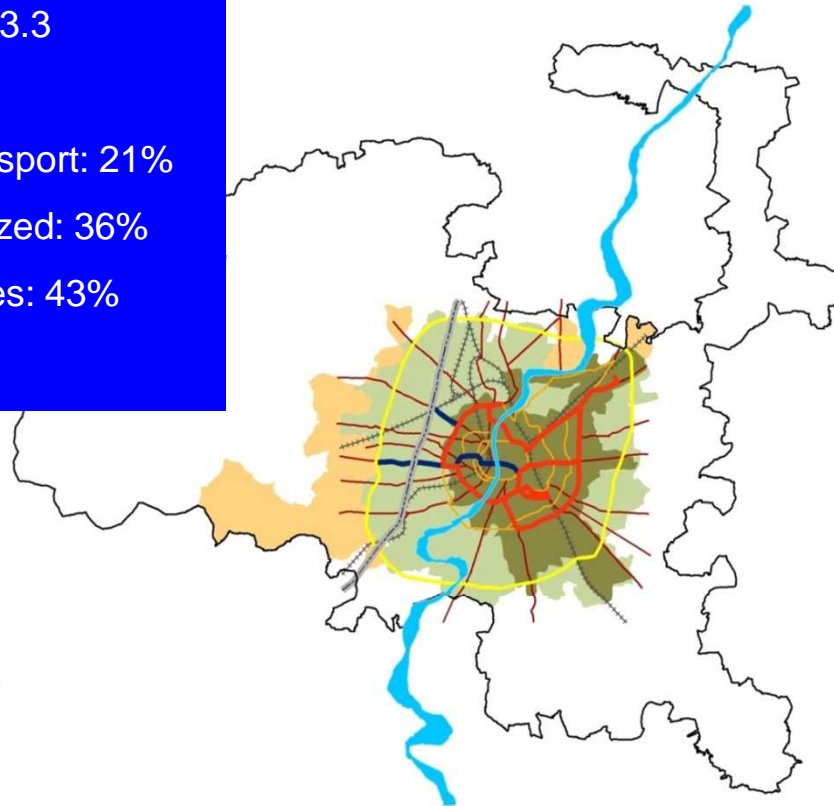
- Modal Share
 - Public Transport: 21%
 - Non-motorized: 36%
 - Other modes: 43%

Legend

-  Sabarmati River
-  Greater Ahmedabad (AUDA)
-  S.G. Highway
-  S.P. Ring Road
-  Bus Rapid Transit System Phase-I
-  Bus Rapid Transit System Phase-II
-  City's other major ring roads
-  City's major radial roads
-  Railway line
-  Ahmedabad old boundary (before 2007)
-  Ahmedabad city (after 2007)
-  Ahmedabad city in 2035 (assumed)

0 25 50 km

Note: Based on Ahmedabad Janmarg Map, AMC 2010



Mobility Module

Inputs

- Economic output from Household, Industry and Commercial sector
- City Development Plans
- National Development Plans
- Labour input for different sectors

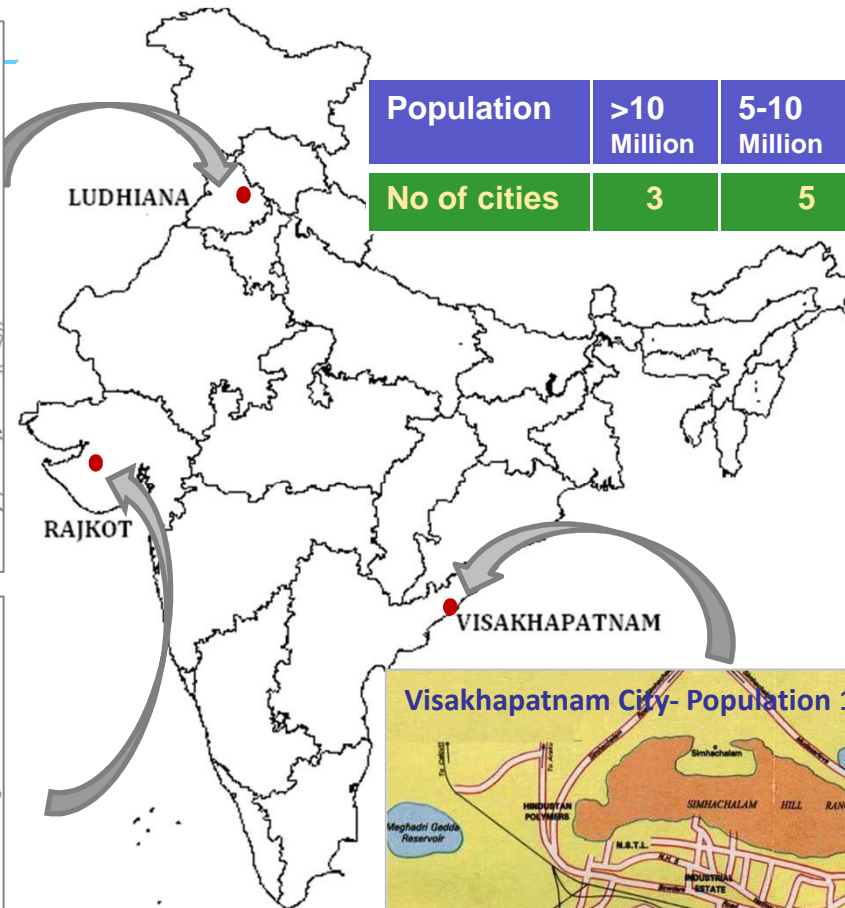
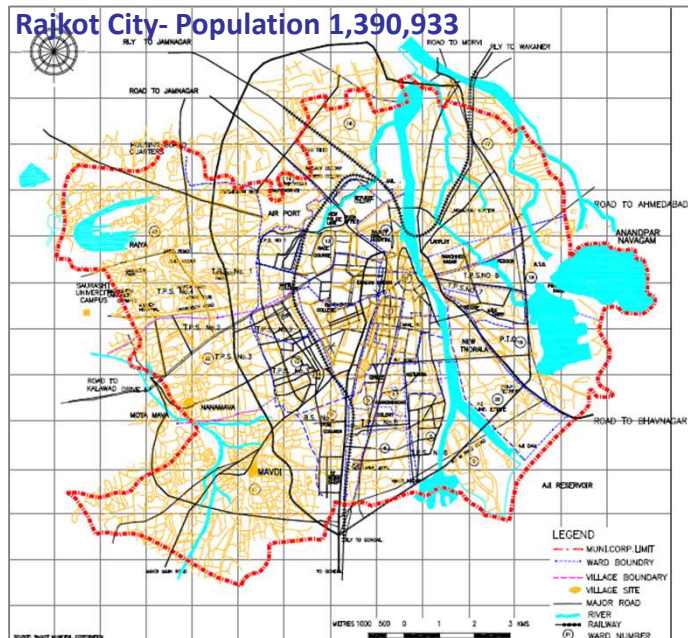
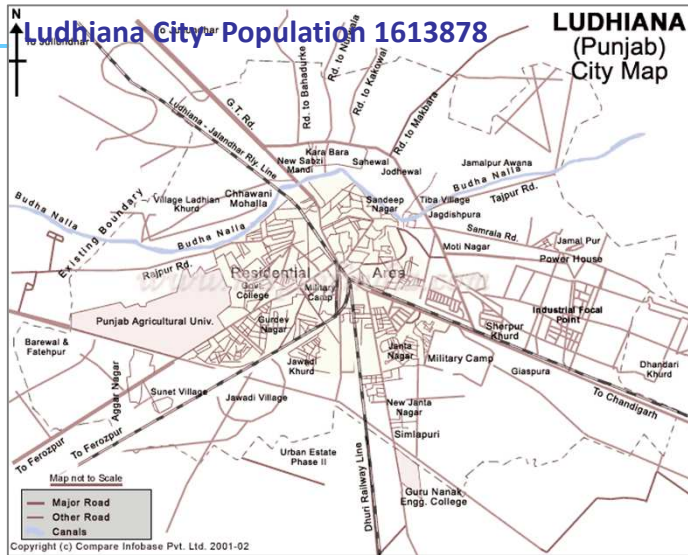
Outputs

- Demand for mobility
- Modal shares
- Infrastructure needs
- Traffic speed

Model Framework

- Land use transportation model

Low Carbon Mobility Plans for Cities



Population	>10 Million	5-10 Million	2-5 Million	1-2 Million
No of cities	3	5	11	34

