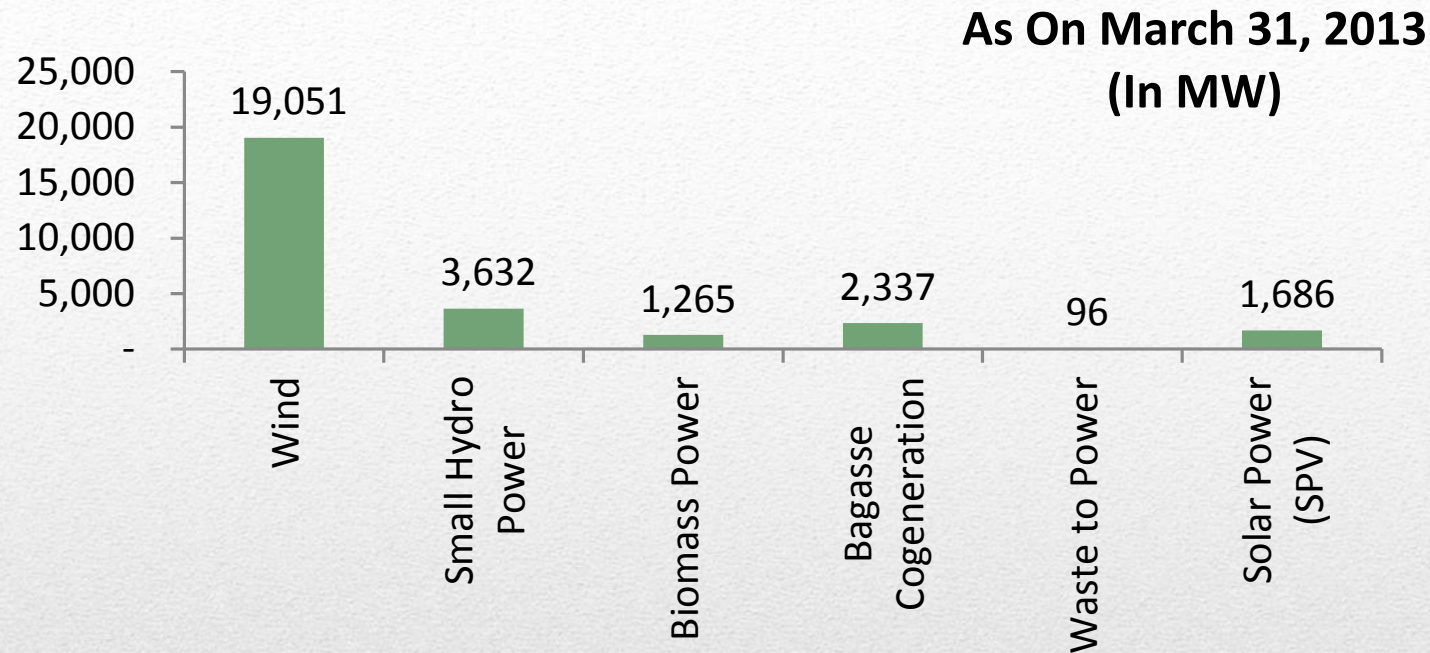


GREEN NORMS FOR RENEWABLE ELECTRICITY

**Potential Impacts and the status of
Green Norms**





- Installation of grid connected RE (excluding large hydro) grew from 3.5 GW in March 2002 to 28 GW in March 2013 – **annual growth rate of 23%**
- March, 2013, **RE (excluding large hydro) constituted 12.5%** of installed capacity
- **51.23 billion kWh** of electricity generated in 2011-12 – annual requirement of **60 million people**

Grid Connected Renewable Power

POTENTIAL

Technology	Capacity (GW)
Wind	100-1,000
Small Hydro	15
Solar	Unlimited (30 MW/km ²)
Biomass/Bagasse/Waste	25 (excluding plantation-based biomass power)

India's RE Potential

Impacts and Regulations



- **Linear fragmentation and impacts on wildlife, forest ecology and water bodies**
- **Impacts on birds and bats** (*few studies*)
- **Noise and shadow flicker:** magnitude and impacts depends on many variables such as distance of human settlement, local topography, weather, background sound levels etc.
- **Local Impacts** – aesthetics, tourism, land acquisition etc.



Wind: Environmental Impacts

Time period	Wind power capacity Installed (MW)	Forest area cleared (hectares)
Till March 2006	4351	478
April 2006 to March 2013	14701	3454

- Total 3932 ha diverted for 72 projects
- 88% diverted in Karnataka (57%) and Maharashtra (31%)
- Average diversion: about 0.5 ha/MW
- **About 8500 MW or 45% of total wind power installed in forest areas**

Wind in forest areas

Hilltops in forest areas cut for windmill installation



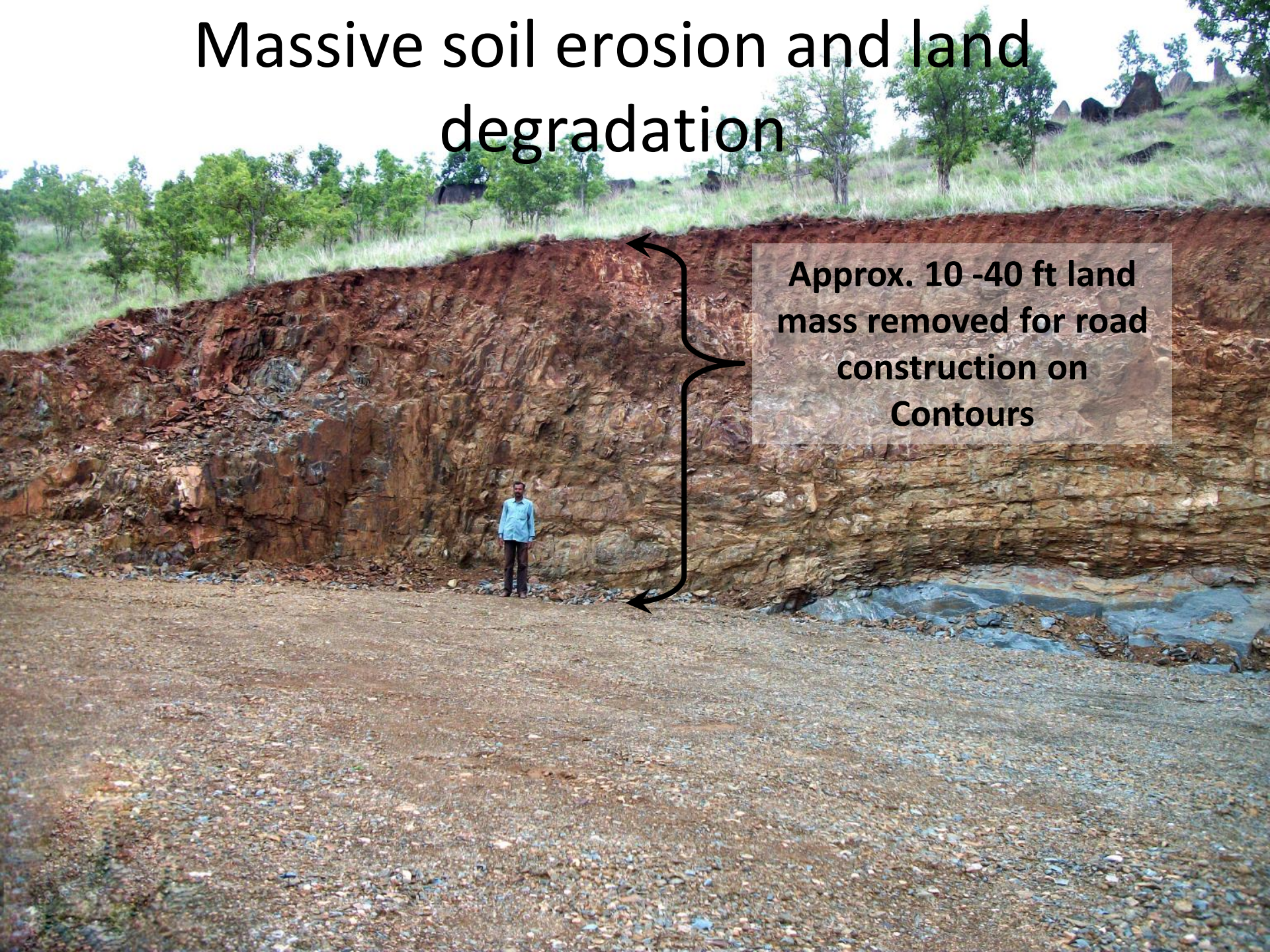
Road Construction in forest area





LINEAR FRAGMENTATION: Access roads and transmission lines to and from multiple wind projects lead to forest fragmentation – isolation of species and disruption of the movements of animals. **Increase in human-animal conflict**

Massive soil erosion and land degradation



Approx. 10 -40 ft land mass removed for road construction on Contours

- **No EIA**
- Categorized in the "**green**" category: **No permits required for noise, shadow flicker or waste oil disposal**
- Guidelines by the MOEF exist as for how to handle **forest diversion** for wind power, but:
 - Without proper impact assessment these cannot be implemented
 - Special concession – half the amount of Net Present Value is added to CAMPA funds
 - **Quick clearance** – average 7.5 months till final clearance; in-principle clearance in many cases in less than a month (the lowest being 10 days)

Wind: Existing Green norms

- **Multiple impacts on the local environment and ecology**
 - **Ecological** - Aquatic flora and fauna specifically impact on fish
 - **Physical** – Flow of the river, Water quality, sediment carrying capacity, erosion, ground water quality and recharge, climate, soil and geology
 - **Humans** - Interference with drinking and agriculture water availability, solid waste and socio-economic factors
- **Cumulative impact and Ecological Flow**



SHP: Environmental Impacts

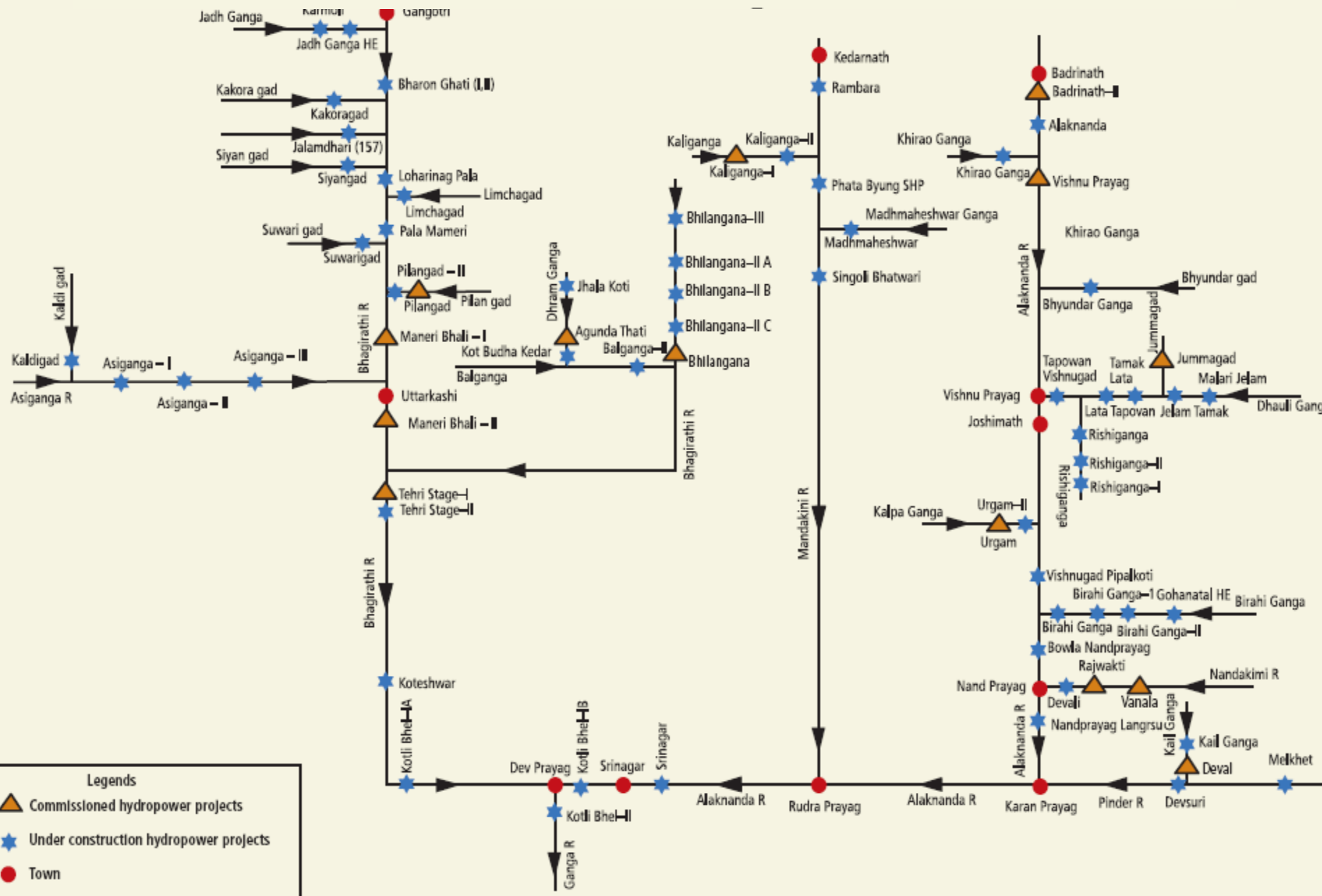
- Analysis of 138 SHP projects
- Average diversion: 1 ha/MW
- 2 months for in-principal approval;
- 6.5 months for final approval from date of application



Forest diversion



Hydro power projects in the Alaknanda and Bhagirathi river basins



- The impact is cumulative with many other development projects in terms of forest use and linear intrusion from roads and power lines
- Cascade operation of small hydro power stations leads to almost drying up of the natural channel of the stream during low flow periods.



Cumulative Impact

- **No EIA; no cumulative impact assessment**
- Himachal Pradesh - Only state to come up with norms for environmental flow - **15 % of the average** of the three leanest months – **3% of the high flow**
- **Forest Clearances** required, but poorly assessed (without EIA)
- Different pollution control boards treat SHPs differently – most green, one even red

SHP: Existing Green norms

- 1 MW of Solar Power needs **2.5-3.0 hectares of land**; **land acquisition is an issue**
- Impact on ecology if the land is large and in eco-sensitive areas
- Solar Thermal uses **water for cooling** at about the same rate as a coal thermal power plant.
- **Battery Disposal & E-Waste Management**



Solar: Environmental Impacts

- **No EIA for any size**
- No Objection Certificate needed for solar thermal plants
- Solar-cells and modules not covered under the **E-Wastes (Management and Handling) Rules of 2011**
- For Solar Thermal plants "**Approval from state/local authority**" for the **water** needed

Solar: Existing Green norms

- **100 GW of wind power** is approximately **50,000 new wind-turbines**, which will require thousands of hectares of forest land and thousands of hectares for roads and linear intrusion
- **11.5 GW of Small Hydro** may leave a combined stretch of **2,300 km of rivers** dry, or nearly dry (assuming average size of the project to be 10 MW) and will need thousands of hectares of forest land
- India should achieve **500 GW of Solar Power** by the end of 2050.
 - This would require approximately **1.25 million hectares of land**.
 - The total land leased for mining in India is about **0.7 million hectares**
- **25 GW of Biomass** plant will use **7.5 million hectares** of plantation land - forest and non-forest land

RE's Land Impacts

‘Bottom-up’ study to understand the potential to reduce GHG emissions in five most emissions-intensive industrial sectors and the power sector

- Benchmarking energy and GHG emissions with Best Available Techniques (BAT)
- Researching technology options; round table with industries to understand their future technology deployment pathway, limitations, dis/advantages

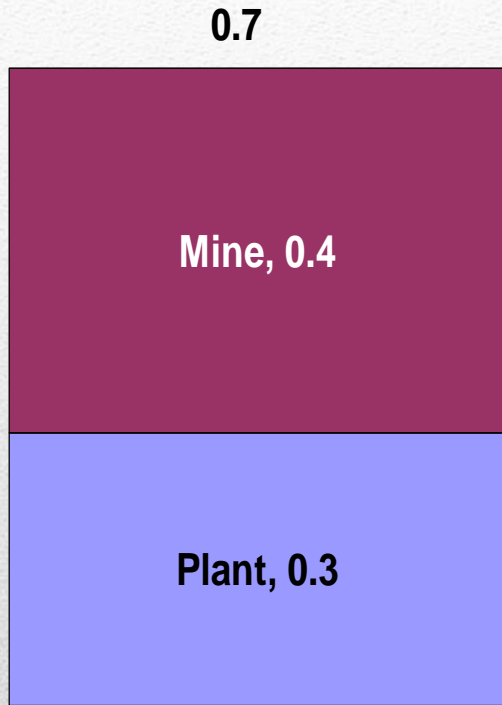
Low carbon study

- **Two pathways projected till 2030-31**
 - **Business As Usual (BAU):** Changes that industry is making or will make on its own to reduce energy consumption -- **high cost of energy is the main driver of change**. Promises made by the government in NAPCC included in this scenario; changes due to environmental regulations also included
 - **Low Carbon (LC):** Policy push required to mainstream emerging, not yet commercialized technologies. In many sectors, it is also a *'leap into the unknown'*. **Combating climate change is the main driver of change.**

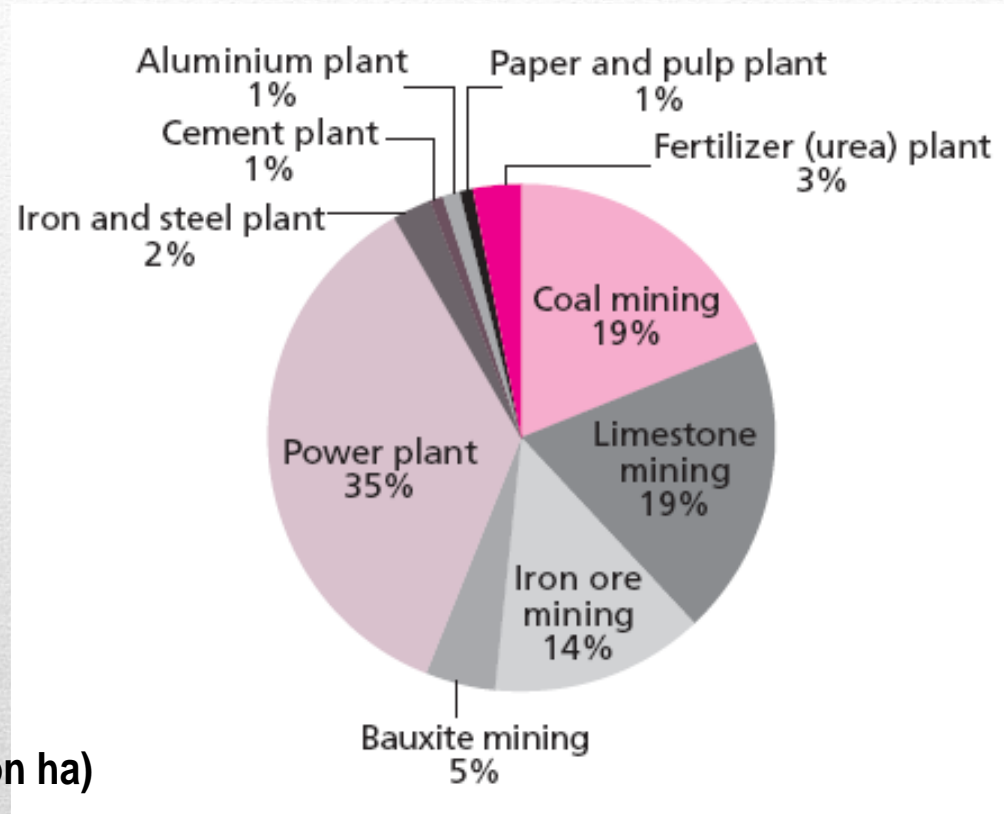
Low carbon study

Land

Resource impacts



Land currently occupied by six sectors (million ha)



Land: 2008-09

Additional land required (million hectares) *excluding land required for biomass*



Additional land required

- Land issues at the center of all protests against development projects in India; protest against solar projects in Rajasthan and wind projects in many parts of India
- Reduce land use (solar rooftops) and allow multiple use (multiple land-use in wind farms)
- Win-win deal with the local community – benefit sharing -- land rent, profit sharing, resource rent (rent per unit of power produced) etc.

Land

- Need to take into consideration environmental impacts of RE development
- Little regulations exists presently and whatever exists are either ineffective or inconsequential or poorly implemented
- Green norms are needed. Will help the industry in long run.
- Similarly, RE industry need to view land differently than conventional industry -- huge potential to provide win-win solution

Way ahead



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