Introduction to CSE

Priyavrat Bhati
Programme Director (Energy)
• Important period for Env regulation – MoEF established
• CSE – research based advocacy
# CSE- Work Domains

<table>
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<tr>
<th>Awareness Raising &amp; Documentation</th>
<th>Research &amp; Policy Advocacy</th>
<th>Training &amp; Outreach</th>
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<tr>
<td>Down to Earth</td>
<td>Water Management (Rural, Urban &amp; Rivers)</td>
<td>Green Schools’ Programme</td>
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<td>Gobar Times</td>
<td>Sustainable Industrialization</td>
<td>Media Outreach</td>
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<tr>
<td>State of India’s Environment Reports</td>
<td>Air Pollution &amp; Mobility</td>
<td>Regulators’ programme</td>
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<tr>
<td>Books, Documents, Journals, Databases</td>
<td>Green Buildings</td>
<td>Environment</td>
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<td>Environment Portal</td>
<td>Policy Research &amp; Community Support</td>
<td>Training Institute (ETI)</td>
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<td>Web-based info. services</td>
<td>Pollution Monitoring Laboratory</td>
<td>AAGC (students)</td>
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<td>Food Safety &amp; Toxins</td>
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<td>Climate Change</td>
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<td>Renewable Energy</td>
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Sustainable industrialization

- Genesis: Green rating of industrial sectors
  - Steel, Cement, Auto, Chlor-Alkali, Paper
- In 2012, started researching power sector
- Why rate Coal-based power sector?
  - Scale of env. impact
- Ratings and Policy Recommendations to the govt - 2015
- Energy Group – Need for long term & wide engagement to improve the sector –
  - policy issues (discoms, renewables, rural energy access)
  - Linkage with climate change and development challenge – different from other industrial sectors
  - Implementation help at state level
Electricity access & consumption

- Third largest power consumer in the world after USA and China.
- But, 25% population without access to electricity; huge population gets intermittent supply - Lowest per capita electricity use amongst major economies (914 kWh/p.a. in 2012 - third of the world average)
- Govt. goal - 24x7 power to all by 2019
Electricity – demand growth

<table>
<thead>
<tr>
<th>TWh</th>
<th>2012</th>
<th>2022</th>
<th>2030</th>
<th>2047</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>336</td>
<td>494</td>
<td>703</td>
<td>1,366</td>
</tr>
<tr>
<td>Residential</td>
<td>175</td>
<td>480</td>
<td>842</td>
<td>1,840</td>
</tr>
<tr>
<td>Commercial</td>
<td>86</td>
<td>142</td>
<td>238</td>
<td>771</td>
</tr>
<tr>
<td>Agriculture</td>
<td>136</td>
<td>245</td>
<td>336</td>
<td>501</td>
</tr>
<tr>
<td>Others</td>
<td>29</td>
<td>71</td>
<td>121</td>
<td>233</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>762</strong></td>
<td><strong>1,433</strong></td>
<td><strong>2,239</strong></td>
<td><strong>4,712</strong></td>
</tr>
</tbody>
</table>

*Source: Niti Ayog, 2014*

- Overall demand expected to grow at 5% p.a. over next 20 years
- Industrial consumption will dominate electricity demand; But, domestic consumption growth rate the fastest
Generation: Coal dominant

Total capacity = 271 GW (2015)

- Coal: 61%
- Hydro: 13%
- Renewable: 15%
- Nuclear: 2%
- Diesel: 9%
- Gas: 2%

Total generation = 1,105 TWh (2014-15)

- Coal: 76%
- Hydro: 12%
- Renewable: 5%
- Nuclear: 3%
- Diesel: 0%
- Gas: 4%
• COAL – 65% OF GENERATION IN 2022; 55% IN 2040

• But, reduced emphasis - NEP/CEA Projections
  • RE 175 GW by 2022;
  • Coal capacity – ZERO addition needed in next 5 years;

• ...So what’s the problem?
Env. Impact – Coal-based Power

A. LOCAL IMPACT
• Air: PM, SO$_x$, NO$_x$, Mercury – 30-60% of Ind. emissions
• Water withdrawal
• Fly Ash

B. GLOBAL IMPACT
• Almost half of GHG from energy contributed by coal-based power. India’s INDC Goals
  ➢ Reduce GDP Intensity by 33-35% (2030 vs 2005)
  ➢ Non-fossil fuel 40% of capacity by 2030
Extreme rainfall events

- 2005: 994 mm of rainfall in 24-hours in Mumbai. One of the highest ever recorded. 5000 dead
- 2010: “cloudburst” 150-250 mm of rainfall in 30 minutes in around Leh town (cold desert). 255 dead
- 2013: Uttarakhand, 340 mm in 24-hours; 850% more rain than normal in a week. 5700 dead
- 2014: Jammu & Kashmir, 200 mm in 24-hours. More than 300 dead
Most of the floods in 2016 were preceded by extreme rainfall events—a precipitation of 124.5 mm or more in a day.

**Flood 2016**
- Population affected: 9.75 million
- Lives lost: 569
- Loss of animal lives: 91,542
- Crop area affected (ha): 565,721
Killing fields: Season of despair for farmers

When freak becomes norm

When hailstorms and unseasonal rains destroyed large swathes of rabi crops in 2013, they were thought to be freak weather events. But they hit again in 2014, and then this year, each time with more intensity, and causing more damage.

<table>
<thead>
<tr>
<th>Year</th>
<th>States affected</th>
<th>Crops damaged</th>
<th>Economic loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>5</td>
<td>0.35 million ha</td>
<td>₹500 crore</td>
</tr>
<tr>
<td>2014</td>
<td>6</td>
<td>5.5 million ha</td>
<td>₹5,000 crore</td>
</tr>
<tr>
<td>2015</td>
<td>15</td>
<td>18.23 million ha</td>
<td>₹20,000 crore</td>
</tr>
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</table>

Source: Based on state estimates
In addition to climate change issues:

- Already serious air and water pollution in vast areas
- Severe health impact that will worsen
- Adverse impact on livelihood and economy

However, development and sustainability can be balanced
- Controlling pollution from coal-based power is affordable
- RE will not replace coal even in several decades

THEREFORE, CONTROLLING COAL’S POLLUTION CRITICAL AND ALSO MOST PRUDENT ALTERNATIVE