Integrated Assessment Modelling Activities in India in 2014-15

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Presented in
The 21th AIM International Workshop
National Institute for Environment Studies, Tsukuba, Japan
Nov 13-14, 2015
1. Research and Dissemination

- Modelling exercises
  - INDC
  - National Level-Deep Decarbonization Pathways Project (DDPP)
  - Sectoral & Sub-National Level Assessments
- LCS-RNet and LOCAR-Net: Linking Research & International Policymaking

2. Year 2015-16: Way Forward
INDC Target (Quantitative)

Base year: 2005
Target year: 2030

Quantitative Features:

1. 33-35% reduction of CO2 Intensity of GDP
2. 40% Electric Power Capacity from non-fossil sources
3. Additional Carbon Sink (2.5 to 3 Bil. Ton of CO2 by 2030)
## Emissions Target (2030)

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2010</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intensity Index</strong></td>
<td>100</td>
<td>91.21</td>
<td>65</td>
</tr>
<tr>
<td><strong>CO2e (Bt)</strong></td>
<td>1.41</td>
<td>1.98</td>
<td>5.97</td>
</tr>
<tr>
<td><strong>GDP (Tr. Rs - 2004-05)</strong></td>
<td>35.43</td>
<td>52.83</td>
<td>230.59</td>
</tr>
<tr>
<td><strong>CO2e/GDP (Ton/Mil Rs)</strong></td>
<td>39.83</td>
<td>37.48</td>
<td>25.89</td>
</tr>
<tr>
<td><strong>Population (Billion)</strong></td>
<td>1.12</td>
<td>1.19</td>
<td>1.475</td>
</tr>
<tr>
<td><strong>CO2e/Capita (Ton)</strong></td>
<td>1.25</td>
<td>1.66</td>
<td>4.05</td>
</tr>
</tbody>
</table>

- **CO2e (Bt)**: Carbon Dioxide Equivalent in Billion (Bt)
- **GDP**: Gross Domestic Product in Trillion Rupees (Tr. Rs)
- **CO2e/GDP**: Carbon Dioxide Equivalent per Million Rupees (Ton/Mil Rs)
- **Population**: Population in Billion
- **CO2e/Capita**: Carbon Dioxide Equivalent per Capita in Ton
NATIONAL LEVEL
pathways to
depth decarbonization
in India
Alternative Development Pathways

DDP Scenarios

Conventional
Paradigm: Climate Centric
Method: Forecasting to meet climate goal
Driving Vision: Competition (Market Efficiency)
Instrument: Global Carbon Price

Sustainable
Paradigm: Sustainability + Climate
Method: Back-casting from SE4ALL Targets
Driving Vision: Co-operation (Co-benefits)
Instrument: Social Cost of Carbon

Economic
Cost of Energy Supply
Energy Security
Environmental Tax

Environmental
Share of Renewable
Air Quality Goals

Social
Energy Access (SE4ALL)
Community Governance
DDPP: Energy related CO2 Emissions

- Conventional
- Sustainable

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2030</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas</td>
<td></td>
<td></td>
<td>2500</td>
</tr>
<tr>
<td>Oil</td>
<td>1000</td>
<td>2000</td>
<td>1500</td>
</tr>
<tr>
<td>Coal</td>
<td>700</td>
<td>3000</td>
<td>1000</td>
</tr>
</tbody>
</table>

Million Tons
DDPP: CO2 Emissions by Sector

- Agriculture
- Transport
- Industry
- Commercial
- Residential

<table>
<thead>
<tr>
<th>Year</th>
<th>Conventional</th>
<th>Sustainable</th>
<th>2010</th>
<th>2030</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Agriculture</td>
<td>Transport</td>
<td>Industry</td>
<td>Industry</td>
<td>Industry</td>
</tr>
<tr>
<td></td>
<td>Residential</td>
<td></td>
<td>Commercial</td>
<td>Commercial</td>
<td>Commercial</td>
</tr>
</tbody>
</table>

Mt CO2

- 0
- 500
- 1000
- 1500
- 2000
- 2500
- 3000
- 3500
Air Pollution & Energy Security
Co-benefits

**PM2.5 Emissions**

- LDVs
- HDVs
- Buses
- 3Ws
- 2Ws
- 4Ws

**Value of Energy Imports**

- Gas
- Oil
- Coal

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<tr>
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<th>Sustainable</th>
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<tbody>
<tr>
<td>2010</td>
<td>50</td>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>2030</td>
<td></td>
<td></td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>2050</td>
<td></td>
<td></td>
<td>300</td>
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</table>
Co-benefits: Social Value of Carbon

Revenues from carbon saved in Sustainable Scenario

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
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<th>2040</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CO₂ saved (Million tCO₂)</strong></td>
<td>370.6</td>
<td>671.8</td>
<td>918.9</td>
<td>1049.4</td>
</tr>
<tr>
<td>Revenue from CO₂ saved (Bn US $ 2010)</td>
<td>16.6</td>
<td>45.1</td>
<td>82.3</td>
<td>152.9</td>
</tr>
<tr>
<td>Revenue as % of GDP</td>
<td>0.6%</td>
<td>0.8%</td>
<td>0.8%</td>
<td>0.7%</td>
</tr>
</tbody>
</table>
SECTORAL & SUB-NATIONAL LEVEL
Air pollution co-benefits of low carbon policies in road transport: a subnational assessment for India
Passenger Transport Demand

Industrialized and economically Advanced regions

Less developed regions
CO2 Emissions

BaU(2010)

BaU(2030)

LCS(2030)

BaU(2050)

LCS(2050)
Figure 5. Emissions from the road passenger transport sector.
Low carbon urban transport scenarios for China and India: A comparative assessment
Urban Passenger Transport Demand

Graph showing Urban Passenger Transport Demand for India and China from year '10 to '50. The bars represent different modes of transport:
- 2 Wheeler
- Car
- Bus
- Metro

The graph indicates a significant increase in both India and China, with a dominance of Car and Bus in India, and a balanced increase across all modes in China.
Technology Mix

The chart displays the energy consumption from various types of vehicles over the years. It compares the baseline (Base) and a low-carbon strategy (LCS) for the years 2010 to 2050. The categories include:

- Metro
- Car plug-in gasoline
- Car plug-in diesel
- Car natural gas
- Car hybrid gasoline
- Car hybrid diesel
- Car gasoline
- Car fuel-cell
- Car electric
- Car diesel
- Bus hybrid
- Bus diesel
- Bus CNG
- 2 wheeler gasoline
- 2 wheeler electric

The vertical axis represents the energy consumption in Mtoe (metric tons of oil equivalent), and the horizontal axis represents the years from 2010 to 2050.
Energy Mix

China

India

Mtoe

year

Biofuel
Hydrogen
Electricity
Natural gas
Oil

Base
LCS

'10 '20 '30 '40 '50 '10 '20 '30 '40 '50 '10 '20 '30 '40 '50
Year 2015-16: Way Forward

1. India national and subnational Low Carbon Scenarios and Plans to align with Global Stabilization Target

2. Comparative Cross-country Assessments

3. Cooperation during Participation in International Projects
   - MILES Project
   - Deep Decarbonization Pathways Project (DDPP)
   - CD-Links Project

4. New research agenda related to sustainable development and climate change

5. Capacity Building and Dissemination

Thank You