Strengthening Networking on Biomass Research and Biowaste Conversion - Biotechnology for Europe - India Integration

"SAHYOG"

Strategic Research Agenda : Indian perspective

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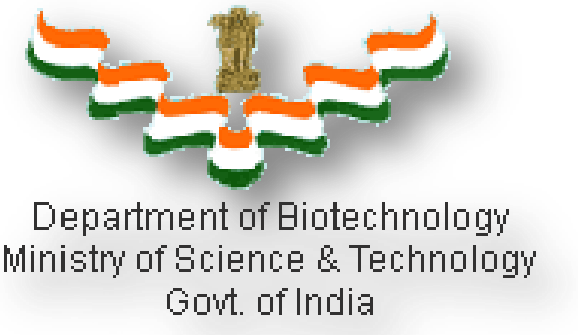


Importance of SRA on India context

India's energy demand is on the rise, driven by high population growth, the modernization of lifestyles, higher electrification and fuel rates and a rapidly growing economy.

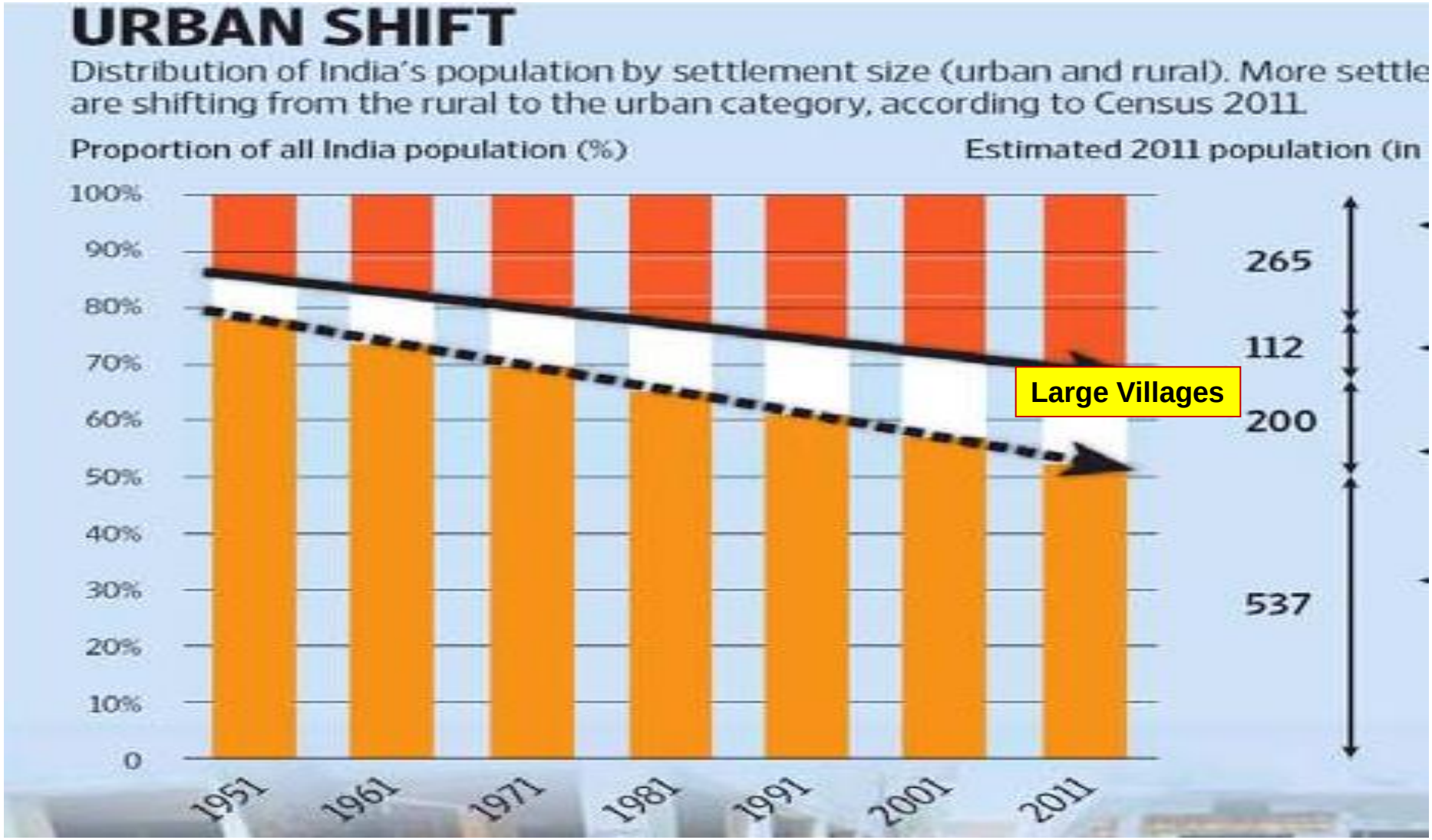
Annual growth in energy demand reached 8% recently, doubling the historical average annual growth rates of the past 30 years.

With GDP expected will grow at rate of 6.7 per cent in 2013-14 and energy demand expected to nearly double by 2030, India is set to surpass Japan and Russia to become the world's third largest energy consumer after the U.S. and China.

This in turn will increase the GHG emissions by roughly three or four fold compared to 2005 levels with the power sector being the key driver of GHG increases.

Despite India's rapid economic development 70% of the population still lives in rural areas and around 50% of the population is employed in agriculture, accounting for 16% of GDP (based on 2009-10 figures)

Shifts in Demographics (Rural/ Urban)



Mint, 1st Oct, 2012

Imperative need for shift to Bio based economy

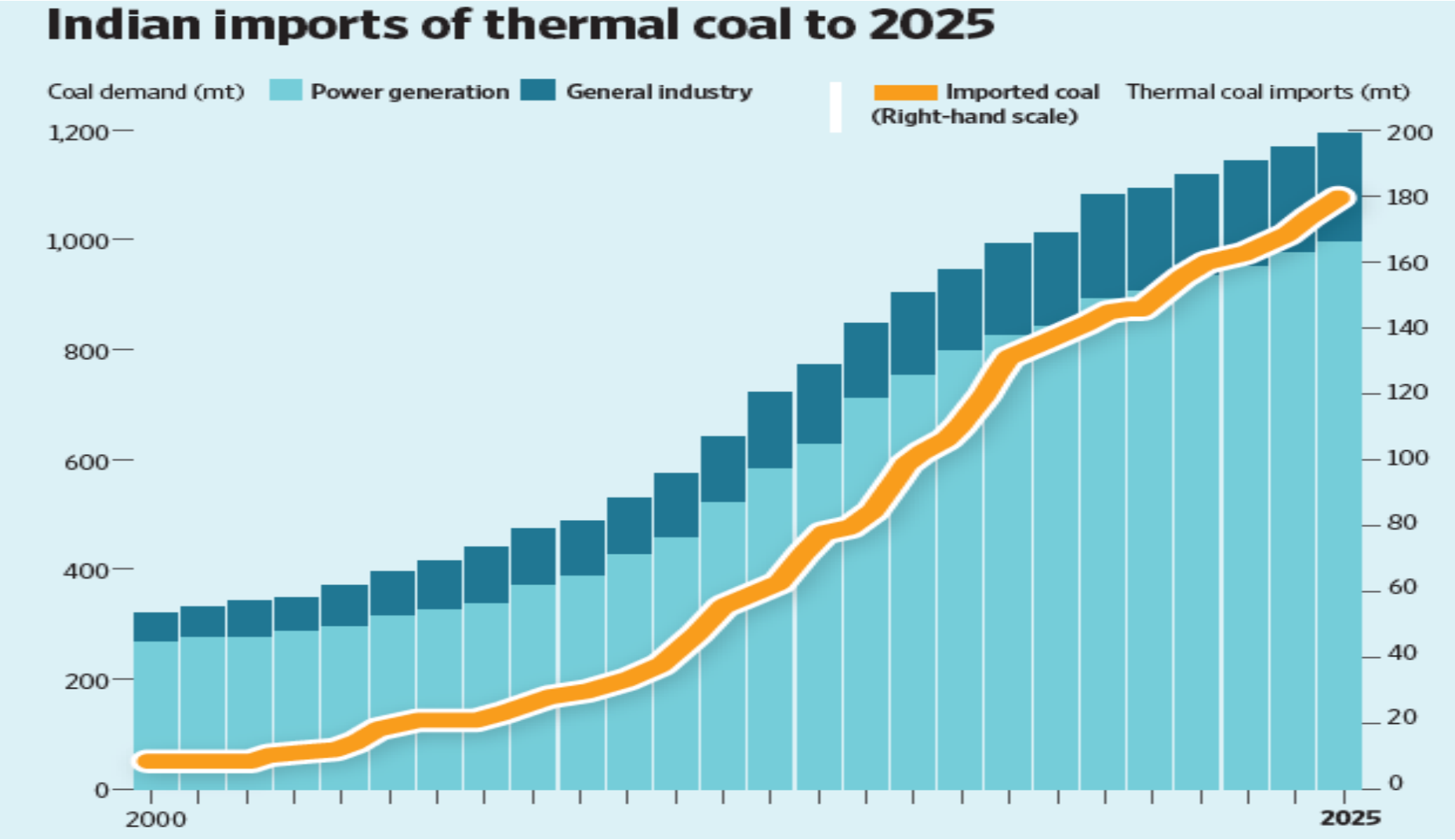
- ***High Cost of Imported Fossil Fuels*:**

(i) CRUDE OIL - India's crude oil import bill for year 2011 crossed 100 Billion USD. Import bill for crude oil is expected to reach upto 300 Billion USD by 2020.

(ii) COAL – Current imports stand at 142 Million MT and import bill is expected to reach at 7 Billion USD and expected to rise upto 300 Million MT by 2020, raising import bill to the level of 40 Billion USD.

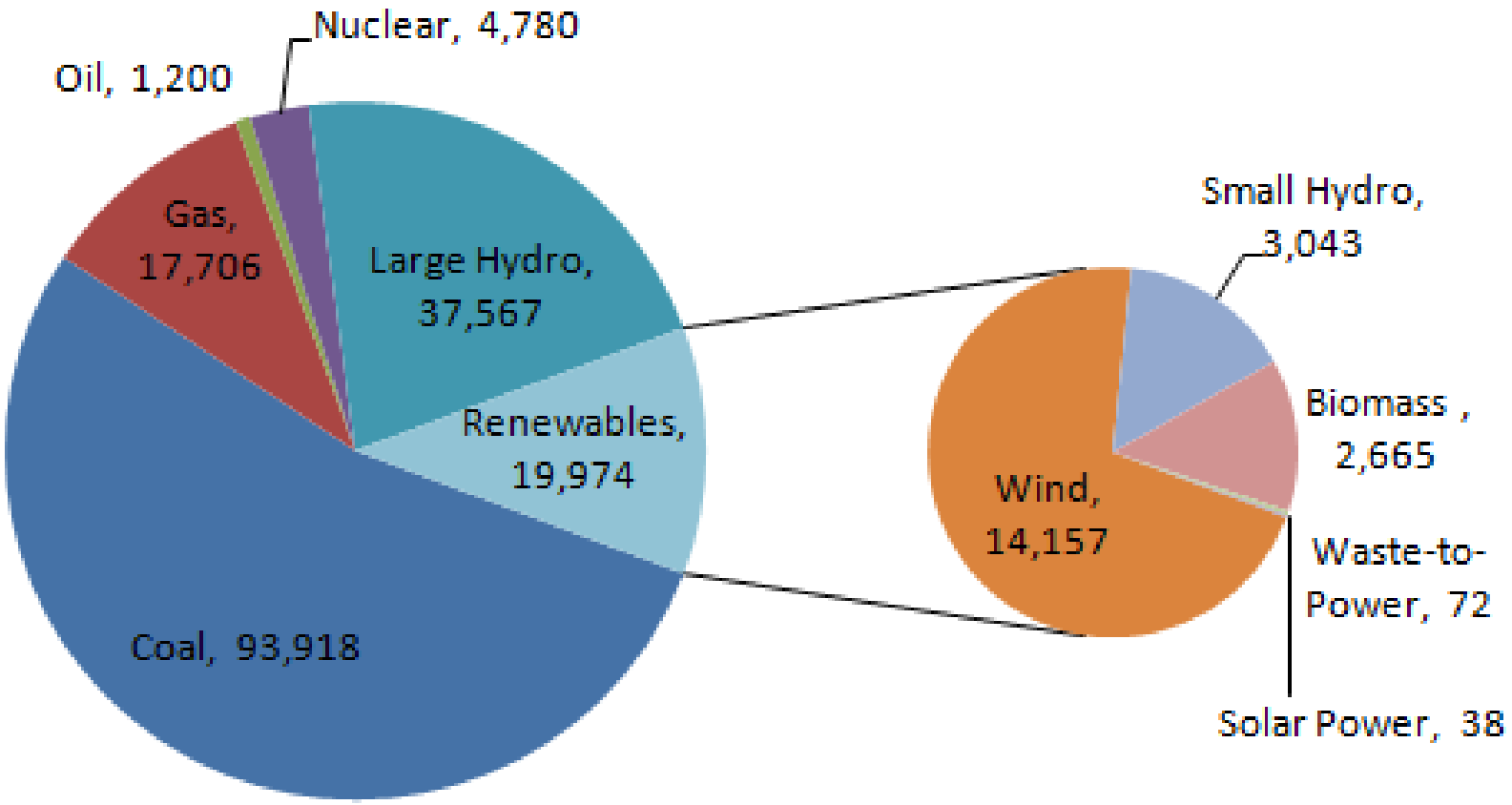
(iii) NATURAL GAS - The situation is similar for imported natural gas, Government of India has offered $12.67/million BTU for Turkmenistan gas, aligned to anticipated price of $ 14-15/million BTU for imported LNG from Ras Gas.

Impact of Coal in Indian economy and sustainability



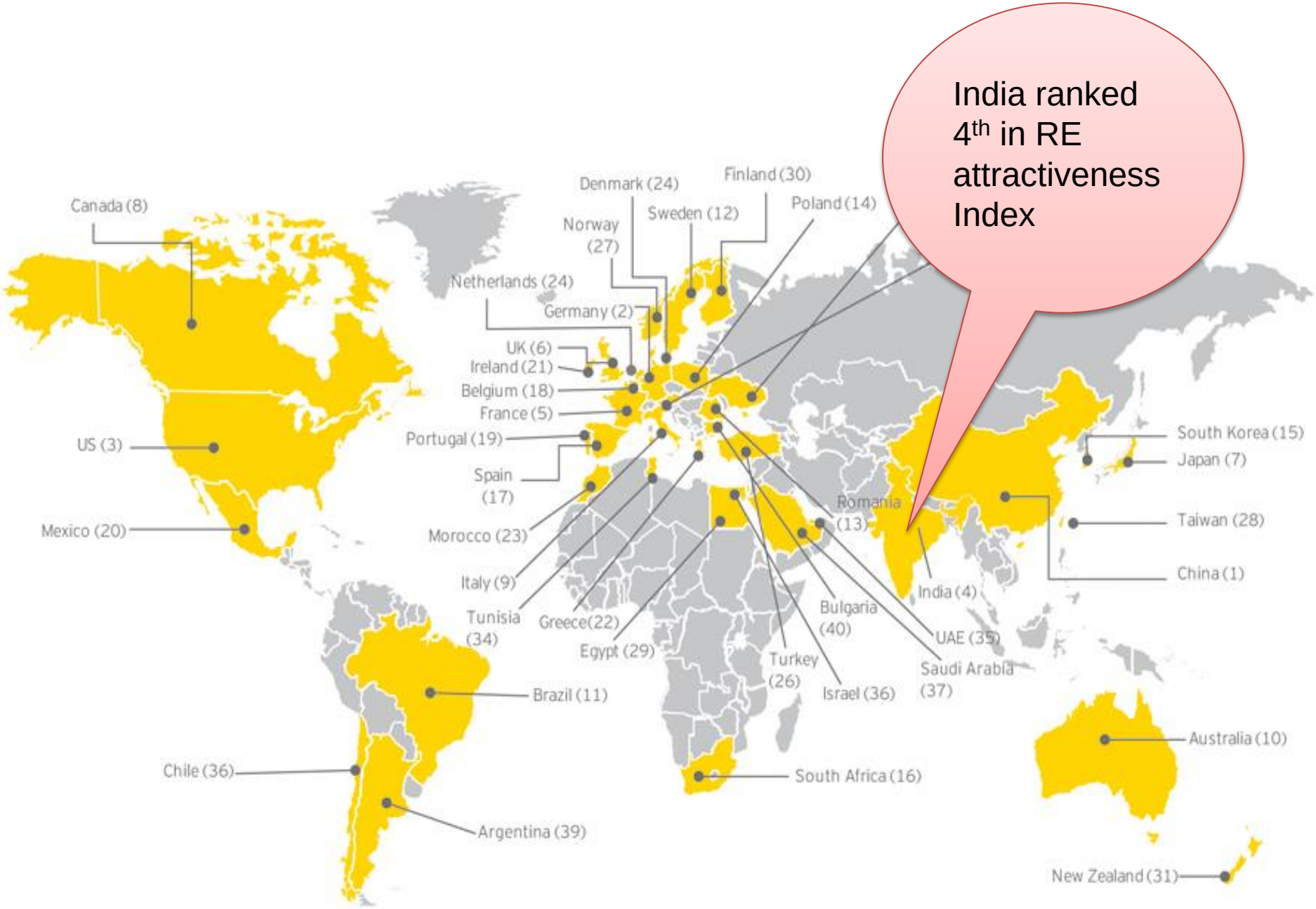
Impact on Fuel source and WATER

Renewable energy in perspective of India



India's Installed power generation capacity by Source (MW)

Source: India's energy crisis and the role of biomass (2012) Sustainable Business Forum



Source: E & Y Index, February 2013

Bio-based economy: potential and initiatives

- India's total biomass potential is estimated at 18,000 – 23,000 MW - this is at least six times more than the current installed capacity.

- The majority of the biomass generated in India come from Agriculture sector with potential from wastes

- Biomass provides over 30% of all the primary energy used in the country at present

- Investments on R&D and enhanced participation from the industry

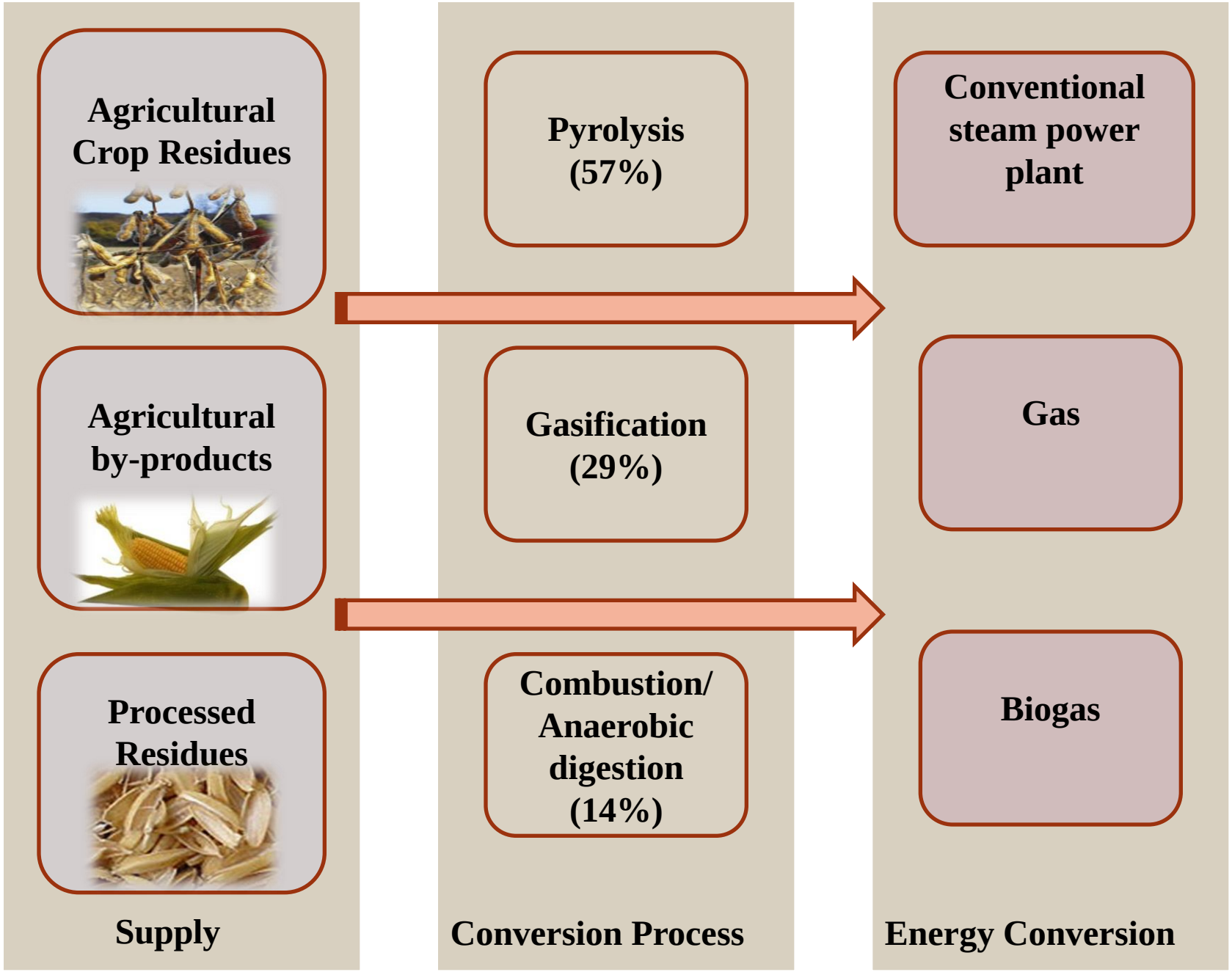
Factors constraining bio based economy

- ***Inadequate focus on Biomass availability and Supply Chain*: Feed-in tariffs/procurement rates for biofuels, capital subsidies, project financing are all designed for integrated projects which combine the Biomass Supply Chain with the Bio Energy production unit.**
  The net result is that many projects suffer from inadequacies in Biomass Supply Chain and this leads to the perception that Bio Resources are not available on sustainable and reliable basis.

- ***Low Feed-in Tariffs/Procurement Prices*: The tariffs for Biomass/Biogas Power Plants and Cogeneration schemes, are low and inhibit investments, at times, lower than that from utility range Power Plants firing imported Coal/LNG.**
  Likewise, for Government fixed prices for Bio diesel/2nd Generation Bio ethanol.

- ***Inadequate appreciation of Social & Environment Benefits*: Bio Energy projects contribute significantly to sustainable socio-economic development of rural communities**

Current status of agricultural feedstock utilization in India



Inception	Feasibility	Action Plan/ Approach
• Increase in agricultural biomass production	• Yes	• Diversified agriculture • Agriculture intensification • Sustainable sharing of marginal farmers produce • Better storage, supply chain & logistics • Crop rotation
• Involvement of selected R&D Projects	• Yes (sharing of new idea)	• Integration between R&D projects, PPP options
• Demarcation of state-wise crops/biomass	• Yes (state wise documentation)	• Rice from NE, Millets, Bamboo Uttrakhand, Castor, Groundnut from Gujarat, Wheat from Punjab
• Forest biomass due diligence	• Not yet feasible for India	• Bamboo, medicinal plants etc

Agenda in relation to biomass availability in India and its utilization

Goals for feedstock availability in India

Short term

- Agriculture intensification
- Production site selection
- Supply chain management
- Better sharing/involvement of marginal farmer in supply chain

Mid term

- Need for adequate national policy for supply and procurement of biomass
- Creation of better logistics, handling and storage facilities
- Reduction of post harvest losses
- More emphasis on diversified agriculture crops (millets, sorghum) i.e. semi-arid and dry land agriculture

Conti…

Goals for feedstock availability in India

Long term

- **Consideration of the potential of other unexplored crops/biomass**
- **Procurement plan for zero waste**
- **Improved investment strategy and optimum marketing plan (geographical location)**
- **Value chain development for more biobased molecules and compounds**

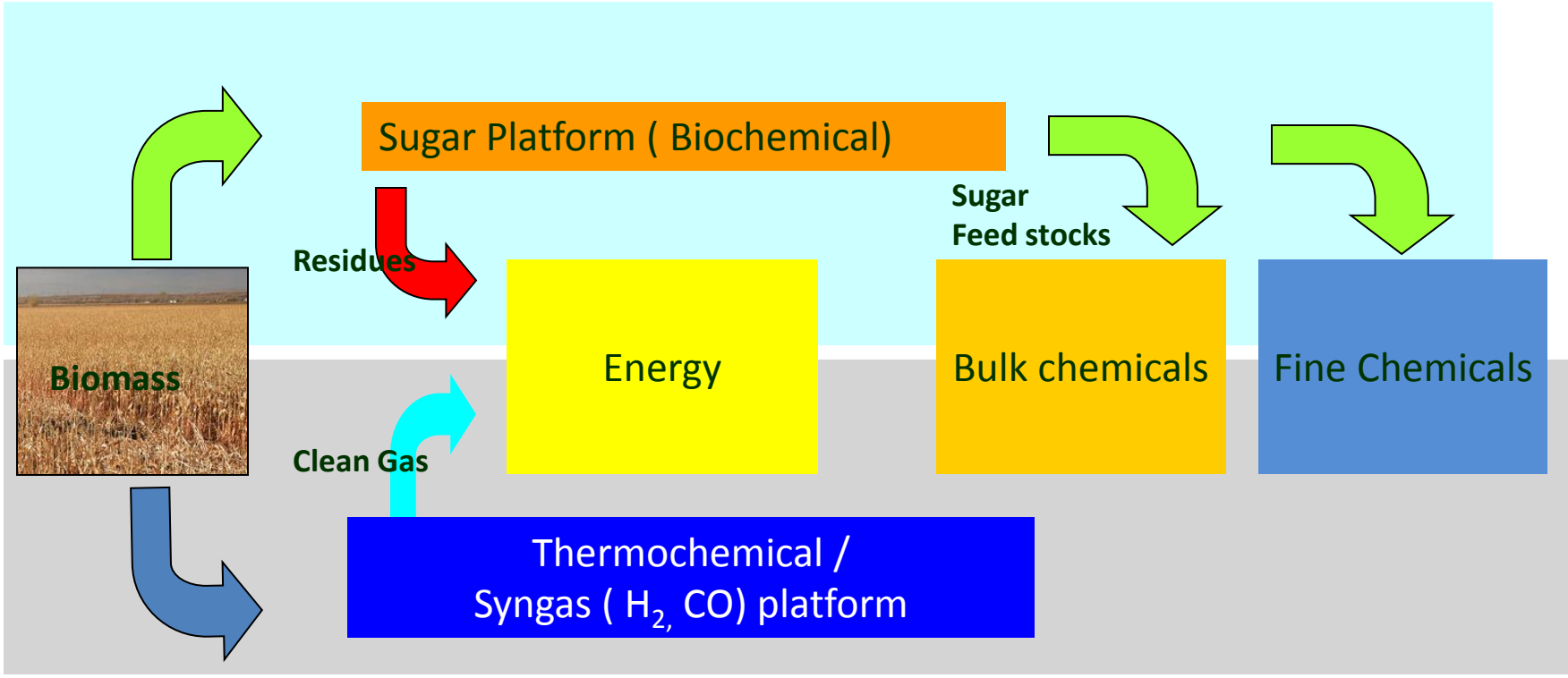
Indian vision on Bio-refineries

- India's Twelfth Five-Year (2012-2017) Plan emphasises on the bio-refinery route for utilisation of agro-wastes as energy sources and other biomaterials. Complete and judicious use of our agricultural produce shall be the key to sustainability.

- A bio-refinery should be capable of producing a gamut of marketable products and energy in a sustainable fashion

- The bio-refinery systems which will come into operation in the near future will have the production of biofuels (transportation sector) as the main focus. These biofuels can be mixed with gasoline, diesel or natural gas to compensate the fuel scarcity in the transportation sector.

Bio-refinary platforms



Biomass as a resource can operate on two platforms

1. **Sugar Platform which uses biochemical conversion of biomass to fermentable sugars, followed by subsequent fermentation to yield useful products.**
2. **Thermo-chemical platform where biomass is gasified using thermo-chemical reactions to generate fuels and the byproducts are utilized.**

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- A biorefinery should be capable of producing a gamut of marketable products and energy in a sustainable fashion

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Bio refineries : Recommendations

The following priorities have to be identified for developing sustainable bio refineries:

- **Utilization of bio wastes such as municipal solid wastes**
- **Pre-treatment or even conversion technologies that can deal with the heterogeneous character of the waste should be developed**
- **Further basic research is required for pilot plant development and installation.**
- **Develop biocatalysts and biocatalytic processes for future integrated bio refineries**
- **Design new bioreactors**
- **Improvisation of the currently available conversion processes**
- **Smooth transitions occur from current generation to next generation technologies and integration of both the technology**

Existing policies on bio based economies

A National Policy on Bio-fuels has been notified by the Government in December 2009, which has laid down detailed guidelines about introduction of bio-fuels.

Salient Features of the existing policies on Biofuels

- An indicative target of 20% blending of biofuels both for biodiesel and bioethanol by 2017

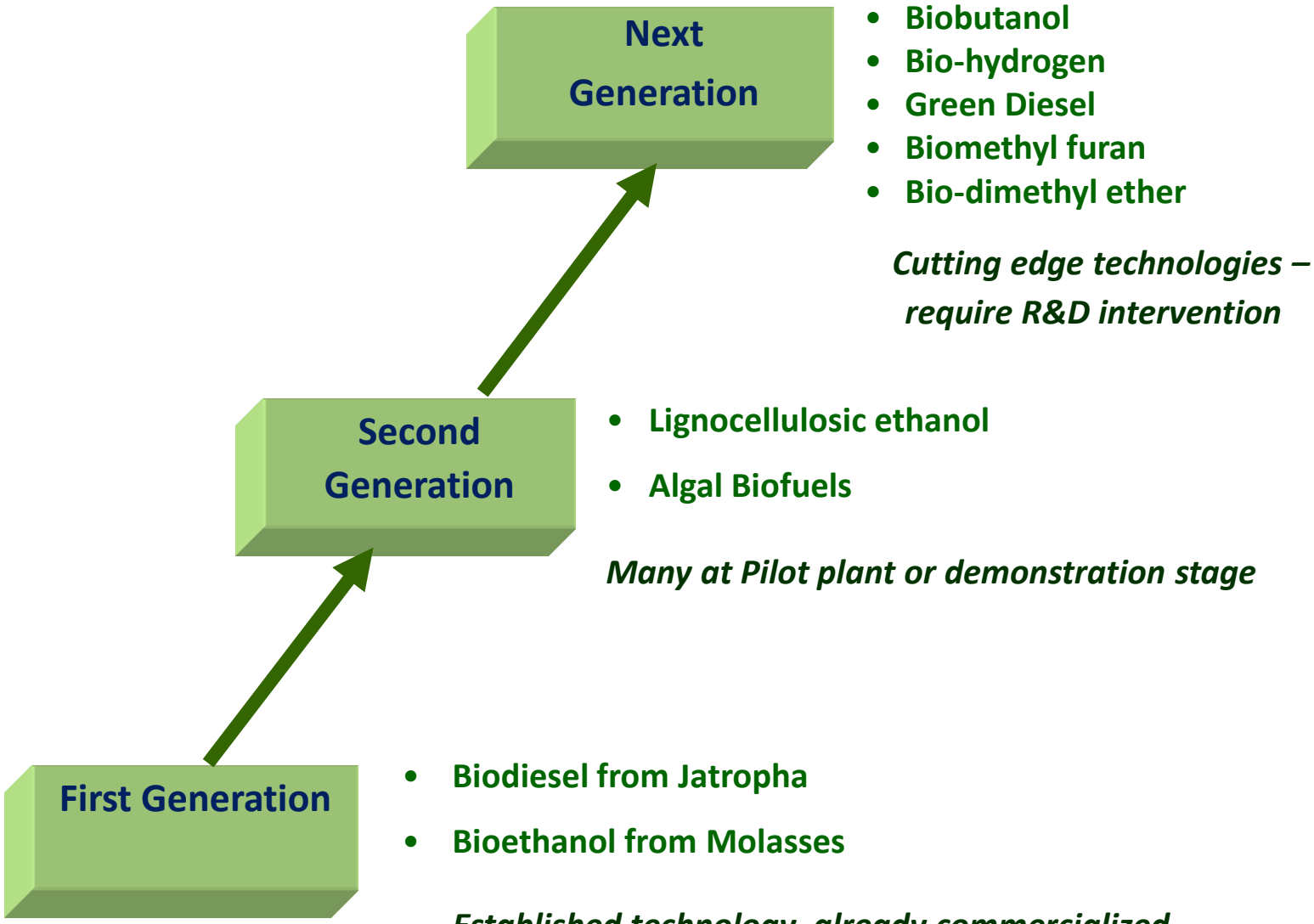
- Biodiesel production from non-edible oilseeds on waste, degraded and marginal lands to be encouraged

- A Minimum Support Price (MSP) to be announced for farmers producing non-edible oilseeds used to produce biodiesel

Existing policies on R & D

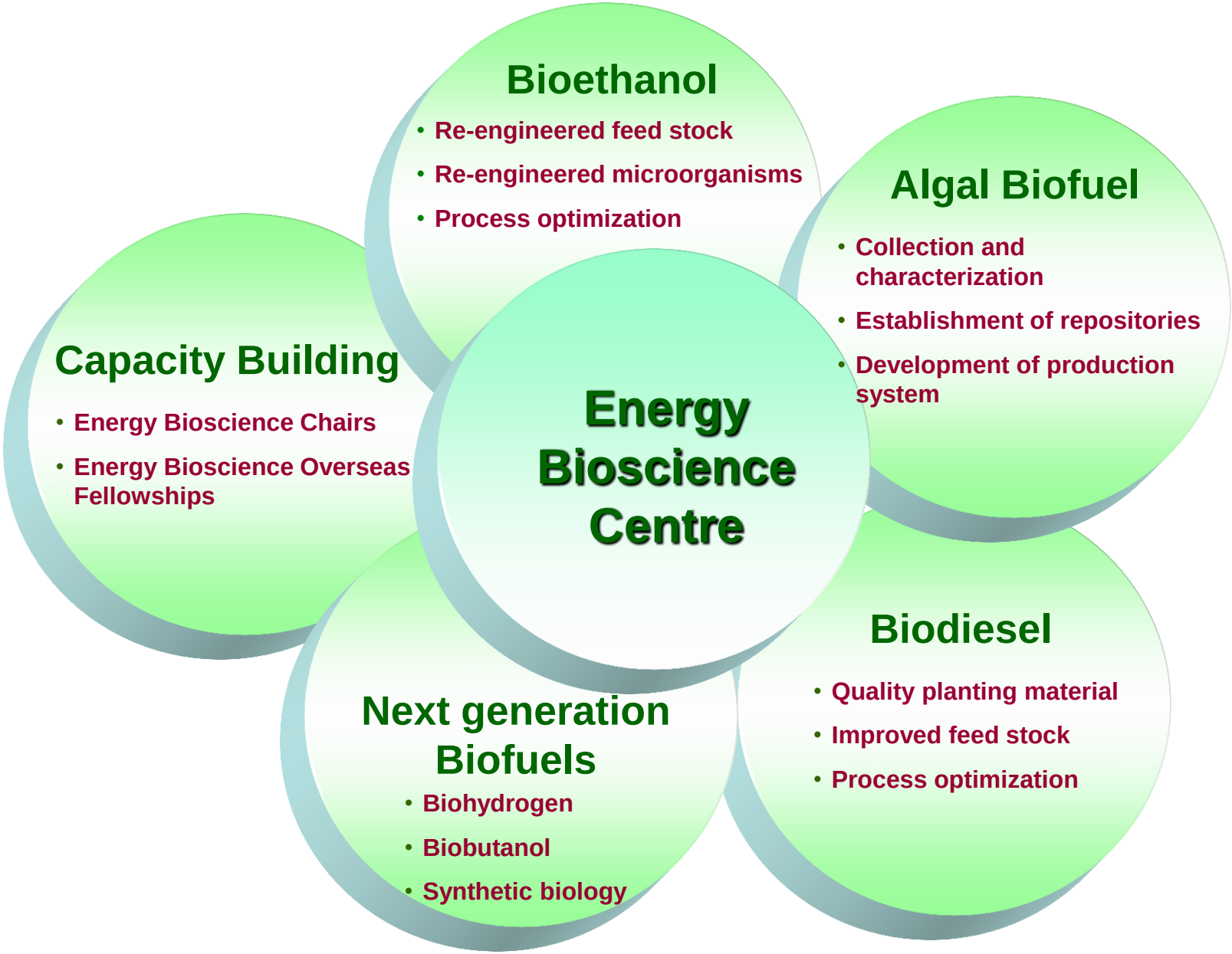
- ✓ Advanced research to address thermo-chemical conversion of biomass- combustion and gasification with the emphasis on efficacies and environmental compliance
- ✓ Engine research in the area of usage of biomass derived fuels – producer gas, biogas, bio-oil, etc
- ✓ Technology packages development for replacing fossil fuels
- ✓ Development of specifications and standards for biomass energy devices and technical support for establishing test centre
- ✓ Establishing standards, best practices and monitoring protocols in the biomass based projects
- ✓ Exploring sector wise usage of biomass to replace/substitute fossil fuel
- ✓ Enhancement of biomass resource assessment and management strategies

Bio-based economy : Current Status in India



Source: Research and Development for Bio based economy : DBT. India (2012)

National Programme on Energy Biosciences



Source: Research and Development for Bio based economy : DBT. India (2012)

Recommendations for India

- Policy on Biomass and resource security
- Centralization of country biomass information and with a quick link to web
- Improve techniques and logistics for production preservation and storage
- Optimizing and standardization of Biofuel processes
- Cost effective production of biomaterials and bioenergy
- Bio refinery concept can be more cost efficiency
- Plantation, breeding and cultivation of energy crop/ trees
- Proper maintainace and use of biowaste and landfills in India

Recommendations for India

- Proper resources and data management: for instance utilization of the animal-by-products, kitchen and restaurant waste, waste from food/fruit processing industries with proper law regulations

- New biomaterial and definition of quality criteria of intermediate and end products based on Biomaterials

- Development of certification schemes for the quality management of biomaterial

Biomass market in India

- Although the potential of biomass sector in India is huge, very less of it has been tapped so far.
- Biomass market is further likely to assume importance as India imports the bulk requirements of petro and coal
- In India the biomass-energy is obtained from biomass primarily through the techniques of direct combustion and gasification
- Biomass power is of strategic importance to India as India have surplus of about 623.81 MMT of biomass per year from Agriculture alone
- The wasteland development for the energy crop plantation can be carried out by local groups with the help of farmers.
- Apart from biomass power being an important source of energy, it can also provide job opportunities especially in the rural areas

Bio-refineries the India's status

- To promote biofuels, ethanol in particular, the Indian Government initiated an ethanol blending policy (EBP) in 2003.
- The Planning Commission of India recommends replacing 20% of India's diesel consumption mainly by non-edible Jatropha oil and Pongamia.
- The cost of producing ethanol in India varies largely with molasses prices and hence cyclical variations in sugarcane production chiefly determine the cost of ethanol production.
- The policy framework related to biofuel was created by the Indian Ministry of New and Renewable Energy (MNRE).
- Algal biorefinery and hydrogen bio refinery are next level approach to address fuel and food insecurity

Conclusion

Biomass has enormous potential in India. The country has available feedstocks; access to land and sea; a large rural workforce; possibilities to improve its energy security; and the potential to reduce its greenhouse gas (GHG) emissions.

- Government entities involved in the biofuel/ bioproducts industry should coordinate to form a holistic view of the value chain, e.g. federal and regional governments should harmonize their strategies regarding policy. Such coordination would decrease the risks inherent in investing in the industry.
- For biomass to be commercially viable, integrated market structures are required, in the form of coordinated government funding, policies and private investment.

- Farmers need to learn about the benefits of producing feedstocks for biorefineries.
- They need to be motivated to increase their production and yields with targeted policies.
- New technologies for fuel and biomaterials' production need to be developed, to increase the effectiveness of biomass across the value chain.
- Supply chain and infrastructure upstream and downstream require substantial investment, to thereby create a sustainable market for biorefinery products.

Thank You