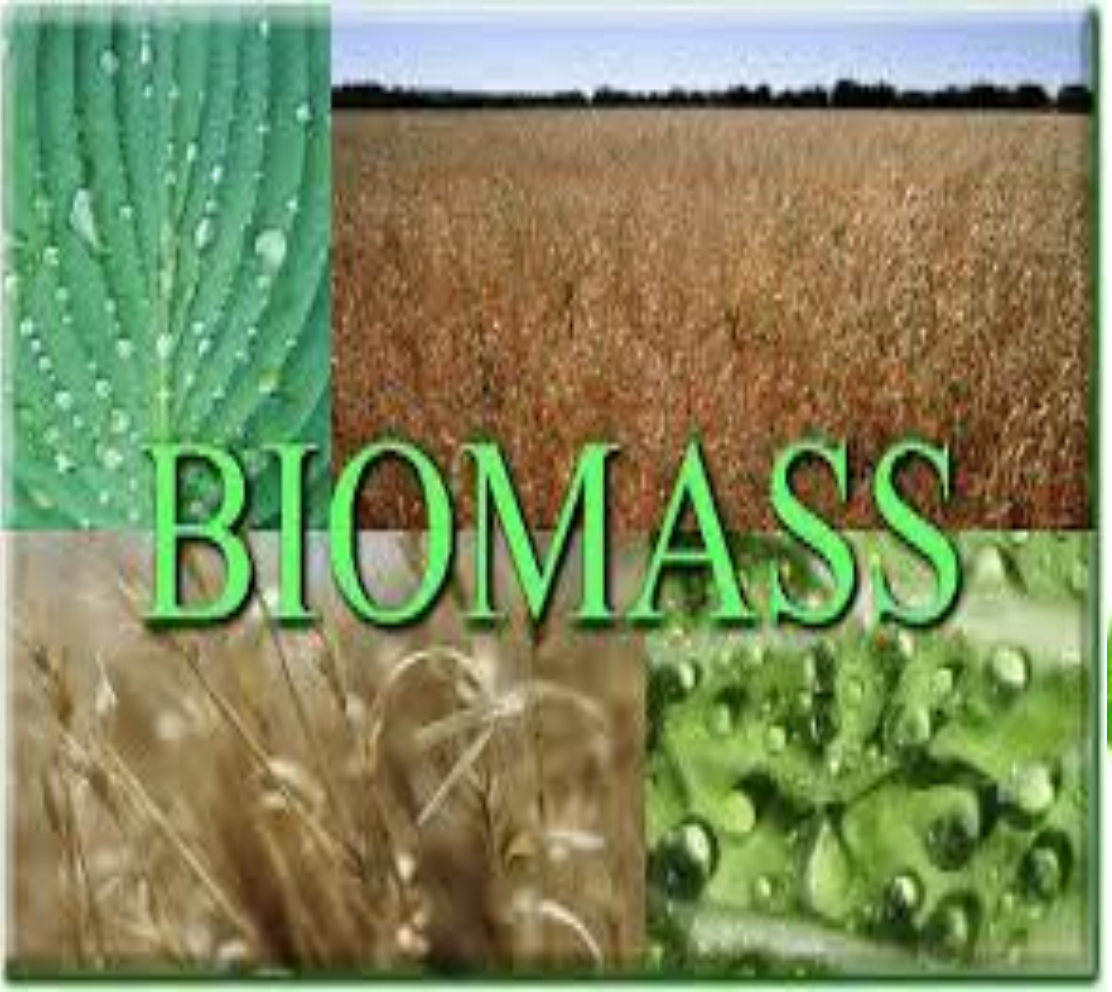


Opportunities and Challenges in Biomass Conversion Technology for Heat and Power

Case Scenario - India

Kavya Dashora- CABI South Asia- New Delhi

Different types of Renewable Resources used as Energy Sources

- Solar energy
- Wind energy
- Geothermal energy
- Hydro energy
- Biomass energy

Main Drivers for Deploying Renewable Energy

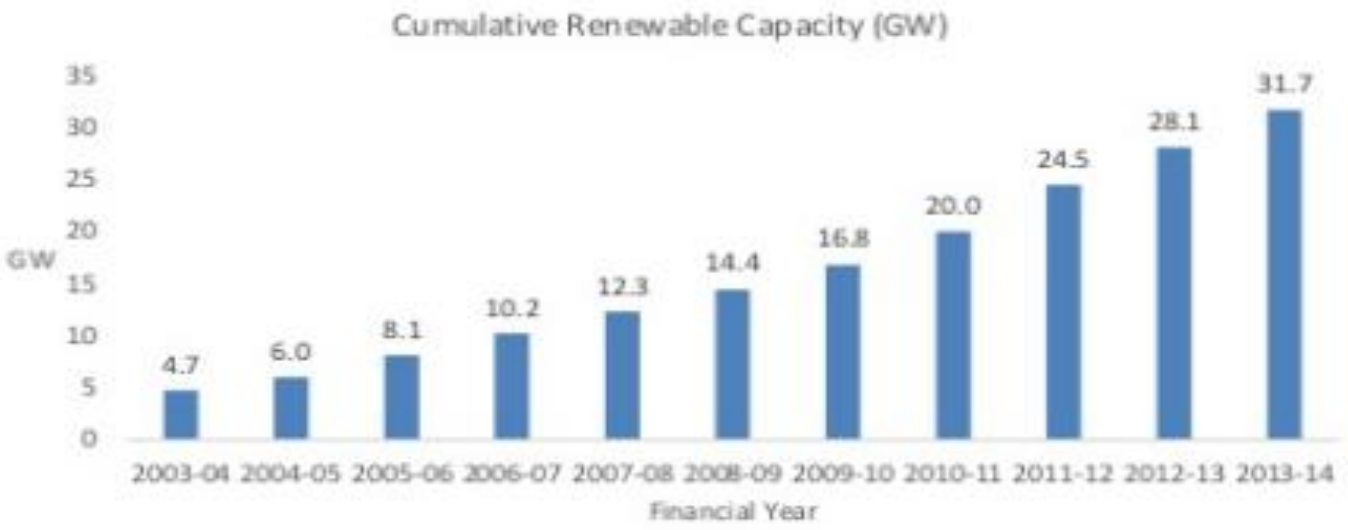
- **Governments and consumers** take measures to increase the deployment of renewable energy
- **Technologies** (RE technologies) for three principal reasons, which are interlinked:
  - To **improve energy security**;
  - To **encourage economic development**, particularly associated with rural and agricultural sectors, or with innovation and high-tech manufacturing;
  - To **protect the climate** and the wider environment from impacts of fossil fuels use.

Planning Commission Report

- By the year 2020, oil and natural gas will meet 44 per cent of India’s energy requirement compared to 50 per cent by coal
- Nuclear and hydel energy would form 2.5 per cent and 3.5 per cent, respectively
- Natural Gas may form 14 per cent of our energy needs in 2020 compared to 8.6 per cent today.

Year-wise Growth

In the last 10 years, grid-interactive renewable power has increased at CAGR of 21.03%. Maximum capacity addition was achieved in 2011-12 in which 4943 MW was added.



Strengths and Weakness of Renewable Energy Sector in India

Strengths

- Conducive policy and regulatory framework at central level
- Good resource potential
- Growing technology maturity in certain sectors such as grid connected wind power
- Emergence of indigenous manufacturers and developers
- Ability of renewable energy technologies to offer off-grid/decentralized energy solutions

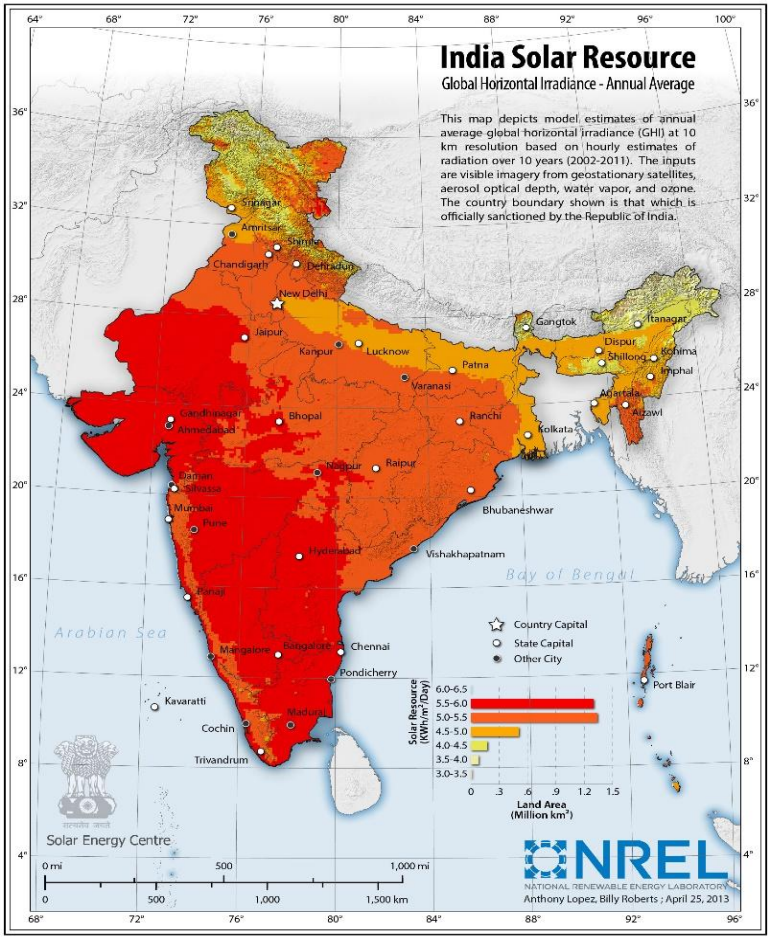
Weaknesses

- Absence of conducive policy and regulatory framework in some States
- High cost of certain technologies
- Current acceptability of end-users
- Inconvenience of use of certain renewable energy based applications vis-à-vis conventional means
- Quality and therefore reliability of equipment – particularly for decentralized applications
- Lack of availability of adequately skilled, technical manpower
- Lack of adequate transmission infrastructure in states for evacuation of renewable power
- Lack of implementation infrastructure
- General lack of awareness of end-users
- Lack of adequate distribution and service network

The Renewable Source of Energy:
Areas of Existence

<u>Solar Energy Data</u>:

As Solar Energy (i.e. Sunlight) is Distributed equally in all areas, so there is no specific area defined.



2020- 20GW Indian Solar Energy Plan: Enviro News

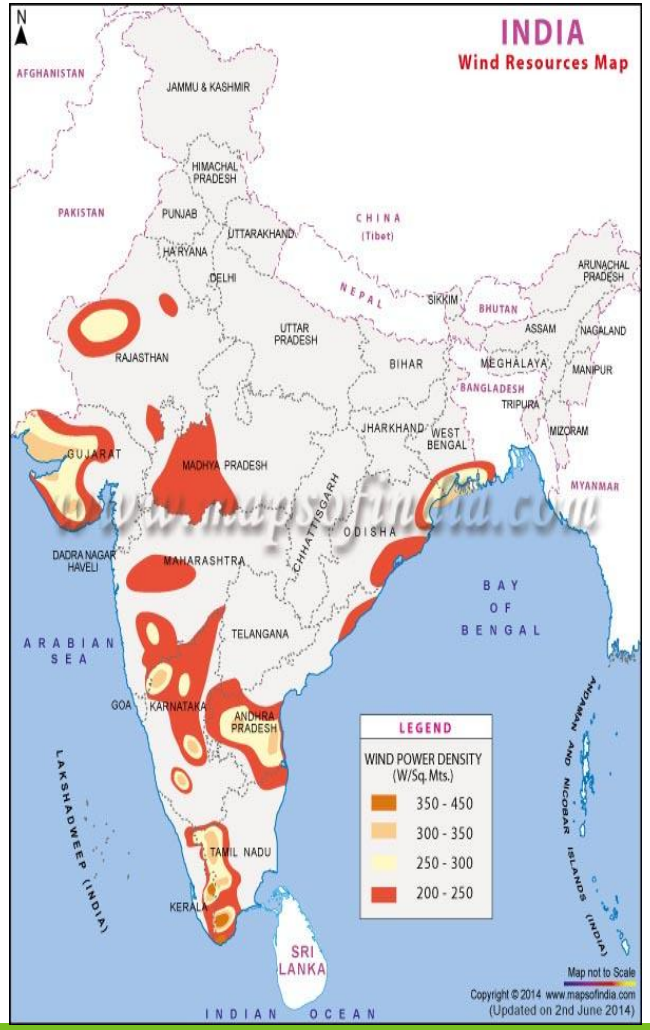
- India intends to implement a comprehensive and rigorous renewable energy plan, through harnessing the power of the sun.
- India' plan is to have electricity from solar energy feeding 20 GW (gigawatts) into the national grid by 2020.
- 20 GW represents a huge amount of electricity.
- IEA (International Energy Agency) envisages that, by 2020, total worldwide capacity from solar energy will be around 27 gigawatts.
- On this basis, then, India's solar electricity will represent approximately three-quarters of this.

The Renewable Source of Energy:
Areas of Existence

<u>Wind Energy Data</u>:

The Nine leading States are

- Rajasthan
- Gujrat
- Madhya Pradesh
- Maharashtra
- Karnataka
- Tamil Nadu
- Andhra Pradesh &
- Odisha
- West Bengal

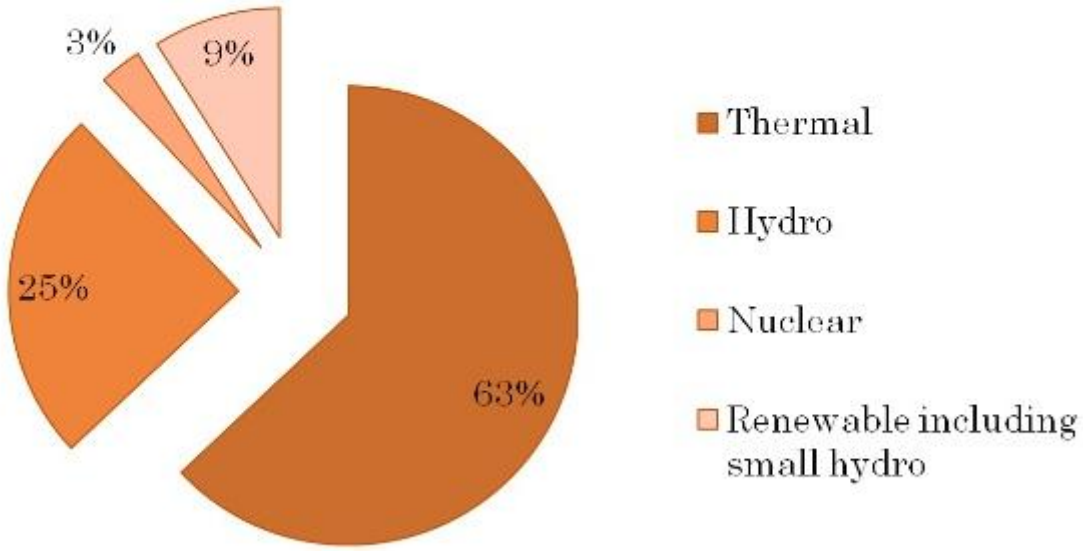


Wind Energy

- The wind power potential of India is about 45,000 MW out of which capacity of 8748 MW has been installed in India.
- India is one of the leading countries in generating the power through wind energy.
- Gujarat, AP, Karnataka, MP and Rajasthan are states having more than 5000 MW potential each.
- These potentials could be improved if the technology of putting turbines in sea is embraced. There are wind farms on sea generating as high as 160 MW of power.

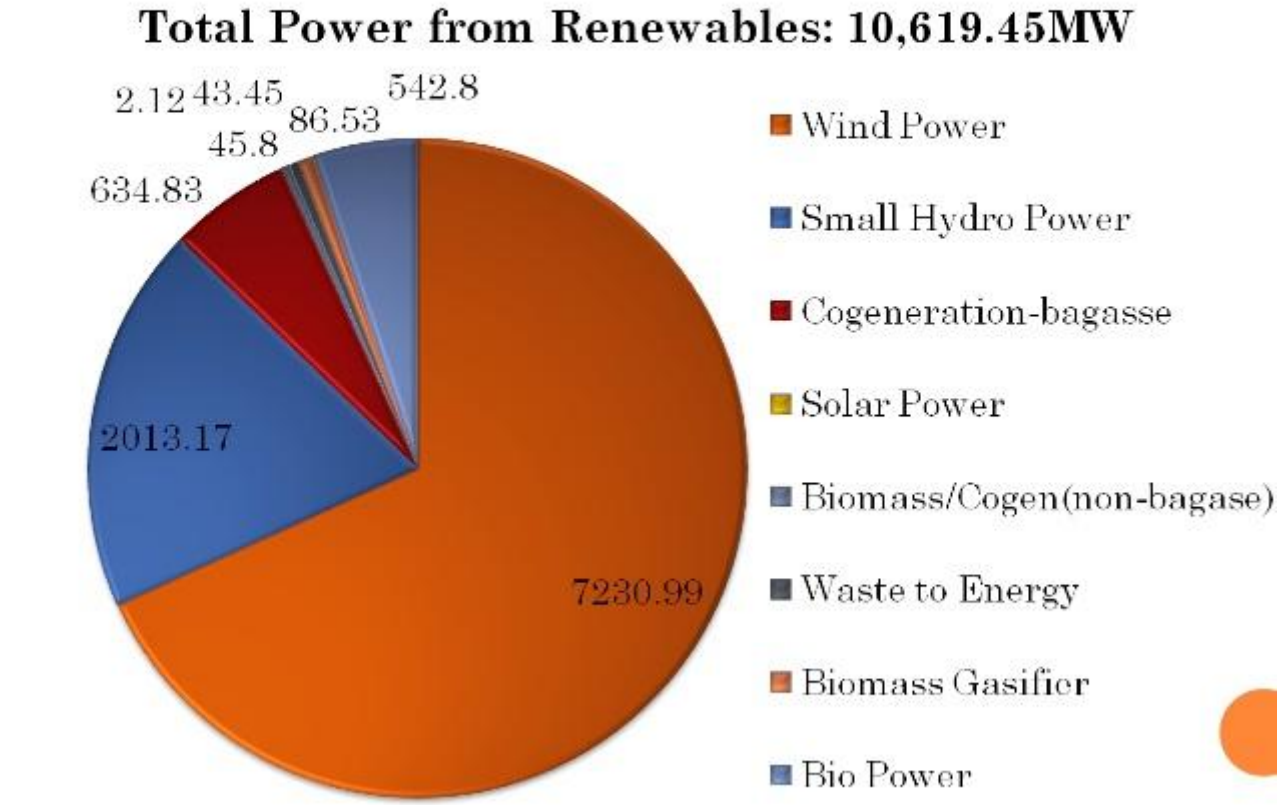
INDIAN POWER SECTOR

Total Installed Capacity: 1,44,912 MW



Source: Ministry of New and Renewable Energy

INSTALLED CAPACITY FROM RENEWABLE ENERGY



Source: Ministry of New and Renewable Energy

What Is Biomass?

The total quantity or weight of organisms in a given area or volume.

It is also referred to as organic matter used as a fuel, especially in a power station for the generation of electricity.

How much biomass exists right now?

- Worldwide, total "standing crop" biomass (99% on land, and 80% in trees) is a huge resource, equivalent to about 60 years of world energy use (1250 billion metric tonnes of dry plant matter, containing 560 billion tonnes of carbon).
- However, the Earth actually grows every year about 130 billion tonnes of biomass on land (60 billion tonnes of carbon) and a further 100 billion tonnes in the rivers, lakes and oceans (46 billion tonnes carbon).
- The energy content of this annual biomass production is estimated to be more than 6 times world energy use .

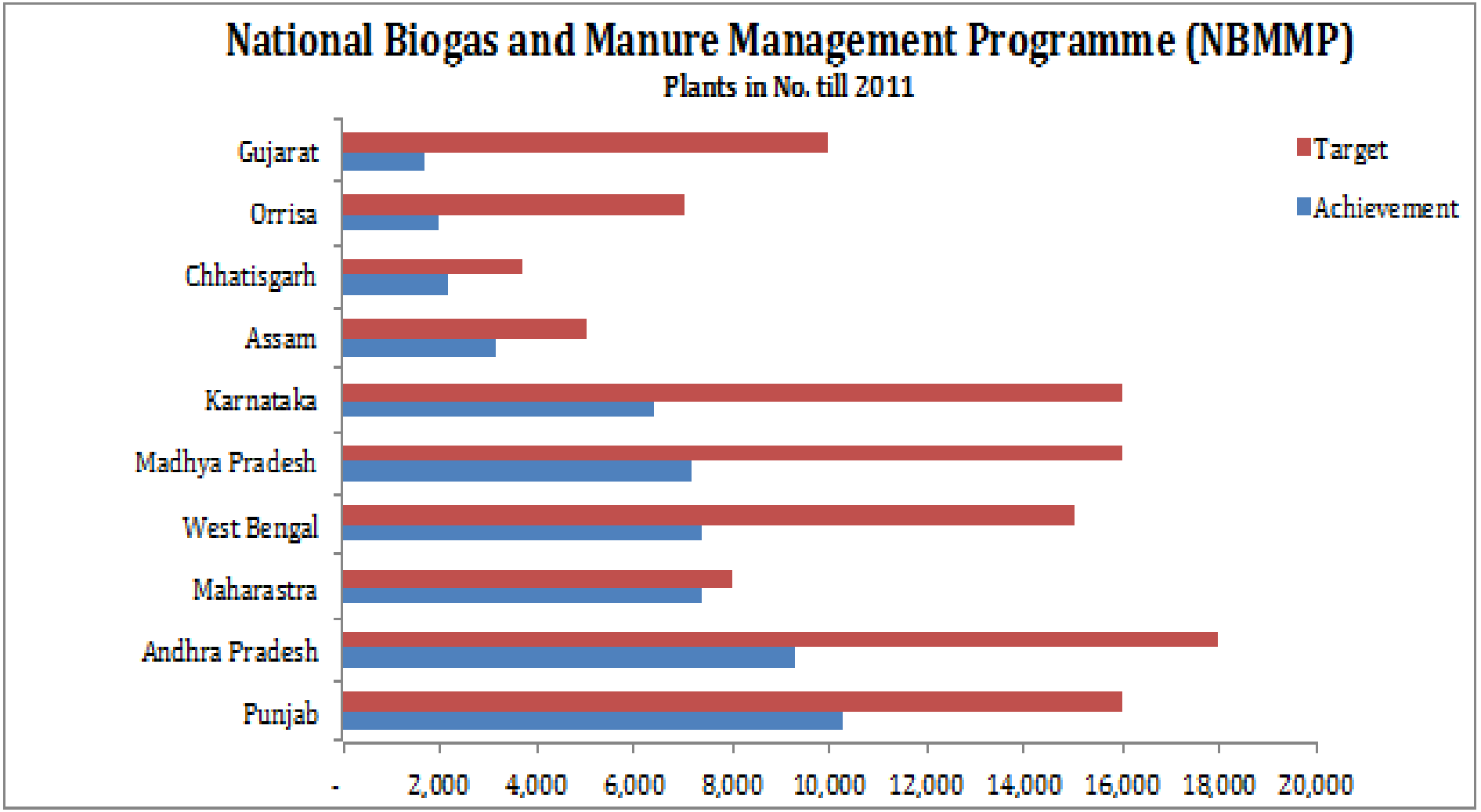
Use of Biomass in India

- India has more than 51% population living in village
- The energy required for domestic purpose largely met from dried organic matter and wood.
- This organic matter called as biomass is available freely as waste.
- It contains stored energy from the sun

.

- Biomass contributes over a third of primary energy in India.
- Biomass fuels are predominantly used in rural households for cooking and water heating, as well as by traditional and artisan industries. Biomass delivers most energy for the domestic use (rural - 90% and urban - 40%) in India
- Wood fuels contribute 56 percent of total biomass energy.
- Consumption of wood has grown annually at 2 percent rate over past two decades.

Prospects of Biomass Management in India



Key Constraints To Renewable Energy Deployment

1. Access to financial capital
2. Removal of subsidies for fossil fuels
3. High in population resulting in lesser land available
4. Always on crossroad to produce for food or industry
5. The regulatory policy stability
6. Mindset of growers and industry for sustainability

- **Techno-economic barriers**
- **Non-economic barriers**
  - **Regulatory and policy uncertainty barriers**
  - **Institutional and administrative barriers.**
  - **Market barriers**

Technical Impediments

- Trees and other biomass is difficult to collect
- Low output as energy vis a vis raw material used
- Non-availability of cheap and reliable combustion techniques at large scale that will not release pollutants
- No easy availability of gasification techniques that incorporate hydrogen to create gaseous biofuel
- Biomass contains less energy per pound than fossil fuels
- Cost-inefficient to transport more than 50 miles before it is converted to fuel

Environmental Disadvantages

•Crop and forest residues often contain high concentrations of important nutrients

•If the residue is harvested as energy, the nutrients can be lost to the surrounding environment.

• This will increase the use synthetic chemical nutrients or fertilizers to produce the next crop

• Plants and trees have to be ensured to be planted more as they will be used in a higher quantity

Sustainability

- Biomass is sustainable but there is an expense in producing and converting biomass into fuels and electricity.
- Collecting biomass is very different from harvesting, so capacity needs to be build for efficient collection.
- Supply-side push is weak. Energy markets are non-existent or weak in rural areas, more emphasis needs to be done for promoting biomass supply or efficient use

Sustainability

- Removing too much biomass can use up nutrients from the soil and possibly increase erosion.
- Biomass supplies can be explored by using the fallow land masses and has the potential to supply much more than the present supply.

Biomass policies should follow a multi-pronged strategy

- improving **efficiency of the traditional biomass** use (e.g. improved cook-stove programme)
- improving the **supply of biomass** (e.g. social forestry, wasteland development)
- technologies for improving the **quality of biomass** use (e.g. biogas, improved cook-stoves)
- introduction **of biomass based technologies** (for irrigation, biomass electricity generation) to deliver services provided by conventional sources
- **establishing institutional support** for programme formulation and implementation.

Conclusion

•Significant social and environmental benefits make biomass a deserving alternative fuel.

•While for wind and solar, efforts are already underway, for biomass state nodal agencies should take a lead in coming up with a biomass resource databank

•Non-agricultural biomass sources should be tapped (like algae)

• Modern biomass technologies provide viable options for such an energy transformation, on the way to a sustainable energy system of the future.

• This definitely calls for more awareness and research to make biomass energy more available and sustainable.

Assalamualikum
merci
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zikomo
xie-xie
efharistó
ありがとう
thank you
gracias
kiitos
tak
zikomo
urakoze
ke itumetse
danke
terima kasih
dhanyawaad
asante

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